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PUBLICATIONS  
OF THE  
YERKES OBSERVATORY

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VOL. I—1900.

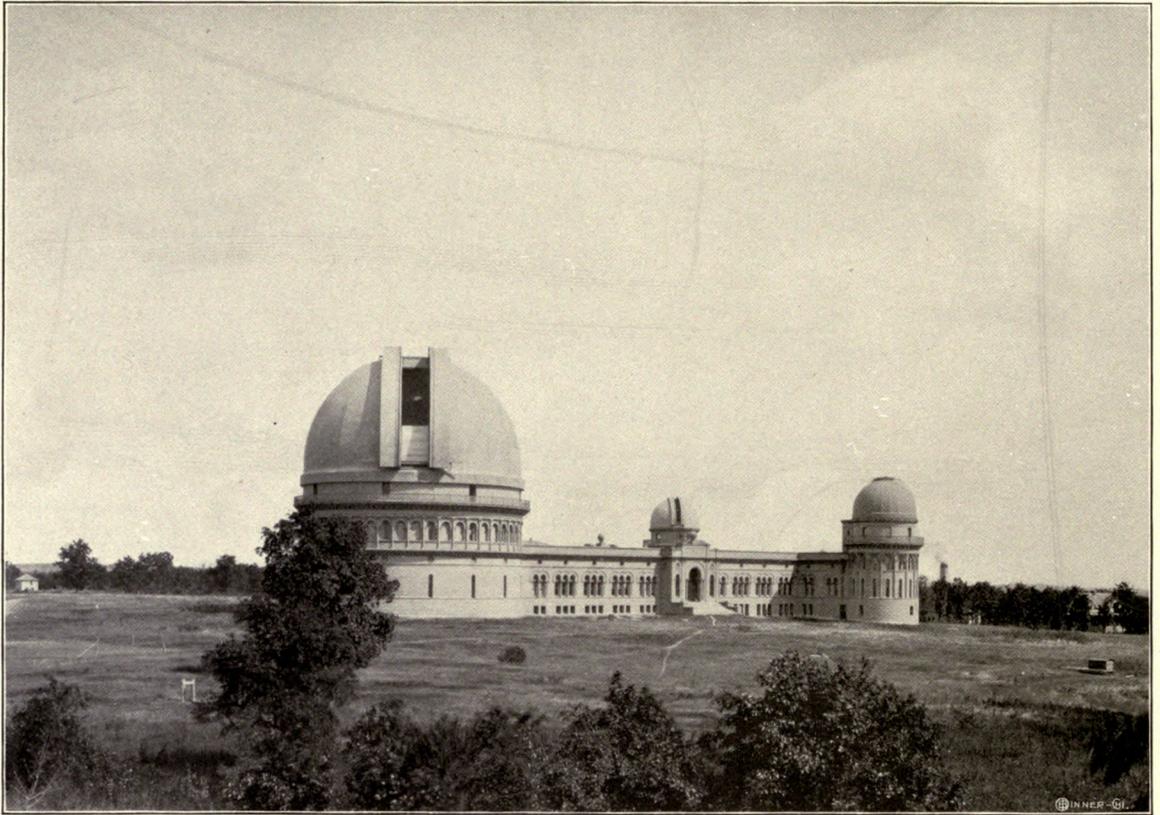
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THE YERKES OBSERVATORY OF THE UNIVERSITY OF CHICAGO

PUBLICATIONS

OF THE

YERKES OBSERVATORY

OF THE

UNIVERSITY OF CHICAGO

VOLUME I



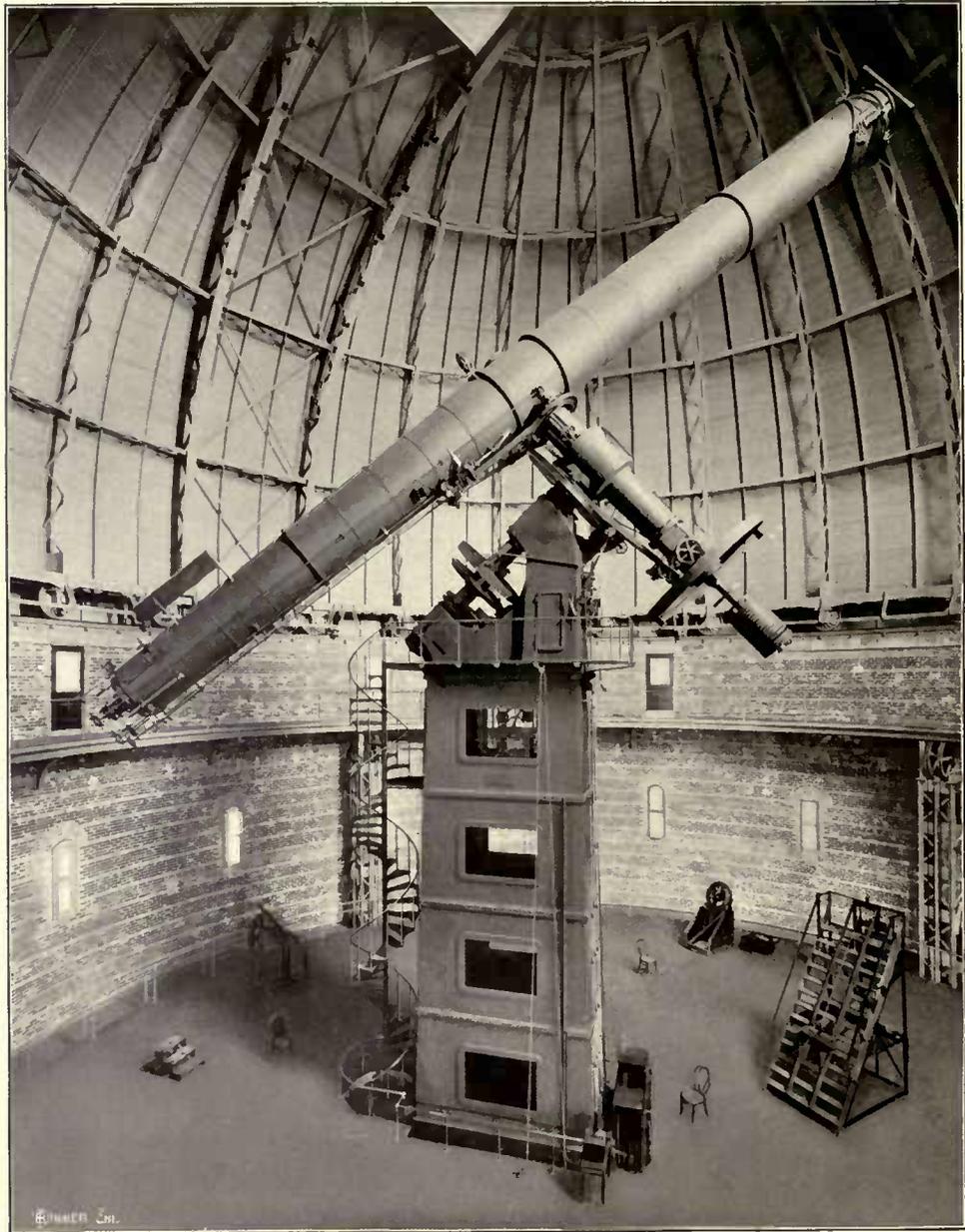
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THE 40-INCH CLARK TELESCOPE OF THE YERKES OBSERVATORY  
MOUNTED BY WARNER & SWABEY

A GENERAL CATALOGUE  
OF  
1290 DOUBLE STARS

DISCOVERED FROM 1871 TO 1899 BY S. W. BURNHAM. ARRANGED IN  
ORDER OF RIGHT ASCENSION WITH ALL THE MICROMETRICAL  
MEASURES OF EACH PAIR

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BY  
S. W. BURNHAM

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CHICAGO  
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1900

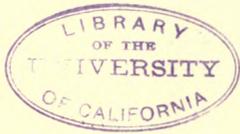


TO THE MEMORY OF

BARON DEMBOWSKI

THE DISTINGUISHED DOUBLE STAR OBSERVER, THE FIRST TO UNDER-  
TAKE THE SYSTEMATIC MEASUREMENT OF THESE STARS, AND  
WHOSE KINDLY CRITICISM AND GENIAL ENTHUSIASM  
WERE TO THE WRITER ALWAYS AN  
INSPIRATION

THIS VOLUME  
IS GRATEFULLY INSCRIBED



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## INTRODUCTION

A general catalogue of all the double stars discovered by me from time to time during the past twenty-five years has long been needed by those interested in this field of astronomical research, and, by reason of the special interest attached to many of these remote sidereal systems, it has become more and more important to bring the scattered material together in order to intelligently pursue the investigations which promise to so much increase our knowledge of the great universe beyond the solar system. These discoveries are scattered through nineteen different catalogues, published at various times and places, commencing with 1873; and the observation of these stars by a great number of astronomers in this country and in Europe can only be made use of by consulting hundreds of volumes of observatory and society publications, astronomical periodicals, etc. It is difficult, if not practically impossible, for the general observer or investigator to make a really complete collection of all the measures of a large number of these stars. Many of the observations are in obscure and unusual places, and in works not always readily accessible.

This general catalogue was arranged and prepared for publication in the latter part of my connection with the Lick Observatory, 1888-1892, and most of my work with the great 36-inch refractor of Mt. Hamilton during those four years was devoted to the careful remeasurement of the stars contained in the catalogues published prior to that time, and to the discovery and observation of another and more difficult class of doubles for which that splendid instrument is so well adapted. A new field was opened which was beyond the reach of most of the telescopes of the world. The pages of this catalogue will bear witness to the importance of the additions in the way of new measures and new systems made at the Lick Observatory during this time. For various reasons this catalogue was not published at that time. Since then it has been kept up to date by the addition of all the more recent measures, and the places recomputed by using later star catalogues, particularly those of the *Astronomischen Gesellschaft*, so far as published, the Cordoba catalogues of southern stars, and the other recent publications, in lieu of the places originally taken from Lalande, Argelander's *Durchmusterung*, Weisse, etc. In this way some minor errors have been eliminated in the places, and in the identity of some of the stars. No attempt has been made to make this work a substitute for original star catalogues with respect to the absolute places of these stars in the heavens. As these positions have no other use than for finding the objects with the telescope, it was not considered worth while to reduce them to any later epoch than that used in the several original double star catalogues, that epoch being uniformly 1880. In the star catalogue references, preference has been given, where the stars are below the naked-eye limit, to the old standard catalogues, although the places have been derived from more modern observations.

### THE FIRST OBSERVATIONS

It may not be out of place here to give a brief history of the beginning of this astronomical work. When in London, about 1861, I purchased one of the cheap astronomical telescopes introduced about that time. It had a nominal aperture of three inches, but was without a finder, and had only the simple alt-azimuth mounting, with a common table tripod. It was supplied with a terrestrial, as well as astronomical, eyepiece and while it was a good instrument for landscape use, it was of little value for astronomical purposes. Some years later I obtained a  $3\frac{3}{4}$ -inch telescope, with an English object-glass, mounted equatorially by Fitz on a portable stand. This was just good enough to be of some use, and poor enough, so far as its optical power was concerned, to make something better more desirable than ever. In 1869 I accidentally met Mr. Alvan G. Clark in Chicago, on his return from Iowa, where he had been to observe the total eclipse of that year, and made some

inquiries of him about a small equatorial. This interview resulted in my ordering from the celebrated firm of Alvan Clark & Sons an equatorial of six inches aperture. I told them what I wanted, and what I wanted it for. Every detail was left entirely to their judgment, stipulating only that its definition should be as perfect as they could make it, and that it should do on double stars all that it was possible for any instrument of that aperture to do. In due course of time this instrument was delivered, and was set up in an observatory prepared for it in the meantime. My attention for some reason or other, which I am unable to explain, had been almost exclusively directed to double stars previous to this while using the smaller telescope referred to. This preference was not in any sense a matter of judgment as to the most desirable or profitable department of astronomical work, or the result of any special deliberation upon the subject. It came about naturally, without any effort or direction upon my part.

At the beginning of the use of the 6-inch telescope my library, so far as the subject of double stars was concerned, was principally confined to the first edition of Webb's *Celestial Objects for Common Telescopes*, and I wish here to record my great indebtedness to this most admirable and really indispensable book. It was of great assistance to me at that time, and it has never ceased to be a valuable and convenient work for frequent reference. It contains about all that the beginner is likely to want in connection with any use of a small telescope. It has passed through several editions since that time, the last one containing many of these stars. The time came finally when other double-star catalogues were necessary. Double stars were frequently found which were not in Webb, and then it was necessary to ascertain what they were. The books at the Dearborn Observatory, then in charge of Professor T. H. Safford, were always accessible to me. This library had some of the principal star catalogues, but very little relating to double stars except Struve's *Mensurae Micrometricae*. The result was that from time to time I made manuscript copies at the Naval Observatory, the Dartmouth College Observatory, and other places, and from books borrowed from these institutions and various astronomers, of the essential results of most of the leading catalogues and observations relating to this subject. These copies included Struve's *Mensurae Micrometricae*, *Positiones Mediae*, and *Catalogus Novus*; the seven catalogues of Sir John Herschel; the catalogues of South, and Herschel and South, in the *Philosophical Transactions*; the *Poulkowa Catalogue* of O. Struve; the measures of Madler in the *Dorpat Observations*; material given in the *Memoirs* and *Monthly Notices of the Royal Astronomical Society*, *Astronomische Nachrichten*, and publications of like character; and many minor contributions, including nearly all the discoveries made after the Struves. While the labor involved in doing this work was very great, there was perhaps a corresponding advantage gained in acquiring a more thorough familiarity with the literature of this subject. Since that time these and many other works of like character have been obtained, and my library is practically complete, so far as double-star material is concerned.

The want of a single catalogue of all the double stars visible in the northern hemisphere was very manifest soon after the commencement of the observations with the 6-inch refractor. Many pairs were picked up on every good night which it was desirable to identify with as little loss of time as possible. If wanting in Struve, Herschel, and other of the old catalogues, they might still be known pairs, and it was unsafe to assume that they had not been before observed, without a careful examination of many minor lists, catalogues and observations of various kinds, scattered throughout a large number of volumes issued by observatories and societies, periodicals, handbooks and monographs printed in the last hundred years. I was therefore compelled in the interest of my own work to bring this material together and arrange all the pairs in order of Right Ascension in a general catalogue. In this way I made a manuscript catalogue of every known double star within  $121^{\circ}$  of the north pole, giving the details of measures, magnitudes, star catalogue references, etc. With this at hand, it was but a moment's work at the telescope to identify any known object, and to decide at

once whether or not an object thus found was really a new pair. This catalogue subsequently passed into a second manuscript edition, more complete and perfect in respect to some details. All the star places were reduced to a common epoch, and every measure of each pair was either given or cited. This served the purpose for a good many years, but the time came when the manuscript became too crowded by the interlineation of stars discovered by myself, and by other observers, and by the addition of a great number of references to measures and observations, and then I undertook the preparation of a third manuscript edition, which was arranged in the proper form for printing, with ample space for new stars and new observations, and giving a brief statement or discussion of the character of each pair of any general interest. This catalogue, substantially bound in twelve volumes, has all the time been kept posted to date by the addition of all new material as soon as printed, and many unpublished discoveries and observations. This general catalogue in its various forms has been of the greatest value and assistance to me from the beginning in all this work. In fact, it rendered possible all that has been accomplished in this field. Very few will fully appreciate the enormous amount of hard work which has been necessarily expended in the preparation of such a work. Whether it will ever assume other than the present manuscript form remains to be seen. It should be remarked in this connection that, with the exception of the four years, 1888-1892, all of this astronomical work, with the telescope and otherwise, has been done when eight or more hours of at least six days in the week were more or less occupied with other and very different affairs of life.

#### THE ORIGINAL LISTS OF NEW DOUBLE STARS

My discoveries of double stars may be said to have commenced in 1872, although the 6-inch Clark refractor had been in my possession for a year or two previously. A complete list of the the nineteen catalogues, which are included in this work is as follows:

- FIRST CATALOGUE ( $\beta$  1 to 81). *Monthly Notices of the Royal Astronomical Society*, XXXIII, 351 (March 1873). Discovered with the 6-inch refractor.
- SECOND CATALOGUE ( $\beta$  82 to 106). *Monthly Notices of the Royal Astronomical Society*, XXXIII, 437 (May 1873). Discovered with the 6-inch refractor.
- THIRD CATALOGUE ( $\beta$  107 to 182). *Monthly Notices of the Royal Astronomical Society*, XXXIV, 59 (December 1873). Discovered with the 6-inch refractor.
- FOURTH CATALOGUE ( $\beta$  183 to 229). *Monthly Notices of the Royal Astronomical Society*, XXXV, 382 (June 1874). Discovered with the 6-inch refractor.
- FIFTH CATALOGUE ( $\beta$  230 to 300). *Monthly Notices of the Royal Astronomical Society*, XXXV, 31 (November 1874). Nos. 230 to 252 were discovered with the 6-inch refractor; Nos. 253 to 281 with the 9.4-inch refractor of the Observatory of Dartmouth College, and Nos. 286 to 300 with the 26-inch refractor of the Naval Observatory at Washington.
- SIXTH CATALOGUE ( $\beta$  301 to 390). *Astronomische Nachrichten*, No. 2062. Discovered with the 6-inch refractor.
- SEVENTH CATALOGUE ( $\beta$  391 to 436). *Astronomische Nachrichten*, No. 2103. Also reprinted in the *American Journal of Science*, September 1876. Discovered with the 6-inch refractor.
- EIGHTH CATALOGUE ( $\beta$  437 to 452). *American Journal of Science* (July 1877). Discovered with the 18½-inch refractor of the Dearborn Observatory.
- NINTH CATALOGUE ( $\beta$  453 to 482). *Monthly Notices of the Royal Astronomical Society*, XXXVIII, 78 (December 1877). Discovered with the 6-inch refractor.
- TENTH CATALOGUE ( $\beta$  483 to 733). *Memoirs of the Royal Astronomical Society*, Vol. XLIV. Discovered with the 18½-inch refractor of the Dearborn Observatory. (This volume contains also measures of 500 other double stars with the same instrument.)

- ELEVENTH CATALOGUE ( $\beta$  734 to 775). *Report to the Trustees of the James Lick Trust of Observations made on Mt. Hamilton with reference to the Location of the Lick Observatory, 1880.* Observations with the 6-inch refractor on Mt. Hamilton in 1879. There are measures of a few of the old pairs with the same instrument. (This report is reprinted in *Publications of the Lick Observatory*, Vol. I.)
- TWELFTH CATALOGUE ( $\beta$  776 to 863). *Publications of the Washburn Observatory*, Vol. I. Observations with the 15½-inch equatorial of the Washburn Observatory, Madison, Wis., in 1881. (This volume contains also several hundred measures of other double stars.)
- THIRTEENTH CATALOGUE ( $\beta$  864 to 1025). *Memoirs of the Royal Astronomical Society*, Vol. XLVII. Nos. 864 to 997 discovered with the 18½-inch refractor of the Dearborn Observatory; Nos. 998 to 1013 with the 12-inch of the Lick Observatory in October 1881; and Nos. 1014 to 1025 with the 18½-inch at Chicago. (This volume contains a large number of measures of Struve and other pairs.)
- FOURTEENTH CATALOGUE ( $\beta$  1026 to 1038). *Astronomische Nachrichten*, No. 2875. Observations with the 12 and 36-inch refractors of the Lick Observatory. The numbers were inadvertently omitted, but are given in the introduction to Catalogue XV. (*Astronomische Nachrichten* 2875 also contains measures of other stars.)
- FIFTEENTH CATALOGUE ( $\beta$  1039 to 1092). *Astronomische Nachrichten*, Nos. 2929, 2930. Observations with the 36-inch refractor. (Also measures of other double stars.)
- SIXTEENTH CATALOGUE ( $\beta$  1093 to 1154). *Astronomische Nachrichten*, Nos. 2956, 2957. Observations with the 36-inch refractor. (Also measures of other double stars.)
- SEVENTEENTH CATALOGUE ( $\beta$  1155 to 1224). *Astronomische Nachrichten*, Nos. 3047, 3048. Observations with the 36-inch refractor, and measures of other stars.
- EIGHTEENTH CATALOGUE ( $\beta$  1225 to 1266). *Astronomische Nachrichten*, Nos. 3113, 3114. Observations with the 36-inch refractor, and measures of other stars.
- NINETEENTH CATALOGUE ( $\beta$  1267 to 1274). *Astronomische Nachrichten*, Nos. 3141, 3142. Observations with the 36-inch refractor. (Catalogues XIV to XIX are given in *Publications of the Lick Observatory*, Vol. II.)
- 
- ( $\beta$  1275 to 1290). Published for the first time in this volume.

#### THE TELESCOPES USED

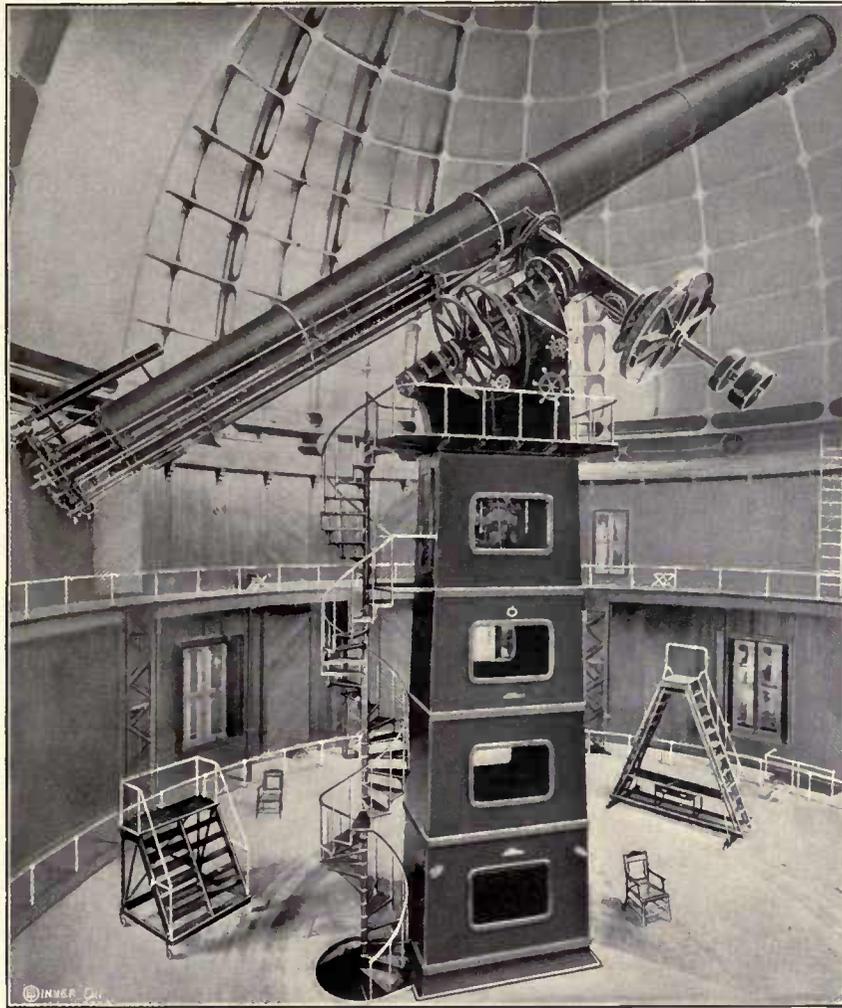
It is worthy of note in this connection that all of these new stars, without exception, were discovered with telescopes made by Alvan Clark & Sons. In one sense the success of this work is due to these eminent opticians, for nothing is more certain than that these discoveries could not have been made with any other class of telescopes. These instruments in order of aperture are as follows:

**The 6-inch refractor.** It is hardly necessary to say, in view of the discoveries made with it and given in this catalogue, that its performance on the most difficult objects was simply perfect. Many of the stars discovered with it are by no means easy to measure with the largest telescopes now in use. Some of the most rapid and interesting binaries in this catalogue were discovered with this instrument. It now belongs to the Washburn Observatory of the University of Wisconsin.

**The 9.4-inch refractor of the Dartmouth College Observatory.** During the summer of 1874 I spent a vacation within a few miles of this place. Before leaving for China on the Transit of Venus expedition, Professor Young very kindly placed his telescope at my disposal, and I spent some ten nights at that Observatory, with the results given in the *Fifth Catalogue*.

**The 12-inch refractor of the Lick Observatory.** The discoveries made with this telescope when I was on Mt. Hamilton for the second time, in 1881, are found in the *Thirteenth Catalogue*. The observations from 1888 to 1892 are contained in the Mt. Hamilton catalogues. Some of the most difficult pairs were discovered with this instrument, for instance,  $\sigma$  Orionis,  $\alpha$  Andromedae, etc.

**The 15.5-inch refractor of the Washburn Observatory at Madison, Wisconsin.** The results of some four or five months' work with that telescope in 1881 will be found in the *Twelfth Catalogue* (*Publications of the Washburn Observatory*, Vol. I.) This is an excellent instrument, and very convenient to use in all its appointments.



THE 36-INCH CLARK TELESCOPE OF THE LICK OBSERVATORY  
MOUNTED BY WARNER & SWASEY



**The 16-inch refractor of the Warner Observatory at Rochester, N. Y.** I had the pleasure of spending an evening with Dr. Lewis Swift, and picked up two or three new pairs which are given in my later catalogues. This fine instrument is now at the Lowe Observatory, in southern California.

**The 18.5-inch refractor of the Dearborn Observatory at Chicago.** This, at the time it was made, was the largest refractor in the world; and, although one of the early works of Clark & Sons, the definition of the object-glass is as perfect as any of their later productions. This is established by the discoveries and measures in my *Tenth* and *Thirteenth Catalogues*. The Dearborn Observatory, at that time, was attached to the old University of Chicago, and was located about three and a half miles from the business center of the city.

**The 26-inch refractor of the Naval Observatory at Washington.** I had the privilege of using this instrument one night in 1874, and found the new stars given in my *Fifth Catalogue*.

**The 36-inch refractor of the Lick Observatory.** With reference to the superb definition and light-power of the great telescope, it is sufficient to refer to the discoveries, and the measures of difficult objects contained in my last five catalogues. These will demonstrate the immense superiority of this instrument over all others elsewhere. There is probably no place in the world, where an observatory has been established, which can compare favorably with Mt. Hamilton.

**The 40-inch refractor of the Yerkes Observatory.** In the last two years I have given the time spent at the Yerkes Observatory to the re-measurement of these stars, where recent measures were wanting, and where change was shown by the prior observations. Much of the time the most difficult of these pairs could not be observed under the conditions present. All the measures given in the following pages, as made by me in 1897, 1898, and 1899, were made with this instrument. Altogether I have made about 950 measures of these pairs. Of course the number of measures which can be made in a given time with so large an instrument is much less than it would be with the other equatorials used in this work. More time is necessarily used in setting on stars in different parts of the sky than would be required with a moderately large aperture. When the 40-inch refractor is moved by hand, as it must be in getting every object into the field, it is necessary to move about twenty tons.

In the course of these observations, sixteen new pairs, Nos. 1275 to 1290, have been added to this catalogue, eight of which were noted with the large refractor. The others were stars discovered many years ago, some at Mt. Hamilton, and others at the old Dearborn Observatory, but were forgotten to be included in the catalogues of that time. In looking over my old observing books, I have made a note of some of these omissions, and as far as possible recovered and measured them for this work.

#### DISTRIBUTION OF DISCOVERIES

An examination of this catalogue to ascertain the distribution of the discoveries among the several telescopes used in this work shows the following:

|                                       |   |   |   |   |   |     |
|---------------------------------------|---|---|---|---|---|-----|
| 6-inch--Private Observatory           | - | - | - | - | - | 451 |
| 18½-inch—Dearborn Observatory         | - | - | - | - | - | 413 |
| 36-inch—Lick Observatory              | - | - | - | - | - | 198 |
| 15½-inch—Washburn Observatory         | - | - | - | - | - | 87  |
| 12-inch—Lick Observatory              | - | - | - | - | - | 56  |
| 9.4-inch—Darmouth College Observatory | - | - | - | - | - | 24  |
| 26-inch—Naval Observatory             | - | - | - | - | - | 14  |
| 40-inch—Yerkes Observatory            | - | - | - | - | - | 8   |
| 16-inch—Warner Observatory            | - | - | - | - | - | 2   |

#### MICROMETRICAL MEASURES

The first measures of these stars were made by the late Baron Dembowski. I was fortunate in being placed in communication with this eminent astronomer soon after the commencement of my work with the 6-inch refractor, and from that time on until his death, in 1881, I was in constant correspondence with him, and all of my discoveries were transmitted to him in advance of their

publication. These new stars were measured by him in the most painstaking and thorough manner, and his observations give the fundamental data for comparison with subsequent measures of very many of the most important of these new systems. As an observer with the micrometer he had no superior, and few, if any, equals. His work is of the highest degree of accuracy. He made no mistakes, and wasted no time in idle speculations. He has left a record of honest, thorough and consistent work which will be an honor to his memory for all time. Baron Dembowski was to me an example so inspiring, a critic so genial and frank, a friend so warm-hearted and disinterested that simple justice as well as friendship impels me to inscribe this volume to his memory. The Royal Astronomical Society recognized the value of his services by the award of its gold medal in 1878. The results of his life-work have been published in two large volumes prepared and issued after his death under the direction of the two distinguished astronomers, Otto Struve and Schiaparelli. These observations are indispensable to every observer engaged in this department of work.

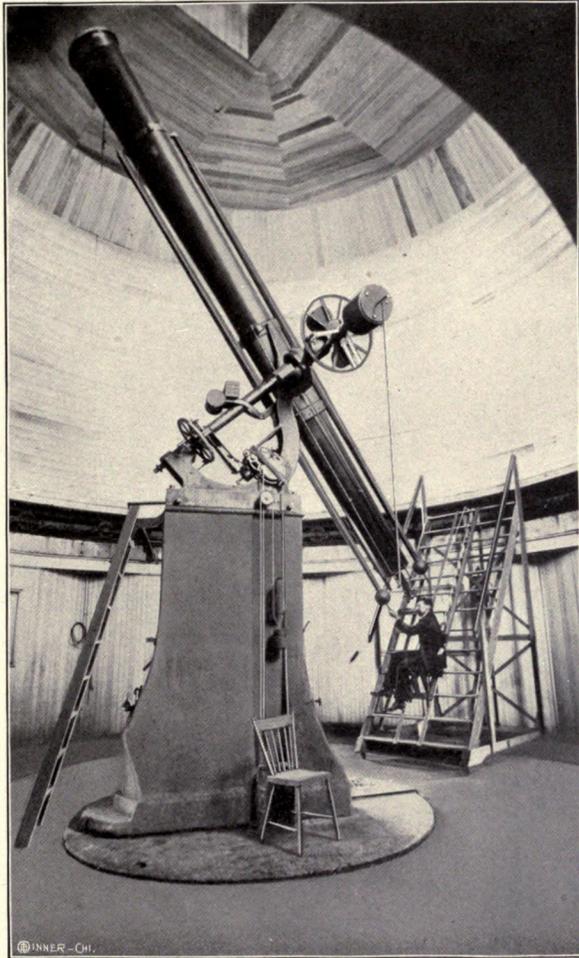
My own work with the micrometer commenced with the use of the 18½-inch equatorial of the Dearborn Observatory, situated then in the city of Chicago. It was continued for a few months at the Washburn Observatory, at Madison, Wis., in 1881, and was then suspended until the commencement of my duties at the Lick Observatory in the latter part of 1888. During the four years spent at that place my time was almost exclusively given to the measurement and discovery of double stars. If the discovery of new pairs, regardless of their micrometrical measurement, had been the paramount object, this general catalogue would have been increased by the addition of at least many hundred new pairs; but I deemed it of the first importance to accompany each discovery with a careful set of measures. This seemed the more necessary because most of the pairs found with the large refractor were too difficult for ordinary instruments; and therefore it was very desirable that good positions should be obtained with which future observations, whenever made, could be compared. A considerable portion of the time was given to the re-measurement of the stars previously discovered, and new pairs added no faster than they could be thoroughly observed with the micrometer.

Below is given a list of the principal observers whose measures of these stars are given in this work.

|                  |                    |                     |
|------------------|--------------------|---------------------|
| AITKEN, R. G.    | ENGELMANN, R.      | SCHIAPARELLI, G. V. |
| BARNARD, E. E.   | GLASENAPP, S.      | SCOTT, J. L.        |
| BOOTHROVD, S. L. | HALL, ASAPH        | SEE, T. J. J.       |
| BOWYER, W.       | HOUGH, G. W.       | SELLORS, R. P.      |
| BROWN, S. J.     | HOWE, H. A.        | STONE, ORMOND       |
| BRYANT, W. W.    | HUSSEV, W. J.      | STRUVE, H.          |
| COGSHALL, W. A.  | LAMB, ALICE        | STRUVE, O.          |
| COLLINS, W. H.   | LEAVENWORTH, F. P. | TARRANT, K. J.      |
| COMSTOCK, G. C.  | LEWIS, THOMAS      | WILSON, H. C.       |
| DEMBOWSKI        | MAW, W. H.         | UPDEGRAFF, MILTON   |
| DOOLITTLE, E.    | MULLER, FRANK      | UPTON, WINSLOW      |
| DYSON, F. W.     | POLLOCK, J. A.     |                     |
| EGBERT, H. V.    | PRITCHETT, H. S.   |                     |

#### NUMBER OF DOUBLE STARS

In giving the number of nights included in the mean result given in the catalogue, I have stated it as the number of complete measures; that is, when distance and position-angle are both measured. In many instances the angle has been measured on a greater number of nights than that given here.



THE 18½-INCH CLARK TELESCOPE OF THE OLD UNIVERSITY OF CHICAGO (DEARBORN OBSERVATORY)



The total number of double stars now known has been greatly overstated by some writers. It has been said that the number is ten thousand and upwards. This is correct if the number is to be arrived at by adding all the stars contained in the various early double star catalogues; but it must be remembered that these lists, and particularly those of the Herschels, include a large proportion of very faint and very wide stars which cannot be called double in the proper sense of the word. The distance between them is much too great to make it in the least probable that the stars have any physical connection. With such a standard the number of pairs could be increased to hundreds of thousands by sweeping with a very moderate aperture. The number recorded in a single night would be limited only by the time occupied in reading the circles, and fixing the star places. The great majority of binary stars are moderately close pairs, where the mean distance does not exceed 2"; and all the short period binaries are very much closer. In the appendix to my *Thirteenth Catalogue* I gave a tabular statement showing the whole number of double stars of Class I (distance 0" to 1") and Class II (distance 1" to 2") in all the original double star catalogues published at that time. This statement, with my later results added in 1891, is as follows:

|  | Class I | Class II | Total | Ratio      |
|--|---------|----------|-------|------------|
| BURNHAM. Catalogue of 1260 stars - - -     | 385     | 305      | 690   | 550 : 1000 |
| O. STRUVE. Catalogue of 547 stars - - -    | 154     | 63       | 217   | 400 : 1000 |
| STRUVE. Catalogue of 2640 stars - - -      | 91      | 314      | 405   | 150 : 1000 |
| HERSCHEL I. Catalogue of 812 stars - - -   | 12      | 24       | 36    | 45 : 1000  |
| HERSCHEL II. Catalogue of 3429 stars - - - | 2       | 20       | 22    | 7 : 1000   |

It will be seen from this exhibit that prior to 1870 all the leading double star catalogues combined, including altogether not less than 7400 so-called double stars, contained less than 700 pairs with distances not exceeding 2". It will be noticed also that 60 per cent. of all known pairs with distances of 1" and less had been discovered in the preceding twenty years.

It is apparent from this investigation that upon a very liberal estimate there were not more than 4000 or 5000 stars within 120° of the north pole which could be properly called double; and that many of this number were of little interest as physical systems, or likely to become so hereafter. In some instances the recording and measuring of a distinct companion has been of value in determining the proper motion of the primary; and in other instances it has been shown that the proper motion is common to both stars, and that therefore they have some connection with each other.

In recent years many new double stars have been discovered by a number of American observers. Of these special mention should be made of the several catalogues of new pairs recorded by Hough with the 18½-inch of the Dearborn Observatory, which is now connected with the Northwestern University at Evanston, Ill., and of the discoveries by See at the Lowell Observatory. These catalogues contain many close and interesting objects.

#### THE FIELD FOR DISCOVERY

For many years prior to 1870 it seems to have been practically accepted that the field for the discovery of new pairs had been substantially worked out by the Herschels and the Struves, and that so little had been overlooked by these eminent pioneers in this work that there was little chance for later observers to make many important additions. The great work of the first Struve, *Mensurae Micrometricae*, published in 1827, contained all known double stars within 105° of the north pole. The stars discovered by Herschel I, and other early observers, which were within the wide limits of distance adopted by Struve, are embraced in his great catalogue. His examination of the heavens

in search of new pairs was as complete and thorough as could have been expected under the conditions existing at that time. This was supplemented by the labors of his equally distinguished son, Otto Struve, who continued the work with the more powerful telescope at Poulkova, and added some four hundred new pairs, published in 1850 as the *Poulkova Catalogue*. For many years after this there was very little done in this field of astronomy, aside from the measurement of the pairs previously discovered; and that seems to have been taken by observers generally as about the only thing remaining to be done.

In 1842 the late Professor O. M. Mitchel visited Europe for the purpose of inspecting foreign observatories, and purchasing a telescope for the proposed Cincinnati Observatory. In the interest of this object he visited most of the leading European astronomers, and, among others, Sir James South. This was during, or about, the time of a long litigation which grew out of a contract between this astronomer and a firm of instrument makers who undertook to mount equatorially a large object glass belonging to South. Mitchel, in describing his interview, says :<sup>1</sup>

One apartment was examined after another, until finally we reached a large room surmounted by a dome of great size and of an expensive construction, while fragments of the framework for mounting a great equatorial were scattered around.

"Here, sir," exclaimed Sir James, "you behold the wreck of all my hopes. Here I have expended thousands, and flattered myself that I was soon to possess the finest instrument in Europe; but it is all over, and there's an end."

I remarked that the object-glass was still in his possession, and might yet be mounted so as to realize his hopes and expectations.

"No," said Sir James, "Struve has reaped the golden harvest among the double stars, and there is little now for me to hope or expect."

It would be difficult to appreciate the feelings which at that moment were sweeping through the mind of the astronomer. Long cherished visions of fame and high distinction, nay, perhaps of grand discoveries in the heavens, which for years had played round his hopes of the future, had fled forever. Another had reaped the golden harvest, and like Clairaut, who wept that there was not for him, as for Newton, the problem of the universe to solve, Sir James South could almost weep to think that another's eye had been permitted to sweep over the far distant realms of space which he had long hoped might remain his own peculiar province.

Such views seem very strange at this time, when, if one is absolutely certain of anything in this direction, it is that there is much more to do, even now, after the lapse of half a century, in every department of double star work, than there ever was before. The late Rev. T. W. Webb, author of *Celestial Objects for Common Telescopes*, one of the most eminent English amateur astronomers, in a letter written to me in 1873, after the publication of my first three catalogues, said: "It will hardly be possible for you to go on for any great length of time as you have begun, because the number of such objects is not interminable, and every fresh discovery is one less to be made; still, what you have already done is so much more than any man now living has accomplished, that your high position as an observer is fully secured." Since that time more than one thousand new double stars have been added to my own catalogues, and the prospect of future discoveries is as promising and encouraging as when the first star was found with the six-inch telescope. The gold medal of the Royal Astronomical Society was awarded in 1894 for these discoveries.

#### NEW STARS TO OLD PAIRS

As would be expected in discoveries of this kind, many of the old pairs recorded by the Herschels, the Struves, and other astronomers, have been found to be triple or quadruple, by the addition of much closer and more difficult components. This catalogue contains 133 stars of this

<sup>1</sup> *Ormsby MacKnight Mitchel: Astronomer and General*. A biographical narrative. By his son, F. A. Mitchel, 1887.



THE 6-INCH CLARK REFRACTOR, NOW AT THE WASHBURN OBSERVATORY, UNIVERSITY OF WISCONSIN



class, or more than one tenth of the whole number is made up of previously known doubles, where one of the components has been again divided, or a much nearer star added to the system. Most of these were difficult objects when discovered, and all of them much more difficult than the old stars. In this way some pairs, much too wide to be of any interest as double stars, have been shown by the discovery of the new star to be important binary systems, and among the most rapid known.

The following is a classified list of the pairs given in the several catalogues of the Herschels, the Struves, and South, which I have found to be more closely double :

| W. STRUVE |      | W. STRUVE    |      | HERSCHEL II |      | HERSCHEL I |      |
|-----------|------|--------------|------|-------------|------|------------|------|
| Σ         | PAGE | Σ            | PAGE | H           | PAGE | H          | PAGE |
| 17        | 3    | 2130         | 155  | 1981        | 7    | VI. 66     | 49   |
| 100       | 18   | 2268         | 171  | 2161        | 33   | VI. 35     | 57   |
| 117       | 20   | 2287         | 173  | 2298        | 75   | V. 25      | 61   |
| 157       | 24   | 2342         | 180  | 2638        | 123  | V. 21      | 70   |
| 171       | 25   | 2476         | 188  | 2661        | 127  | V. 91      | 73   |
| 258       | 30   | 2538         | 192  | 2710        | 133  | VI. 70     | 90   |
| 524       | 34   | 2539         | 193  | 2867        | 190  | III. 27    | 91   |
| 366       | 37   | 2549         | 194  | 3133        | 249  | VI.. 42    | 91   |
| 439       | 41   | 2557         | 195  | 3216        | 266  | IV. 26     | 97   |
| 468       | 43   | 2704         | 212  | 3261        | 53   | VI. 78     | 97   |
| 645       | 58   | 2793         | 229  | 3275        | 63   | IV. 120    | 102  |
| 668       | 59   | 2816         | 233  | 3644        | 47   | V. 124     | 130  |
| 687       | 61   | 2824         | 235  | 3761        | 64   | III. 7     | 146  |
| 692       | 62   | 2959         | 254  | 3780        | 69   | V. 6       | 148  |
| 707       | 63   | 3018         | 261  | 3875        | 81   | III. 113   | 202  |
| 721       | 64   | 3047         | 267  | 4774        | 142  | V. 95      | 244  |
| 734       | 66   |              |      | 4803        | 144  | VI. 21     | 250  |
| 753       | 67   | HERSCHEL II. |      | 4935        | 160  | SOUTH      |      |
| 762       | 68   |              |      | 5009        | 170  |            |      |
| 809       | 72   | H            | PAGE | 5028        | 172  | S          | PAGE |
| 888       | 77   | 367          | 65   | 5035        | 173  |            |      |
| 1026      | 85   | 607          | 204  | 5072        | 184  | 409        | 29   |
| 1057      | 87   | 998          | 271  | 5532        | 256  | 423        | 35   |
| 1097      | 89   | 1455         | 199  | HERSCHEL I. |      | 437        | 42   |
| 1179      | 96   | 1489         | 203  |             |      | 537        | 82   |
| 1780      | 128  | 1499         | 206  |             |      | 571        | 100  |
| 1835      | 133  | 1554         | 214  | H           | PAGE | 627        | 114  |
| 2005      | 147  | 1828         | 252  | V. 92       | 25   | 663        | 137  |

## General Catalogue of Double Stars

| SOUTH              |      | O. STRUVE                          |      | W. STRUVE (Appendix)<br>Wide Pairs |      |
|--------------------|------|------------------------------------|------|------------------------------------|------|
| S                  | PAGE | O $\Sigma$                         | PAGE | $\Sigma$                           | PAGE |
| 738                | 203  | 24                                 | 17   | 38 App. I                          | 181  |
| 752                | 210  | 169                                | 86   | 39 App. I                          | 183  |
| 781                | 225  | 173                                | 90   | 58 App. I                          | 247  |
| SOUTH AND HERSCHEL |      | 242                                | 117  | 12 App. II                         | 257  |
|                    |      | 336                                | 167  | O. STRUVE (Appendix)<br>Wide Pairs |      |
|                    |      | 367                                | 189  | O $\Sigma$                         | PAGE |
| Sh                 | PAGE | 425                                | 220  | App. 12                            | 17   |
| 110                | 107  | 447                                | 232  | App. 38                            | 41   |
| SOUTH AND HERSCHEL |      | W. STRUVE (Appendix)<br>Wide Pairs |      | App. 77                            | 79   |
|                    |      | $\Sigma$                           | PAGE | App. 177                           | 189  |
|                    |      | 120                                | 114  | App. 209                           | 215  |
|                    |      | 179                                | 134  | App. 215                           | 225  |
|                    |      | 255                                | 169  | App. 220                           | 232  |
|                    |      | 263                                | 176  | App. 234                           | 245  |
|                    |      | 264                                | 176  |                                    |      |
| 376                | 141  | 14 App. I                          | 65   |                                    |      |
|                    |      | 21 App. I                          | 120  |                                    |      |
|                    |      | 24 App. I                          | 124  |                                    |      |

## NEW NAKED-EYE DOUBLE STARS

In nearly one fourth of the whole number of stars found to be double, the primary is bright enough to be visible to the unaided eye. These stars, numbering altogether 291, are pretty well distributed among the different constellations visible in this latitude. Many of them are among the most prominent of the bright and well-known stars. To facilitate easy reference to these stars, when only the constellation name is given, I have arranged them under the heads of the constellations in which they are found.

| $\beta$ | STAR                     | PAGE | $\beta$ | STAR               | PAGE |
|---------|--------------------------|------|---------|--------------------|------|
|         | <i>Andromeda</i>         |      |         | <i>Aquarius</i>    |      |
| 1095    | 28 Andromedae            | 5    | 1034    | 7 Aquarii          | 219  |
| 491     | $\delta$ Andromedae      | 9    | 73      | $\beta$ Aquarii    | 230  |
| 999     | $\omega$ Andromedae      | 20   | 1212    | 24 Aquarii         | 232  |
| 1147    | 2 Andromedae             | 255  | 172     | 51 Aquarii         | 244  |
| 717     | 8 Andromedae             | 259  | 178     | Aquarii 252        | 252  |
| 388     | W <sup>2</sup> XXII. 590 | 262  | 1220    | $\psi^1$ Aquarii   | 257  |
| 995     | Groombridge 4139         | 265  | 279     | $\omega^2$ Aquarii | 264  |

| $\beta$ | STAR                   | PAGE | $\beta$ | STAR                    | PAGE |
|---------|------------------------|------|---------|-------------------------|------|
|         | <i>Aquila</i>          |      |         | <i>Cancer</i>           |      |
| 287     | $\zeta$ Aquilae        | 187  | 1065    | $\beta$ Cancri          | 98   |
| 653     | $\mu$ Aquilae          | 193  |         | <i>Canes Venatici</i>   |      |
| 672     | 71 Aquilae             | 214  | 925     | Groombridge 1938        | 121  |
|         | <i>Argo</i>            |      | 930     | B.A.C. 4389             | 123  |
| 755     | Argus 34               | 81   | 608     | 17 Canes Ven.           | 124  |
| 757     | Argus 101              | 86   |         | <i>Canis Major</i>      |      |
| 578     | Lalande 14545          | 89   | 753     | $\lambda$ Canis Majoris | 80   |
| 1061    | $\kappa$ Argus         | 91   | 328     | Canis Majoris 139       | 85   |
| 1063    | $\xi$ Argus            | 92   | 329     | Canis Majoris 146       | 85   |
| 101     | $\rho$ Argus           | 92   |         | <i>Canis Minor</i>      |      |
| 1064    | 19 Argus               | 97   | 21      | $\eta$ Canis Minoris    | 89   |
| 208     | Lalande 17103          | 101  |         | <i>Capricornus</i>      |      |
|         | <i>Aries</i>           |      | 294     | 3 Capricorni            | 204  |
| 522     | $\mu$ Arietis          | 32   | 295     | $\alpha^1$ Capricorni   | 204  |
| 306     | Arietis 307            | 32   | 60      | $\pi$ Capricorni        | 208  |
| 878     | 66 Arietis             | 39   | 61      | $\rho$ Capricorni       | 208  |
|         | <i>Auriga</i>          |      | 668     | B.A.C. 7080             | 210  |
| 554     | $\epsilon$ Aurigae     | 57   |         | <i>Cassiopeia</i>       |      |
| 1046    | $\rho$ Aurigae         | 57   | 1094    | Lalande 655             | 5    |
| 888     | $\sigma$ Aurigae       | 62   | 231     | $\circ$ Cassiopeiae     | 10   |
| 1240    | 26 Aurigae             | 66   | 492     | B.A.C. 201              | 10   |
| 192     | $\tau$ Aurigae         | 70   | 497     | B.A.C. 239              | 13   |
| 893     | B.A.C. 1935            | 74   | 1098    | $v^1$ Cassiopeiae       | 13   |
| 901     | 65 Aurigae             | 87   | 1028    | $\gamma$ Cassiopeiae    | 14   |
|         | <i>Bootes</i>          |      | 1099    | B.A.C. 255              | 14   |
| 1111    | B.A.C. 4766            | 133  | 396     | B.A.C. 282              | 15   |
| 616     | $\gamma$ Bootis        | 135  | 1101    | $\psi$ Cassiopeiae      | 19   |
| 1086    | 47 Bootis              | 140  | 1103    | 44 Cassiopeiae          | 23   |
|         | <i>Caelum</i>          |      | 513     | 48 Cassiopeiae          | 27   |
| 750     | $\gamma$ Caeli         | 58   | 785     | 49 Cassiopeiae          | 28   |
|         | <i>Cameleopardalis</i> |      | 278     | B.A.C. 8138             | 260  |
| 1043    | 3 Camelopardali        | 51   |         |                         |      |
| 1187    | 5 Camelopardali        | 55   |         |                         |      |

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|         | <i>Centaurus</i>        |      |         | <i>Corvus</i>     |      |
| 343     | Centauri 219            | 129  | 1079    | Lalande 22586     | 117  |
| 1112    | Lacaille 5893           | 135  | 920     | Corvi 17          | 118  |
| 414     | Centauri 315            | 136  | 605     | Corvi 26          | 119  |
| 347     | Centauri 330            | 138  | 1245    | $\zeta$ Corvi     | 119  |
|         |                         |      | 28      | B.A.C. 4213       | 120  |
|         | <i>Cepheus</i>          |      |         | <i>Crater</i>     |      |
| 1176    | 48 Cephei (H)           | 37   | 220     | Crateris 22       | 113  |
| 1134    | D.M. (63°) 1618         | 208  | 600     | Crateris 36       | 114  |
| 1143    | P XXI. 248              | 233  | 1078    | Crateris 79       | 115  |
| 690     | $\mu$ Cephei            | 237  |         | <i>Cygnus</i>     |      |
| 697     | 19 Cephei               | 240  | 1131    | $\theta$ Cygni    | 195  |
| 702     | $\delta$ Cephei         | 246  | 980     | $\eta$ Cygni      | 199  |
|         |                         |      | 660     | B.A.C. 6963       | 204  |
|         | <i>Cetus</i>            |      | 661     | Cygni 166         | 205  |
| 486     | Ceti 33                 | 3    | 665     | $\gamma$ Cygni    | 207  |
| 490     | 13 Ceti                 | 8    | 669     | $\omega^2$ Cygni  | 210  |
| 395     | Ceti 82                 | 9    | 675     | 51 Cygni          | 215  |
| 1160    | B.A.C. 230              | 12   | 676     | $\epsilon$ Cygni  | 216  |
| 734     | Ceti 132                | 13   | 677     | T Cygni           | 217  |
| 505     | $\theta$ Ceti           | 20   | 1137    | B.A.C. 7278       | 219  |
| 1163    | Ceti 199                | 20   |         | <i>Delphinus</i>  |      |
| 399     | Ceti 211                | 21   | 63      | $\iota$ Delphini  | 209  |
| 7       | 58 Ceti                 | 27   | 151     | $\beta$ Delphini  | 211  |
| 518     | Ceti 389                | 31   | 298     | $\alpha$ Delphini | 214  |
| 84      | W <sup>1</sup> III. 147 | 38   | 65      | 13 Delphini       | 217  |
|         |                         |      |         | <i>Draco</i>      |      |
|         | <i>Coma Berenices</i>   |      | 794     | O. Arg. N. 12149  | 116  |
| 1080    | 17 Comae                | 120  | 799     | R 2963            | 124  |
| 1081    | 37 Comae                | 121  | 946     | B.A.C. 5248       | 145  |
| 112     | P XXII. 243             | 121  | 1088    | $\mu$ Draconis    | 155  |
| 1083    | P XXII. 268             | 123  | 1090    | $\beta$ Draconis  | 165  |
|         |                         |      | 962     | 26 Draconis       | 166  |
|         | <i>Corona</i>           |      | 633     | $\gamma$ Draconis | 168  |
| 1087    | $\tau$ Coronae          | 148  | 971     | Draconis 205      | 183  |
|         |                         |      | 1255    | B.A.C. 6476       | 185  |

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|---------|------------------------|------|---------|-------------------|------|
|         | <i>Equuleus</i>        |      |         | <i>Hercules</i>   |      |
| 71      | $\gamma$ Equulei       | 224  | 1198    | $\tau$ Herculis   | 149  |
|         | <i>Eridanus</i>        |      | 625     | $\omega$ Herculis | 150  |
| 11      | $\rho^a$ Eridani       | 36   | 816     | $\zeta$ Herculis  | 152  |
| 400     | Eridani 103            | 37   | 818     | $\zeta$ Herculis  | 152  |
| 531     | Lalande 6275           | 38   | 627     | $\eta$ Herculis   | 154  |
| 744     | Eridani 299            | 47   | 954     | $\theta$ Herculis | 154  |
| 311     | Eridani 315            | 48   | 130     | $\iota$ Herculis  | 168  |
| 881     | 46 Eridani             | 51   | 646     | $\kappa$ Herculis | 184  |
| 88      | 51 Eridani             | 52   |         | <i>Hydra</i>      |      |
|         | <i>Fornax</i>          |      | 587     | $\alpha$ Hydrae   | 102  |
| 877     | $\gamma$ Fornacis      | 33   | 588     | Hydrae 96         | 105  |
|         | <i>Gemini</i>          |      | 590     | $\beta$ Hydrae    | 106  |
| 1241    | 3 Geminorum            | 74   | 593     | $\gamma$ Hydrae   | 109  |
| 1058    | 4 Geminorum            | 75   | 1269    | $\delta$ Hydrae   | 110  |
| 1008    | $\eta$ Geminorum       | 76   | 411     | Lacaille 4360     | 110  |
| 1059    | $\mu$ Geminorum        | 78   | 1075    | $\epsilon$ Hydrae | 110  |
| 1192    | $\nu$ Geminorum        | 79   | 341     | Hydrae 348        | 122  |
| 571     | W <sup>1</sup> VI. 956 | 81   | 1246    | B.A.C. 4740       | 132  |
| 1193    | 36 Geminorum           | 82   | 940     | 52 Hydrae         | 134  |
| 1009    | $\tau$ Geminorum       | 85   | 239     | 59 Hydrae         | 139  |
| 1194    | 65 Geminorum           | 89   |         | <i>Lacerta</i>    |      |
| 200     | 70 Geminorum           | 90   | 694     | Lacertae 4        | 240  |
| 580     | $\beta$ Geminorum      | 91   | 703     | $\alpha$ Lacertae | 247  |
| 1062    | 82 Geminorum           | 92   | 451     | 15 Lacertae       | 252  |
|         | <i>Grus</i>            |      | 382     | B.A.C. 7983       | 252  |
| 768     | Lacaille 8964          | 238  |         | <i>Leo</i>        |      |
| 771     | $\sigma^a$ Gruis       | 248  | 105     | $\kappa$ Leonis   | 105  |
| 773     | $\nu$ Gruis            | 255  | 1076    | 55 Leonis         | 112  |
|         |                        |      | 598     | 59 Leonis         | 112  |
|         |                        |      | 599     | 65 Leonis         | 113  |
|         |                        |      | 1282    | $\delta$ Leonis   | 113  |
|         |                        |      | 604     | $\beta$ Leonis    | 116  |

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|         | <i>Leo Minor</i>    |      |         | <i>Ophiuchus</i>          |      |
| 913     | 40 Leonis Minoris   | 110  | 626     | $\phi$ Ophiuchi           | 151  |
|         | <i>Lepus</i>        |      | 1117    | 24 Ophiuchi               | 154  |
| 314     | Leporis 3           | 57   | 1118    | $\eta$ Ophiuchi           | 158  |
| 320     | $\beta$ Leporis     | 64   | 282     | S. D. ( $14^\circ$ ) 4585 | 159  |
| 321     | Leporis 45          | 68   | 126     | B.A.C. 5839               | 162  |
| 94      | Leporis 61          | 72   | 1251    | B.A.C. 5991               | 167  |
|         | <i>Libra</i>        |      | 1124    | 67 Ophiuchi               | 169  |
| 106     | $\mu$ Librae        | 137  | 1125    | 68 Ophiuchi               | 170  |
| 1085    | Piazzi XIV. 229     | 139  | 637     | W' XVIII. 28              | 172  |
| 618     | $\iota^1$ Librae    | 141  |         | <i>Orion</i>              |      |
|         | <i>Lynx</i>         |      | 553     | $\sigma^2$ Orionis        | 56   |
| 758     | Lyncis 51           | 88   | 555     | $\beta$ Orionis           | 59   |
|         | <i>Lyra</i>         |      | 188     | $\tau$ Orionis            | 61   |
| 1253    | Lyrae 28            | 180  | 558     | $\delta$ Orionis          | 65   |
| 968     | $\zeta$ Lyrae       | 181  | 1048    | Lalande 10437             | 65   |
| 293     | $\beta$ Lyrae       | 183  | 1032    | $\sigma$ Orionis          | 68   |
| 648     | B.A.C. 6480         | 185  | 1056    | $\mu$ Orionis             | 74   |
|         | <i>Microscopium</i> |      | 96      | 75 Orionis                | 77   |
| 766     | $^2$ Microscopii    | 228  |         | <i>Pegasus</i>            |      |
| 767     | Lacaille 8809       | 229  | 685     | 2 Pegasi                  | 230  |
|         | <i>Monoceros</i>    |      | 989     | $\kappa$ Pegasi           | 234  |
| 16      | 3 Monocerotis       | 74   | 290     | 34 Pegasi                 | 244  |
| 17      | 4 Monocerotis       | 74   | 1144    | $\eta$ Pegasi             | 250  |
| 566     | Monocerotis 21      | 76   | 718     | 64 Pegasi                 | 260  |
| 567     | Monocerotis 23      | 76   | 720     | 72 Pegasi                 | 262  |
| 570     | 11 Monocerotis      | 79   | 733     | 85 Pegasi                 | 268  |
| 897     | Monocerotis 97      | 82   |         | <i>Perseus</i>            |      |
| 1268    | 24 Monocerotis      | 86   | 874     | 5 Persei                  | 28   |
| 332     | P VII. 116          | 89   | 1170    | $\chi$ Persei             | 29   |
|         |                     |      | 875     | 9 Persei                  | 29   |
|         |                     |      | 521     | Persei 67                 | 32   |
|         |                     |      | 524     | 20 Persei                 | 34   |
|         |                     |      | 526     | $\beta$ Persei            | 36   |
|         |                     |      | 1179    | 34 Persei                 | 39   |
|         |                     |      | 535     | 38 Persei                 | 41   |
|         |                     |      | 1183    | B.A.C. 1142               | 42   |

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|         | <i>Pisces</i>             |      |         | <i>Serpens</i>          |      |
| 302     | Piazzì O. 245             | 14   | 348     | 2 Serpentis             | 139  |
| 303     | Piscium 201               | 16   | 32      | 6 Serpentis             | 142  |
| 1029    | $\zeta$ Piscium           | 18   | 619     | Serpentis 55            | 144  |
| 1164    | 95 Piscium                | 21   |         | <i>Taurus</i>           |      |
| 506     | $\eta$ Piscium            | 22   | 544     | 36 Tauri                | 45   |
| 5       | 103 Piscium               | 23   | 547     | 47 Tauri                | 46   |
| 730     | 27 Piscium                | 267  | 87      | Piazzì IV. 53           | 47   |
|         | <i>Piscis Australis</i>   |      | 1186    | Tauri 248               | 48   |
| 276     | $\eta$ Piscis Australis   | 239  | 550     | $\alpha$ Tauri          | 49   |
| 772     | $\delta$ Piscis Australis | 253  | 551     | 96 Tauri                | 53   |
|         | <i>Sagitta</i>            |      | 1045    | 99 Tauri                | 56   |
| 57      | Lalande 38415             | 201  | 1007    | 126 Tauri               | 69   |
|         | <i>Sagittarius</i>        |      | 1054    | 136 Tauri               | 72   |
| 283     | B.A.C. 6088               | 169  |         | <i>Ursa Major</i>       |      |
| 245     | Sagittarii 46             | 172  | 1067    | o Ursae Majoris         | 99   |
| 292     | $\mu$ Sagittarii          | 173  | 1071    | $\theta$ Ursae Majoris  | 106  |
| 286     | 16 Sagittarii             | 174  | 1077    | $\alpha$ Ursae Majoris  | 112  |
| 760     | $\eta$ Sagittarii         | 175  | 918     | Lalande 22496           | 117  |
| 1033    | $\nu^1$ Sagittarii        | 184  | 919     | W <sup>2</sup> XI. 1013 | 117  |
| 654     | 52 Sagittarii             | 193  | 1082    | 78 Ursae Majoris        | 122  |
| 1288    | 55 Sagittarii             | 196  |         | <i>Virgo</i>            |      |
| 763     | $\kappa^2$ Sagittarii     | 206  | 923     | Virginis 168            | 120  |
|         | <i>Scorpio</i>            |      | 924     | 31 Virginis             | 121  |
| 36      | 2 Scorpii                 | 145  | 929     | 48 Virginis             | 123  |
| 622     | $\pi$ Scorpii             | 146  | 932     | Virginis 550            | 126  |
| 947     | $\beta$ Scorpii           | 146  | 612     | B.A.C. 4559             | 127  |
| 39      | 11 Scorpii                | 147  | 935     | 86 Virginis             | 128  |
| 120     | $\nu$ Scorpii             | 148  | 225     | Lalande 26320           | 134  |
| 1116    | B.A.C. 5600               | 153  |         | <i>Vulpecula</i>        |      |
| 416     | Scorpii 185               | 160  | 248     | 2 Vulpeculae            | 190  |
|         | <i>Sculptor</i>           |      | 1130    | 9 Vulpeculae            | 193  |
| 391     | $\kappa^1$ Sculptoris     | 1    | 983     | B.A.C. 6966             | 204  |
| 1013    | $\delta$ Sculptoris       | 266  | 447     | Vulpeculae 129          | 229  |
|         |                           |      | 767     | Lacaille 8809           | 229  |

## NEW BINARY STARS

All of the most interesting of the known physical pairs have small apparent distances, and are difficult objects when compared with those in slow motion. As these catalogues, commencing with the first, contained an unusual proportion of close pairs, it was evident that sooner or later they would contribute a large number of physical systems. This expectation has been realized, and to an extent which could hardly have been anticipated within the time covered by the observations. The extreme range of the measures is but little more than twenty-five years, and the greater portion of the micrometrical work commenced at a later date. There is little doubt that this catalogue will furnish far more binaries than are found in all the voluminous early lists. There is nothing remarkable in this when the character of the stars with respect to distance is taken into account. As already stated the old catalogues contain a large proportion of very wide couples, where the distance between the components is much too great to make any physical connection between them at all probable. But it must be remembered that at least some of the instruments used by these observers could not compare favorably with modern refractors, and particularly with telescopes made by the Clarks; and even when those observers had had more powerful instruments in point of light-gathering power, as in the case of the Herschels, there can be no doubt that they were far inferior in definition, and in every practical respect for observations of this kind, to the 6-inch refractor with which so much of my work has been done. A glance at the list of old pairs to which new and more difficult components have been added will be sufficient on this point. I have shown in the appendix to my *Thirteenth Catalogue* that my several lists which had been published at that time include more double stars of Class I (where the distance does not exceed 1") than all of the various catalogues of both Herschels and both Struves, notwithstanding the fact that the works of these eminent astronomers contain altogether not less than 7400 double stars.

It is only among the very closest pairs that rapid binaries are found, and it is certain that when the very close pairs, and particularly those discovered with the 36-inch, are fully observed, many wonderful systems of short periods will be brought to light. It is unfortunate that there are not more telescopes in the world powerful enough to take part in the work of reobserving these difficult pairs. But few short-period binaries are yet known. In all the old catalogues above referred to, there are but six whose orbits have been computed where the periodic time is less than fifty years. This catalogue contains not only the binary of the shortest known period, but it has several with periods of less than thirty years; and this number will be largely augmented when many of the stars known to be rapidly changing have been more fully measured.

The list of binary and probably binary stars which is given in this general catalogue must be regarded as only provisional. For many of the stars, and particularly the later discoveries, the evidence is insufficient when the relative motion is not rapid. Most of the pairs in the binary list are placed there because of the change, more or less rapid, shown by the micrometrical measures. In a few instances this may be the result of proper motion, but in the great majority of cases it is true orbital motion. A few examples are also included where the primary has a well determined proper motion, which the measures show is common to both stars. This fact sufficiently establishes a physical relation between the components, although the relative motion may be very small.

In the following table I have classified the stars in the order of their numbers. In these cases the evidence seems to warrant the conclusion that they are probably physical systems. For the numbers marked with a \* orbits have been computed.



Introduction

| $\beta$ | PAGE | $\beta$ | PAGE | $\beta$ | PAGE | $\beta$ | PAGE |
|---------|------|---------|------|---------|------|---------|------|
| 4       | 19   | 237     | 126  | 608     | 124  | 862     | 271  |
| 5       | 23   | 239     | 139  | 612*    | 127  | 870     | 24   |
| 7       | 27   | 271     | 226  | 620     | 144  | 874     | 28   |
| 16      | 74   | 279     | 264  | 625     | 150  | 877     | 33   |
| 17      | 74   | 281     | 271  | 627     | 154  | 878     | 39   |
| 28      | 120  | 286     | 174  | 631     | 166  | 883*    | 53   |
| 31      | 138  | 287     | 187  | 633     | 168  | 886     | 61   |
| 32      | 142  | 290     | 244  | 637     | 172  | 894     | 76   |
| 35      | 144  | 291     | 245  | 639     | 176  | 895     | 77   |
| 36      | 145  | 302     | 14   | 641     | 177  | 897     | 82   |
| 39      | 147  | 320     | 64   | 648     | 185  | 901     | 87   |
| 63      | 209  | 348     | 139  | 658     | 197  | 911     | 108  |
| 64      | 215  | 367     | 218  | 668     | 210  | 924     | 121  |
| 75      | 238  | 382     | 252  | 670     | 211  | 929     | 123  |
| 79      | 258  | 395     | 9    | 675     | 215  | 932     | 126  |
| 80      | 259  | 416*    | 160  | 683     | 229  | 935     | 128  |
| 83      | 32   | 456     | 115  | 696     | 240  | 940     | 134  |
| 101*    | 92   | 491     | 9    | 701     | 245  | 947     | 146  |
| 105     | 105  | 513     | 27   | 710     | 250  | 953     | 153  |
| 106     | 137  | 524*    | 34   | 711     | 251  | 962     | 166  |
| 113     | 126  | 525     | 35   | 717     | 259  | 971     | 183  |
| 117     | 135  | 531     | 38   | 718     | 260  | 989*    | 234  |
| 120     | 148  | 533     | 40   | 720     | 262  | 992     | 258  |
| 130     | 168  | 535     | 41   | 730     | 267  | 996     | 266  |
| 132     | 173  | 536     | 42   | 733*    | 268  | 999     | 20   |
| 142     | 191  | 543     | 44   | 741     | 35   | 1000    | 22   |
| 148     | 198  | 547     | 46   | 753     | 80   | 1004    | 45   |
| 151*    | 211  | 550     | 49   | 760     | 175  | 1007    | 69   |
| 152     | 216  | 552     | 54   | 766     | 228  | 1008    | 76   |
| 163     | 226  | 555     | 59   | 769     | 241  | 1009    | 85   |
| 172     | 244  | 560     | 71   | 785     | 28   | 1013    | 266  |
| 182     | 258  | 581     | 95   | 794     | 116  | 1022    | 84   |
| 232     | 12   | 587     | 102  | 800     | 125  | 1028    | 14   |
| 205     | 99   | 590     | 106  | 816     | 152  | 1029    | 18   |
| 208     | 101  | 599     | 113  | 823     | 155  | 1031    | 49   |
| 235     | 17   | 603     | 116  | 858     | 264  | 1032    | 68   |

| $\beta$ | PAGE | $\beta$ | PAGE | $\beta$ | PAGE | $\beta$ | PAGE |
|---------|------|---------|------|---------|------|---------|------|
| 1034    | 219  | 1087    | 148  | 1117    | 154  | 1179    | 39   |
| 1035    | 228  | 1088    | 155  | 1118    | 158  | 1212    | 232  |
| 1046    | 57   | 1089    | 165  | 1125    | 170  | 1220    | 257  |
| 1047    | 58   | 1090    | 165  | 1131    | 195  | 1240    | 66   |
| 1055    | 73   | 1092    | 249  | 1146    | 251  | 1241    | 74   |
| 1058    | 75   | 1095    | 5    | 1147    | 255  | 1246    | 132  |
| 1067    | 99   | 1099    | 14   | 1163    | 20   | 1251    | 167  |
| 1071    | 106  | 1101    | 19   | 1164    | 21   | 1260    | 207  |
| 1077    | 112  | 1103    | 23   | 1174    | 36   | 1266    | 261  |
| 1082    | 122  | 1111    | 133  | 1176    | 37   | 1281    | 110  |
| 1085    | 139  |         |      |         |      |         |      |

## QUADRUPLE STARS

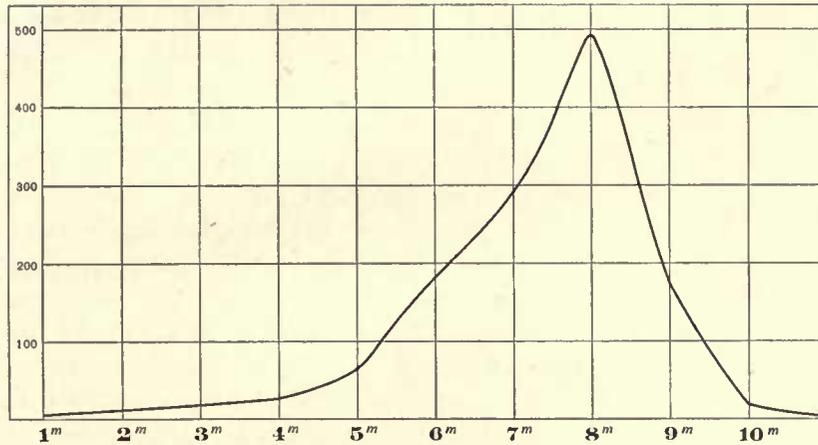
This catalogue furnishes a number of examples of double-double stars, of the  $\epsilon$  *Lyrae* type, but with the pairs separated by a much smaller distance. Strictly speaking  $\epsilon$  *Lyrae* should not be called a quadruple star, as the distance between the pairs renders it almost, if not quite, certain that they can have no physical relation, unless it is assumed from a small common proper motion. It is probable that many of the examples selected from this catalogue, although the distances are very much less, are too widely separated to give any presumption in favor of their belonging to one system. Of course, two double stars would be on no better footing, so far as this question is concerned, than two single stars within the same distance.

The distance between  $\epsilon^1$  and  $\epsilon^2$  *Lyrae* is about 207". In the following list none of the stars have more than half that distance, and in most instances the component pairs are much closer. They are arranged in the order of the separating distance.

| $\beta$ | AB  | CD  | A AND C | PAGE | $\beta$ | AB   | CD  | A AND C | PAGE |
|---------|-----|-----|---------|------|---------|------|-----|---------|------|
| 973     | 1.7 | 3.7 | 11.1    | 186  | 120     | 0.7  | 1.8 | 41.1    | 148  |
| 368     | 0.6 | 5.1 | 12.2    | 222  | 886     | 17.6 | 0.8 | 48.5    | 61   |
| 1210    | 2.5 | 4.3 | 14.0    | 220  | 366     | 1.2  | 1.4 | 50.7    | 27   |
| 639     | 0.1 | 8.1 | 17.3    | 176  | 285     | 1.6  | 2.0 | 60.1    | 175  |
| 935     | 1.6 | 2.0 | 27.1    | 128  | 876     | 1.2  | 6.2 | 70.7    | 30   |
| 836     | 0.8 | 1.3 | 27.4    | 223  | 806     | 0.7  | 1.2 | 72.0    | 136  |
| 1101    | 2.9 | 2.9 | 27.4    | 19   | 321     | 0.8  | 1.4 | 89.3    | 68   |
| 141     | 0.8 | 4.9 | 28.7    | 190  | 898     | 3.0  | 1.8 | 97.2    | 83   |
| 1049    | 0.6 | 1.6 | 29.2    | 65   | 1202    | 0.6  | 3.9 | 103.8   | 169  |

## DISTRIBUTION IN MAGNITUDES

The following diagram shows the distribution of these pairs in magnitudes. The magnitude on the lower part of the diagram is of course that of the primary to the nearest whole number. As would be expected the maximum is reached at the eighth magnitude. A map showing the distribution in the heavens of the first one thousand double stars is given in my *Thirteenth Catalogue*.



## REJECTED DOUBLE STARS

The numbers mentioned below are not given in this *General Catalogue*, as they are identical with pairs found in other and prior works.

|                         |                              |
|-------------------------|------------------------------|
| $\beta$ 29 = H 1218     | $\beta$ 562 = O $\Sigma$ 122 |
| 58 = $\Sigma$ 2629 rej. | 594 = O $\Sigma$ 216         |
| 99 = $\Sigma$ 1007 rej. | 644 = H 864                  |
| 110 = H 2036            | 667 = $\Sigma$ 2656          |
| 187 = Dembowski         | 737 = O. Stone               |
| 362 = O $\Sigma$ 406    | 1038 = O $\Sigma$ 510        |
| 444 = Omitted number    | 1057 = O $\Sigma$ 129        |

## UNPUBLISHED MEASURES

I am under deep obligations to many well-known double-star observers in this country and in Europe for unpublished measures of these stars. This catalogue contains several thousand observations which have never been printed elsewhere. The following astronomers have kindly furnished me with most valuable material for this work:

AITKEN, Lick Observatory.  
 BARNARD, Yerkes Observatory.  
 BROWN, Naval Observatory.  
 CHRISTIE, Greenwich Observatory.  
 COGSHALL and BOOTHROYD, Lowell Observatory.  
 DOOLITTLE, Flower Observatory.  
 HUSSEY, Lick Observatory.  
 SEE, Naval Observatory.  
 SCHIAPARELLI, Royal Observatory, Milan.  
 STRUVE, H., Universitäts Sternwarte, Königsberg.  
 WILSON, Goodsell Observatory, Northfield, Minn.

When it was definitely arranged to publish this catalogue, it was evident that its value would be greatly increased by giving, as far as practicable at this time, a complete history of each pair, so that the change, or absence of relative motion, could be fairly inferred in all pairs from the measures given. There were many pairs, and particularly among those discovered at the Lick Observatory from 1888 to 1892, which had not been re-observed, and therefore nothing was known concerning them as to the question of motion. In other instances there were no very recent measures, and the earlier observations were not sufficiently numerous, or extended in point of time, to show the character of the relation between the components. In order to supply these needed observations, I prepared and sent to Aitken, of the Lick Observatory, from time to time, special lists of these objects, which included the closest and most difficult stars to measure in the entire catalogue, and requested him to undertake their measurement with the 36-inch. These lists also included some pairs which had apparently become single from rapid motion, and others of a more or less doubtful character. This request received a hearty response, and he entered upon the work with enthusiasm and zeal, and has contributed results which, without his assistance, would be wanting here. I wish to record here my high appreciation of the great value and accuracy of these measures. Other measures have been made by the same observer while this catalogue was passing through the press, but received too late for insertion in their proper places, and these, with measures by other observers, will be given in a supplement at the end of this work. His last published series of measures in *A.N.* 3585, giving the observations of 1898, was received in printed form after a considerable portion of this work was in type. The measures are all given in this catalogue, but only those after R.A.  $17^{\text{h}} 10^{\text{m}}$  are referred to by the above *A.N.* number.

Lists of other stars were sent to Brown, of the Naval Observatory; to Doolittle, of the Flower Observatory; to the observers of the Lowell Observatory; and to Wilson, of the Goodsell Observatory, and their valuable results are given in this catalogue. Doolittle has measured a large number of pairs with the  $18\frac{1}{2}$ -inch. These will soon be published in Vol. I. of the *Publications of the Flower Observatory*, and they are therefore cited in the references in this way. I am also indebted to the Astronomer Royal of Great Britain for a large number of measures of close and difficult pairs, made principally by LEWIS, BOWYER, BRYANT and DYSON, with the 28-inch of the Royal Observatory at Greenwich.

The unpublished measures of Schiaparelli with the 18-inch refractor of the Royal Observatory embrace a large number of objects, altogether more than 1200 measures, and cover a period of not less than ten years. It is unnecessary to say that the measures of this distinguished observer are of the highest value.

The unpublished measures by See were made during his connection with the Lowell Observatory with the 24-inch, and, like the subsequent observations of Cogshall and Boothroyd at the same place, are principally of southern pairs. The observations by H. Struve were made with the 30-inch Clark refractor, at Pulkowa, about 1885, while he was connected with that Observatory; and those by Hussey with the 36-inch at the Lick Observatory.

My own unpublished observations with the 40-inch have already been referred to. The work with this instrument also includes measures by BARNARD of special objects of interest, of which some will be found in the supplement.

#### PROPER MOTIONS

As far as practicable I have given the proper motions of all the stars in this catalogue where the value has been deduced from meridian observations. A knowledge of this movement has an important bearing in determining the question of physical relation. Where the components are moving together in space, there can be but little doubt of their forming binary systems, although

the relative change may be insignificant in the comparatively short time covered by the observations. In this examination I have given the first place to the investigations of Auwers as found in his *Catalogue of the Bradley Stars*, *Fundamental Catalogue*, and contributions on this subject in the *Astronomische Nachrichten*, and other publications. The new catalogues of the *Astronomischen Gesellschaft* have furnished the proper motions of a good many of the lower magnitudes. Other material has been obtained from the Greenwich, Radcliffe, Cape, Cincinnati, and other catalogues, and also from the recent works of Kustner, Bossert, and others. Porter, of the Cincinnati Observatory, has furnished information concerning many stars which appeared from the micrometrical measures to have some rectilinear movement, and which had not been recognized heretofore in the meridian observations.

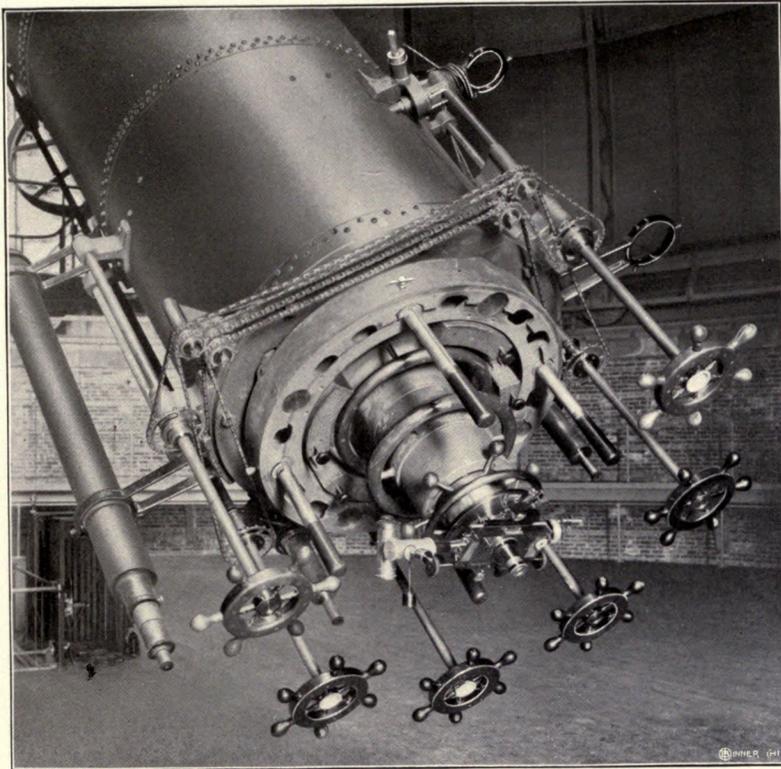
I am specially indebted to Professor George E. Hale, Director of the Yerkes Observatory, for his hearty assistance and coöperation in the prosecution of the work at this Observatory, and in its preparation and publication.

This volume in printed form owes its existence to the interest and liberality of that generous patron of astronomical science, Miss Catherine W. Bruce, of New York City. Her large gifts in aid of original research, in providing instruments and means for the prosecution of work, and the publication of observations and investigations, have been widely distributed, not only in this country, but abroad. The results already achieved in widely different fields are of the highest importance, and with the results yet to follow in the near and in the far future, will form a monument to the memory of this benefactor of Astronomy, which will endure for all time.

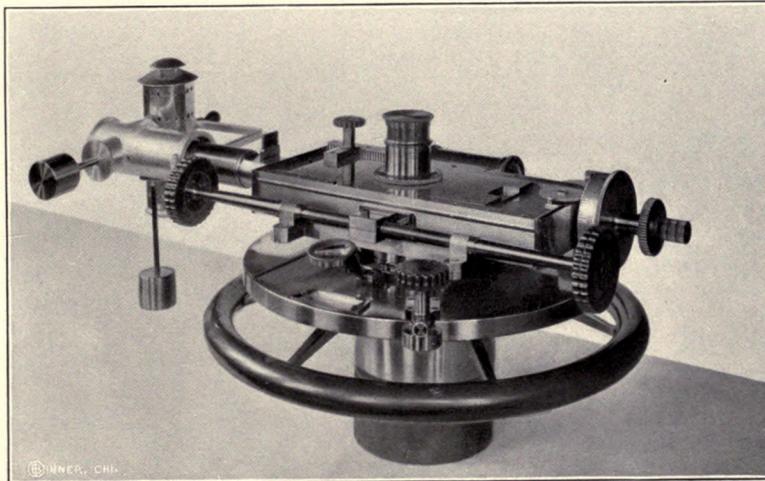
S. W. BURNHAM.

Chicago, December 6, 1899.





EYE END OF THE 40-INCH TELESCOPE OF THE YERKES OBSERVATORY



MICROMETER OF THE 40-INCH TELESCOPE  
MADE BY WARNER & SWASEY



## ABBREVIATIONS.

Most of the abbreviations of observers and publications used in the measures will be readily understood from the references given at the end of each double in the catalogue. The following only need a further explanation :

- A. N.*            *Astronomische Nachrichten.* In the references, the Arabic figures in parenthesis, without other designation, following the name of the observer, *e. g.*,  $\beta$  (3114), indicate, in all cases, the number of the *A. N.* in which the observation is made.
- $\beta^1$             *Double Star Observations made in 1877-8 at Chicago, with the 18½-inch refractor of the Dearborn Observatory, comprising: I. A catalogue of 251 new double stars with measures; II. Micrometrical measures of 500 double stars. Memoirs of the Royal Astronomical Society, Vol. XLIV. (This volume contains my Tenth Catalogue.)*
- $\beta^2$             *Report to the Trustees of the James Lick Trust, of observations made on Mt. Hamilton, with reference to the location of the Lick Observatory, 1879. (This contains the Eleventh Catalogue and measures of other stars. It is reprinted in Publications of the Lick University, Vol. I.)*
- $\beta^3$             *Double Star Observations made in 1879-80 with the 18½-inch refractor of the Dearborn Observatory. I. Catalogue of 151 new double stars with measures. II. Micrometrical measures of 770 double stars. Memoirs R. A. S., Vol. XLVII. (Thirteenth Catalogue.)*
- $\beta^4$             *Publications of the Washburn Observatory, Vol I. (Twelfth Catalogue, and measures of other stars.)*
- Cin<sup>3</sup>, Cin<sup>4</sup>, etc. *Publications of the Cincinnati Observatory, Nos. 3 to 6. (Measures of double stars by Stone, Howe, Upton, and Egbert, from 1875 to 1880. No. 10 of this series contains measures by Wilson.)*
- $\Delta$             Dembowski.
- $\Delta$  (I)        *Misure Micrometriche di Stelle Doppie e Multiple fatte negli anni 1852-1878 dal Barone Ercole Dembowski. Roma 1883. (Vol. I contains the measures of  $\beta$  stars; Vol. II the Struve stars.)*
- Glasenapp (I, II, III, IV, V) } The Roman numerals refer to the five series of micrometrical measures made by the Director of the Observatory of the Imperial University of St. Petersburg, and published from 1892 to 1899.
- H<sup>1</sup>            Sir William Herschel.
- H<sup>2</sup>            Sir John F. W. Herschel.
- Hall (I)       *Observations of double stars made at the U. S. Naval Observatory by Asaph Hall. Appendix to the Washington Observations for 1877. (Measures with the 26-inch 1875-1879.)*
- Hall (II)      *Observations of double stars made at the U. S. Naval Observatory 1880-1891 by Asaph Hall. Appendix to Washington Observatory for 1888.*
- LM            *Publications of the McCormick Observatory of the University of Virginia, Vol. I, Part 4. (Measures of double stars with the 26-inch refractor in 1885-6 by F. P. Leavenworth and Frank Muller.)*

- Lv' *Micrometrical Measurements of Double Stars made at the Haverford College Observatory* by F. P. Leavenworth. (Measures in 1888 with the 10-inch Clark refractor. A few of the measures by student assistants.)
- Sp (II) *Osservazioni Sulle Stelle Doppie 1875-1885 da G. V. Schiaparelli.* Milano, 1888. (A prior series of measures of the Struve stars was published in 1882.)
- Sp (III) Unpublished measures by Schiaparelli, made at Milan, 1889-1898.
- Wilson (Cin.<sup>no</sup>) *Publications of the Cincinnati Observatory* No. 10. (Double star measures 1882-1886, principally by H. C. Wilson. The unpublished measures by the same observer were made with the 16-inch of the Goodsell Observatory, Northfield, Minn.)





*A General Catalogue of the Double Stars discovered by  
S. W. Burnham from 1871 to 1899, arranged in  
order of Right Ascension. By S. W. BURNHAM.*

**β 1155.** D.M. (3°) 4932

R.A. 0<sup>h</sup> 0<sup>m</sup> 26<sup>s</sup> }  
Decl. + 3° 30' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1890.82 | 90.4 | 0.44 | 8.7... 9.3 | 3 <sup>n</sup> | β |
| 1898.64 | 91.1 | 0.42 | 8.7... 9.0 | 2 <sup>n</sup> | A |

Discovered with the 36-inch. Apparently without change.

[β (xvii)...β (3047)...β (*Pub. L. O. II.*)...Aitken ( )...]

**β 1014.** Lalande 47287

R.A. 0<sup>h</sup> 1<sup>m</sup> 24<sup>s</sup> }  
Decl. + 31° 0' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1882    | 340 ± | 2 ±  | 7 ... 12    |                | β |
| 1891.70 | 335.9 | 1.50 | 7.0... 12.5 | 3 <sup>n</sup> | β |
| 1897.94 | 304.1 | 1.15 | ...         | 3 <sup>n</sup> | L |
| 1898.65 | 337.4 | 1.55 | 7.0... 13.0 | 2 <sup>n</sup> | β |

Discovered with the 18½-inch. Probably no relative change. According to PORTER this star has no appreciable proper motion.

[β (xiii)...β<sup>3</sup> (app.)...β (3113)...β (*Pub. L. O. II.*)...Lewis (*Mon. Not. LIX, 400*)...]

**β 483.** Lalande 47348

R.A. 0<sup>h</sup> 2<sup>m</sup> 50<sup>s</sup> }  
Decl. + 40° 11' }

|         |      |      |             |                |    |
|---------|------|------|-------------|----------------|----|
| 1878.66 | 44.7 | 2.37 | 7.5... 11.8 | 1 <sup>n</sup> | β  |
| 1885.83 | 44.0 | 3.09 | ...         | 2 <sup>n</sup> | HΣ |
| 1891.70 | 44.1 | 2.95 | 7.2... 11.7 | 3 <sup>n</sup> | β  |
| 1898.59 | 42.7 | 3.05 | 7.5... 10.7 | 2 <sup>n</sup> | β  |

Discovered with the 18½-inch; one of a wide pair. Probably unchanged.

[β (x)...β<sup>1</sup>...β (3113)...β (*Pub. L. O. II.*)...HΣ ( )...]

**β 391.** κ' *Sculptoris*

R.A. 0<sup>h</sup> 3<sup>m</sup> 14<sup>s</sup> }  
Decl. - 28° 39' }

|         |       |      |            |                |       |
|---------|-------|------|------------|----------------|-------|
| 1876.79 | 97.2  | 0.78 | 6.0... 6.2 | 1 <sup>n</sup> | Cin   |
| 1877.74 | 97.1  | 0.87 | 6.2... 6.3 | 3 <sup>n</sup> | Cin   |
| 1888.88 | 92.5  | 0.94 | 6.1... 6.1 | 6 <sup>n</sup> | Lv    |
| 1892.88 | 88.0  | 0.75 | 6.1... 6.1 | 2 <sup>n</sup> | Gl    |
| 1893.91 | 91.0  | 0.74 | 6 ... 6    | 2 <sup>n</sup> | Sel   |
| 1894.94 | 92.0  | 0.94 | ...        | 3 <sup>n</sup> | Sel   |
| 1895.83 | 91.0  | 0.93 | ...        | 3 <sup>n</sup> | A     |
| 1895.85 | 91.0  | 0.98 | ...        | 3 <sup>n</sup> | Scott |
| 1897.07 | 93.5  | 1.24 | 6.4... 6.4 | 3 <sup>n</sup> | See   |
| 1897.95 | 271.2 | 1.11 | 6½... 6½   | 4 <sup>n</sup> | Scott |
| 1898.69 | 270.1 | 1.09 | 7.0... 7.2 | 2 <sup>n</sup> | Bd    |

Discovered with the 6-inch. The measures do not show any certain change.

[β (vii)...β (2103)...Cin<sup>3</sup>...Cin<sup>4</sup>...Lv<sup>1</sup>...Glasenapp (II) Sellors (3420,3303)...Scott (*Brit. Ast. Asso. vi. 368*) (*Mon. Not. LIX, 427*)...Aitken (3395)...See (3495)...Boothroyd ( )...]

**β 484.** D.M. (51°) 9

R.A. 0<sup>h</sup> 3<sup>m</sup> 29<sup>s</sup> }  
Decl. + 51° 22' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.66 | 156.3 | 1.95 | 7.7... 11.9 | 2 <sup>n</sup> | β  |
| 1885.74 | 154.7 | 1.90 | ...         | 2 <sup>n</sup> | HΣ |
| 1890.90 | 154.6 | 1.91 | 7.7... 11.7 | 3 <sup>n</sup> | β  |
| 1891.70 | 156.1 | 1.86 | 7.6... 11.5 | 3 <sup>n</sup> | β  |

Discovered with the 18½-inch.

[β (x)...β<sup>1</sup>...β (3048,3113)...β (*Pub. L. O. II.*)...HΣ ( )...]

**$\beta$  253.** D.M. (57°) 15

R.A. 0<sup>h</sup> 4<sup>m</sup> 8<sup>s</sup> }  
Decl. + 57° 51' }

|         |      |      |        |     |                |          |
|---------|------|------|--------|-----|----------------|----------|
| 1875.95 | 49.9 | 0.42 | 8.3... | 8.5 | 5 <sup>n</sup> | $\Delta$ |
| 1889.28 | 50.8 | 0.65 | 8.3... | 8.3 | 3 <sup>n</sup> | $\beta$  |
| 1891.52 | 47.2 | 0.60 | 8.3... | 8.4 | 2 <sup>n</sup> | $\beta$  |

Discovered with the 9.4-inch at the Dartmouth College Observatory. This is the *n* star of a wide pair, 38' *n* of  $\beta$  *Cassiopeiae*.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta$  (2956,3113)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...]

 **$\beta$  485.** D.M. (57°) 22

R.A. 0<sup>h</sup> 4<sup>m</sup> 29<sup>s</sup> }  
Decl. + 58° 6' }

|         |       |       |        |     |                |         |
|---------|-------|-------|--------|-----|----------------|---------|
| 1878.17 | 148.5 | 0.41  | 8.7... | 9.0 | 2 <sup>n</sup> | $\beta$ |
| 1889.55 | 307.4 | 0.44  | 8.5... | 8.6 | 3 <sup>n</sup> | $\beta$ |
| 1890.93 | 120.2 | 0.4±  | ...    |     | 1 <sup>n</sup> | Sp      |
| 1891.52 | 307.6 | 0.43  | 8.5... | 8.5 | 2 <sup>n</sup> | $\beta$ |
| 1892.96 | 305.9 | 0.28± | ...    |     | 5 <sup>n</sup> | Sp      |

The duplicity of this star was suspected at the time of finding the preceding pair, and subsequently verified with the 18½-inch. It is one of a small triangle of stars between  $\beta$  253 and  $\beta$  *Cassiopeiae*.

[ $\beta$  (x)... $\beta^t$ ... $\beta$  (2956,3113)... $\beta$  (*Pub. L. O.* II)...Sp.(III)...]

 **$\beta$  254.** O. Arg. N. 74

R.A. 0<sup>h</sup> 5<sup>m</sup> 14<sup>s</sup> }  
Decl. + 59° 6' }

## A and B

|         |       |      |        |      |                |          |
|---------|-------|------|--------|------|----------------|----------|
| 1875.71 | 237.7 | 7.41 | 7.5... | 11.5 | 4 <sup>n</sup> | $\Delta$ |
| 1884.76 | 240.0 | 7.42 | 7.9... | 10.9 | 6 <sup>n</sup> | En       |
| 1893.51 | 235.6 | 7.40 | 7.7... | 10.8 | 3 <sup>n</sup> | W        |
| 1898.74 | 237.6 | 7.17 | 8.0... | 10.7 | 2 <sup>n</sup> | $\beta$  |

## A and C

|         |       |       |     |      |                |         |
|---------|-------|-------|-----|------|----------------|---------|
| 1893.51 | 240.3 | 38.16 | ... | 12.2 | 2 <sup>n</sup> | W       |
| 1898.74 | 241.4 | 38.35 | ... | 11.1 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 9.4-inch at the Dartmouth College Observatory. Apparently fixed.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\Delta$  (I)...Engelmann (2742)...Wilson ( )...]

 **$\beta$  255.** Lalande 54

R.A. 0<sup>h</sup> 5<sup>m</sup> 38<sup>s</sup> }  
Decl. + 27° 45' }

|         |       |      |        |     |                |            |
|---------|-------|------|--------|-----|----------------|------------|
| 1875.76 | 99.0  | 0.38 | 7.5... | 7.8 | 4 <sup>n</sup> | $\Delta$   |
| 1880.57 | 106.7 | 0.49 | 7.5... | 8.5 | 1 <sup>n</sup> | $\beta$    |
| 1882.62 | 93.5  | 0.63 | 7.5... | 9.0 | 1 <sup>n</sup> | O $\Sigma$ |
| 1887.25 | 101.2 | 0.56 | ...    |     | 4 <sup>n</sup> | Sp         |
| 1888.55 | 105.9 | 0.52 | ...    |     | 5 <sup>n</sup> | H $\Sigma$ |
| 1888.98 | 98.4  | 0.48 | ...    |     | 4 <sup>n</sup> | Sp         |
| 1890.87 | 97.9  | 0.59 | 7.5... | 8.4 | 3 <sup>n</sup> | $\beta$    |
| 1896.83 | 107.5 | 0.44 | ...    |     | 1 <sup>n</sup> | Lew        |
| 1897.81 | 91.7  | 0.53 | ...    |     | 3 <sup>n</sup> | Bow        |
| 1897.88 | 99.3  | 0.45 | ...    |     | 3 <sup>n</sup> | Lew        |

Discovered with the 9.4-inch at the Dartmouth College Observatory. There is no evidence of change. This star has no appreciable proper motion.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...O $\Sigma$  (*Poulkowa Obsns.* x)...Sp(III)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...H $\Sigma$  ( )...]

 **$\beta$  1026.** Lalande 58

R.A. 0<sup>h</sup> 5<sup>m</sup> 50<sup>s</sup> }  
Decl. + 52° 57' }

|         |       |      |        |     |                |         |
|---------|-------|------|--------|-----|----------------|---------|
| 1888.76 | 329.6 | 0.48 | 8.1... | 8.9 | 4 <sup>n</sup> | $\beta$ |
|---------|-------|------|--------|-----|----------------|---------|

Discovered with the 12-inch. This star is 6.5 in D.M., and 7<sup>m</sup> in L.

[ $\beta$  (xiv)... $\beta$  (2875)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  864.** D.M. (34°) 12

R.A. 0<sup>h</sup> 6<sup>m</sup> 40<sup>s</sup> }  
Decl. + 34° 40' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1880.77 | 138.6 | 1.60 | 8.9... | 12.3 | 4 <sup>n</sup> | $\beta$ |
| 1891.70 | 136.4 | 2.03 | 8.4... | 11.5 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  998.** Lalande 130

R.A. 0<sup>h</sup> 7<sup>m</sup> 30<sup>s</sup> }  
Decl. + 5° 55' }

|         |       |      |        |     |                |         |
|---------|-------|------|--------|-----|----------------|---------|
| 1881.86 | 114.9 | 1.04 | 8.7... | 8.7 | 3 <sup>n</sup> | $\beta$ |
| 1891.68 | 114.5 | 1.23 | 8.3... | 8.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.70 | 115.3 | 1.39 | 8.8... | 9.0 | 3 <sup>n</sup> | Cg      |

Discovered with the 12-inch. No change unless in distance.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Cogshall ( )...]

**β 486. Ceti 33**

R.A. 0<sup>h</sup> 8<sup>m</sup> 19<sup>s</sup> }  
Decl. - 3° 27' }

|         |     |      |            |    |     |
|---------|-----|------|------------|----|-----|
| 1877.87 | 4.3 | ...  | 5.5...10.0 | 1n | Cin |
| 1878.54 | 5.2 | 2.81 | 6.0...12.0 | 4n | β   |
| 1879.76 | 6.3 | 3.05 | 5.8...10.5 | 2n | Cin |
| 1886.86 | 3.4 | 3.31 | 6.0...11.5 | 2n | LM  |
| 1888.91 | 5.3 | 3.09 | 5.0...11.0 | 1n | β   |
| 1898.68 | 8.8 | 3.13 | 5.7...11.5 | 2n | Bd  |
| 1898.78 | 2.9 | 3.03 | 6.0...12.0 | 1n | Cg  |

Discovered with the 18½-inch. Apparently fixed. This star (= L 158) is 6 m in ARGELANDER and HEIS.

[β (x)...β<sup>2</sup>...β<sup>3</sup>...β<sup>4</sup>...β (2956)...β (Pub. L. O. II)...Cin<sup>3</sup>...Cin<sup>4</sup>...LM...Boothroyd and Cogshall ( )...]

**β 1027. D.M. (20°) 15**

R.A. 0<sup>h</sup> 8<sup>m</sup> 44<sup>s</sup> }  
Decl. + 20° 53' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1888.92 | 186.8 | 1.54 | 7.2...10.3 | 3n | β |
| 1891.85 | 187.4 | 1.55 | 7.7...11.5 | 3n | β |
| 1895.90 | 180.5 | 1.38 | ...        | 1n | L |
| 1897.89 | 180.9 | 1.62 | ...        | 3n | A |

Discovered with the 36-inch. This star is W<sup>2</sup>O. 200.

[β (xiv)...β (2875,3113)...β (Pub. L. O. II)...Lewis (Mon. Not. LVI, 359) (Greenwich Obsns., 1895)...Aitken (A. J. 429)...]

**β 487. W<sup>2</sup>O. 241**

R.A. 0<sup>h</sup> 10<sup>m</sup> 18<sup>s</sup> }  
Decl. + 28° 38' }

B and C

|         |       |      |         |    |   |
|---------|-------|------|---------|----|---|
| 1878.25 | 265.4 | 2.04 | ...12.5 | 2n | β |
| 1891.64 | 266.5 | 2.39 | ...11.5 | 2n | β |
| 1898.72 | 266.2 | 2.54 | ...11.5 | 2n | β |

A and B (= Σ 17)

|         |      |       |            |    |    |
|---------|------|-------|------------|----|----|
| 1828    | 29.4 | 20±   | 8 ... 9-10 | 1n | H  |
| 1830.05 | 29.3 | 26.33 | 8.0... 9.2 | 2n | Σ  |
| 1847.43 | 29.2 | 26.85 | ...        | 2n | Ma |
| 1866.17 | 29.6 | 26.76 | 7.8... 9.2 | 3n | Δ  |
| 1878.77 | 28.9 | 27.06 | ...        | 1n | β  |

|         |      |       |            |    |     |
|---------|------|-------|------------|----|-----|
| 1891.64 | 29.4 | 26.98 | 8.1...     | 2n | β   |
| 1892.96 | 29.5 | 27.17 | 8.0... 9.2 | 2n | Gla |
| 1898.72 | 29.5 | 26.88 | 8.2... 8.5 | 2n | β   |

The companion to B was discovered with the 18½-inch. There appears to be no change in the components of Σ 17. The foregoing are all the measures of AB.

[β (x)...β<sup>2</sup>...β (3113)...β (Pub. L. O. II)...β (Astron. & Astro-Physics XIII, 16)...Madler (Fixstern-Systeme II)...Herschel (Mem. R. A. S. IV)...Δ (II)...Glaserapp (II)...]

**β 392. B.A.C. 46**

R.A. 0<sup>h</sup> 10<sup>m</sup> 31<sup>s</sup> }  
Decl. + 60° 52' }

|         |      |       |            |    |   |
|---------|------|-------|------------|----|---|
| 1879.70 | 68.6 | 19.38 | 6.0...12.0 | 2n | β |
| 1888.71 | 68.2 | 19.80 | 6.5...12.3 | 3n | β |
| 1898.71 | 69.1 | 19.70 | 6.1...13   | 2n | β |

Discovered with the 6-inch. Probably fixed.

[β (VII)...β<sup>3</sup>...β (2103,2875)...β (Pub. L. O. II)...]

**β 776. D.M. (49°) 40**

R.A. 0<sup>h</sup> 10<sup>m</sup> 53<sup>s</sup> }  
Decl. + 49° 55' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.59 | 202.5 | 0.90 | 8.8... 9.0 | 3n | β   |
| 1888.88 | 202.0 | 1.11 | 8.8... 9.2 | 3n | Com |

Discovered with the 15½-inch at the Washburn Observatory. So far no evidence of change.

[β (XII)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. VI)...]

**β 393. Lalande 291**

R.A. 0<sup>h</sup> 12<sup>m</sup> 12<sup>s</sup> }  
Decl. - 21° 48' }

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1877.87 | 6.2  | 0.6± | 7.0... 8.0 | 1n | Cin |
| 1879.75 | 11.4 | 0.77 | 6.0... 8.0 | 1n | Cin |
| 1886.81 | 12.6 | ...  | 7 ... 8    | 1n | LM  |
| 1890.89 | 16.0 | 0.71 | 7.5... 8.1 | 3n | β   |
| 1893.91 | 12.9 | 0.59 | 7 ... 9    | 2n | Sel |
| 1897.71 | 18±  | 0.3± | ...        | 1n | See |
| 1898.68 | 12.7 | 0.69 | 7.5... 9.0 | 1n | Cg  |
| 1898.69 | 10.8 | 0.80 | 7.0... 7.5 | 1n | β   |

Discovered with the 6-inch. Probably unchanged.

[β (VII)...β (2103,3048)...β (Pub. L. O. II)...Cin<sup>4</sup>...Cin<sup>6</sup>... Sellors (3240)...See (3495)...Cogshall ( )...]

**$\beta$  256.** S.D. (14°) 48

R.A. 0<sup>h</sup> 13<sup>m</sup> 53<sup>s</sup> }  
Decl. - 14° 30' }

|         |       |      |              |                |          |
|---------|-------|------|--------------|----------------|----------|
| 1876.40 | 249.1 | 2.31 | 10.0... 10.5 | 3 <sup>n</sup> | $\Delta$ |
| 1878.79 | 249.9 | 2.43 | 8.3... 8.8   | 2 <sup>n</sup> | Cin      |
| 1886.79 | 248.4 | 2.70 | 8.8... 9.1   | 2 <sup>n</sup> | LM       |
| 1893.81 | 250.9 | 2.70 | 9.0... 9.2   | 2 <sup>n</sup> | W        |
| 1898.72 | 251.7 | 2.51 | 9.0... 9.2   | 1 <sup>n</sup> | Bd       |

Discovered with the 9.4-inch at the Dartmouth College Observatory. Evidently without change. The magnitude in S.D. is 8.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\Delta$  (1)...Cin<sup>4</sup>...Cin<sup>6</sup>... LM...Wilson ( )...Boothroyd ( )...]

 **$\beta$  1015.** Lalande 368

R.A. 0<sup>h</sup> 14<sup>m</sup> 27<sup>s</sup> }  
Decl. + 11° 39' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1888.56 | 114.8 | 0.59 | 8.0... 8.0 | 1 <sup>n</sup> | Lv      |
| 1891.64 | 120.6 | 0.52 | 8.4... 8.6 | 2 <sup>n</sup> | $\beta$ |
| 1897.86 | 116.4 | 0.40 | ...        | 1 <sup>n</sup> | Bow     |
| 1897.93 | 112.6 | 0.46 | ...        | 1 <sup>n</sup> | L       |
| 1897.96 | 125.4 | 0.51 | ...        | 2 <sup>n</sup> | Br      |
| 1898.86 | 124.0 | 0.48 | ...        | 3 <sup>n</sup> | Bow     |
| 1898.89 | 118.1 | 0.51 | ...        | 1 <sup>n</sup> | L       |

Discovered with the 18½-inch. Probably unchanged.

[ $\beta$  (xiii)... $\beta^3$  (app)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Brown ( )...]

 **$\beta$  1093.** Lalande 375

R.A. 0<sup>h</sup> 14<sup>m</sup> 44<sup>s</sup> }  
Decl. + 10° 19' }

|         |      |        |            |                |         |
|---------|------|--------|------------|----------------|---------|
| 1889.65 | 54.3 | 0.39   | 7.3... 8.2 | 3 <sup>n</sup> | $\beta$ |
| 1890.98 | 49.1 | 0.25 ± | ...        | 3 <sup>n</sup> | Sp      |
| 1895.88 | 46.3 | 0.2 ±  | ...        | 1 <sup>n</sup> | Sp      |
| 1895.90 | 42.0 | ....   | ...        | 1 <sup>n</sup> | L       |
| 1896.93 | 39.8 | 0.31   | ...        | 1 <sup>n</sup> | L       |
| 1897.96 | 49.2 | 0.50   | ...        | 1 <sup>n</sup> | L       |
| 1898.71 | 55.5 | 0.66   | 7.5... 8.2 | 3 <sup>n</sup> | Bd      |
| 1898.84 | 61.4 | 0.44   | 7.5... 8.5 | 1 <sup>n</sup> | $\beta$ |
| 1898.88 | 60.9 | 0.39   | ...        | 1 <sup>n</sup> | L       |

Discovered with the 36-inch. The *f* one of three bright stars.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...Sp. (III)... Lewis (*Mon. Not.* LVI, 359; LIX, 400) (*Greenwich Obsns.* 1895) ...Boothroyd ( )...]

 **$\beta$  777.** D.M. (-1°) 32

R.A. 0<sup>h</sup> 14<sup>m</sup> 56<sup>s</sup> }  
Decl. - 0° 55' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.73 | 166.7 | 4.09 | 8.5... 9.5 | 3 <sup>n</sup> | $\beta$ |
| 1886.86 | 166.6 | 3.91 | ...        | 2 <sup>n</sup> | UL      |
| 1888.32 | 166.2 | 3.98 | 8.7... 9.8 | 3 <sup>n</sup> | Com     |
| 1891.83 | 166.0 | 4.08 | 8 ... 10   | 3 <sup>n</sup> | Col     |
| 1898.69 | 167.0 | 3.89 | 8.2... 8.8 | 3 <sup>n</sup> | Bd      |

Discovered with the 15½-inch of the Washburn Observatory. Apparently fixed.

[ $\beta$  (xii)... $\beta^4$ ...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...Collins (*Pub. Haverford Coll. Obsy.* 1891)...Boothroyd ( )...]

 **$\beta$  488.** Lalande 465

R.A. 0<sup>h</sup> 17<sup>m</sup> 52<sup>s</sup> }  
Decl. - 4° 8' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1878.40 | 347.9 | 3.32 | 7.5... 10.5 | 4 <sup>n</sup> | $\beta$ |
| 1886.74 | 347.2 | 3.40 | 7.6... 10.9 | 7 <sup>n</sup> | LM      |
| 1893.81 | 347.3 | 2.90 | 7.2... 11.0 | 2 <sup>n</sup> | W       |
| 1898.71 | 346.7 | 3.07 | 7.4... 10.6 | 4 <sup>n</sup> | Cg      |

Discovered with the 18½-inch. Probably unchanged.

[ $\beta$  (x)... $\beta^4$ ...LM...Glasenapp (II)...Wilson ( )...Cogshall ( )...]

 **$\beta$  489** D.M. (43°) 80

R.A. 0<sup>h</sup> 19<sup>m</sup> 40<sup>s</sup> }  
Decl. + 43° 31' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1878.43 | 182.5 | 3.32 | 8.0... 12.0 | 3 <sup>n</sup> | $\beta$ |
| 1891.64 | 180.4 | 3.35 | 8.3... 11.5 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. No indication of motion.

[ $\beta$  (x)... $\beta^4$ ... $\beta^3$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  778.** D.M. (51°) 72

R.A. 0<sup>h</sup> 19<sup>m</sup> 43<sup>s</sup> }  
Decl. + 51° 10' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1881.61 | 47.9 | 1.05 | 9.5... 9.5 | 3 <sup>n</sup> | $\beta$ |
| 1888.37 | 45.0 | 1.24 | 9.2... 9.3 | 4 <sup>n</sup> | Com     |

Discovered with the 15½-inch of the Washburn Observatory. Motion doubtful.

[ $\beta$  (xii)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...]

**β 1156.** D.M. (63°) 48

R.A. 0<sup>h</sup> 19<sup>m</sup> 58<sup>s</sup> }  
Decl. + 63° 46' }

1890.74 31.9 0.52 9.2... 9.3 3<sup>n</sup> β

Discovered with the 36-inch in examining the place of TYCHO BRAHE'S star.

[β (xvii)...β (3047)...β (Sid. Mess. ix, 449)...β (Pub. L. O. ii)...]

**β 1225.** W<sup>2</sup> O. 496

R.A. 0<sup>h</sup> 20<sup>m</sup> 55<sup>s</sup> }  
Decl. + 20° 26' }

1891.85 189.3 1.15 8.1... 11.8 3<sup>n</sup> β  
1898.90 187.5 1.36 ... 2<sup>n</sup> Bar

Discovered with the 36-inch. The magnitude in D.M. is 7.3.

[β (xviii)...β (3113)...β (Pub. L. O. ii)...Barnard ( )...]

**β 779.** Lalande 592

R.A. 0<sup>h</sup> 21<sup>m</sup> 37<sup>s</sup> }  
Decl. + 22° 55' }

1881.67 263.3 0.85 8.5... 9.0 3<sup>n</sup> β  
1887.86 260.4 0.87 8.4... 9.2 3<sup>n</sup> Com  
1897.75 253.6 1.18 8+... 9 3<sup>n</sup> D

Discovered with the 15½-inch of the Washburn Observatory. Some change is probable.

[β (xi)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...Doolittle (Pub. Flower Obsy. 1)...]

**β 1157.** D.M. (63°) 52

R.A. 0<sup>h</sup> 22<sup>m</sup> 30<sup>s</sup> }  
Decl. + 63° 35' }

1890.74 90.2 1.66 8.4... 11.3 3<sup>n</sup> β  
1897.76 81.2 1.54 8+... 11 3<sup>n</sup> D

Discovered with the 12-inch; near β 1156. The magnitude is 8.0 in D.M.

[β (xvii)...β (3047)...β (Pub. L. O. ii)...Doolittle (Pub. Flower Obsy. 1)...]

**β 1094.** Lalande 655

R.A. 0<sup>h</sup> 23<sup>m</sup> 29<sup>s</sup> }  
Decl. + 59° 19' }

1889.53 244.6 0.70 5.7... 9.5 3<sup>n</sup> β  
1897.96 246.3 0.79 ... 3<sup>n</sup> A

Discovered with the 36-inch. This is a naked-eye star in *Cassiopea*.

[β (xvi)...β (2956)...β (Pub. L. O. ii)...Aitken (A.J. 429)...]

**β 1095.** 28 *Andromedae*

R.A. 0<sup>h</sup> 23<sup>m</sup> 47<sup>s</sup> }  
Decl. + 29° 5' }

1889.51 0.1 2.42 5.5... 13.3 3<sup>n</sup> β  
1898.73 4.5 2.34 6.0... 13.5 3<sup>n</sup> β

Discovered with the 36-inch. The principal star has an annual proper motion of 0".061 in the direction of 159°.8, according to AUWERS. The effect of this movement would decrease the position angle of B 3°.8, and increase the distance 0".53 in the interval covered by the foregoing measures. The change shown by the measures is in the reverse direction, indicating common proper motion.

[β (xvi)...β (2956)...β (Pub. L. O. ii)...]

**β 394.** Lalande 678

R.A. 0<sup>h</sup> 24<sup>m</sup> 16<sup>s</sup> }  
Decl. + 46° 52' }

1876.77 278.0 0.83 8.2... 8.4 3<sup>n</sup> Δ  
1885.74 278.5 0.97 ... 4<sup>n</sup> HΣ  
1888.68 281.5 1.08 8.0... 8.2 3<sup>n</sup> T  
1893.54 280.1 1.06 8.0... 8.3 W

Discovered with the 6-inch. Probably unchanged.

[β (vii)...β (2103)...Δ (1)...Tarrant (2991)...Wilson ( ) ...HΣ ( )...]

**β 107.** D.M. (62°) 93

R.A. 0<sup>h</sup> 24<sup>m</sup> 31<sup>s</sup> }  
Decl. + 62° 41' }

1873.68 360± 2± 9.0... 10.0 β  
1891.52 358.8 4.44 8.0... 9.6 2<sup>n</sup> β  
1898.72 354.0 5.67 9.1... 9.4 3<sup>n</sup> β

Discovered with the 6-inch. About 25' n of κ *Cassiopeiae*.

It would be assumed in the first instance that any change in a pair of very small stars, separated by so great a distance, would be due to the proper motion of one or the other. In this instance the two sets of measures give an apparent annual movement of the companion of  $0''.18$  in the direction of  $337^\circ.3$ . Carrying this back to 1873, the smaller component at that time would be  $1''.87$  from the primary in the position-angle of  $37^\circ.7$ . This agrees well enough with the estimated places so far as distance is concerned, but the agreement with the estimate of the angle is not very satisfactory. It is more difficult to judge of the direction of one star from another in high northern declinations, unless special care is taken, and this may explain the large error, if this is an error. In addition to this, allowable errors in the measure would change the direction of motion and give a much smaller position-angle for 1873. The probabilities are that the movement is rectilinear, and due to the proper motion of one of the stars, but of course there is nothing to indicate which one is drifting, beyond perhaps a slight presumption in favor of the brighter. The difference in magnitude, however, is too small to make this of much importance.

At the time of finding this pair, I assumed that it was D.M. (62°) 93 from its situation with reference to two stars of similar magnitude, in the same field and nearly south of the double, which appeared to be Nos. 94 and 95 of that catalogue.

Since making the last measure, showing change in the components, I have more carefully examined ARGELANDER, and find that the stars in the D.M. do not correspond at all to the present positions of the stars in this vicinity. In order to compare the two accurately, I have connected the four principal stars in the field with A of the double by micrometrical measures. The results are as follows:

|    |         |               |           |        |            |
|----|---------|---------------|-----------|--------|------------|
| AC | 1898.73 | $336.2^\circ$ | $46.95''$ | ...8.2 | 2 <i>n</i> |
| AD | 1898.73 | 146.6         | 50.27     | ...8.3 | 2 <i>n</i> |
| AE | 1898.76 | 171.2         | 113.78    | ...8.5 | 1 <i>n</i> |
| AF | 1898.76 | 113.9         | 150.44    | ...8.7 | 1 <i>n</i> |

There are many small stars in the field, but all too faint for the D.M. These five stars are laid down to scale on Fig. 1 from the above measures. The four stars given in ARGELANDER (Nos. 93 to 96) are platted on the same scale, and shown in Fig. 2.

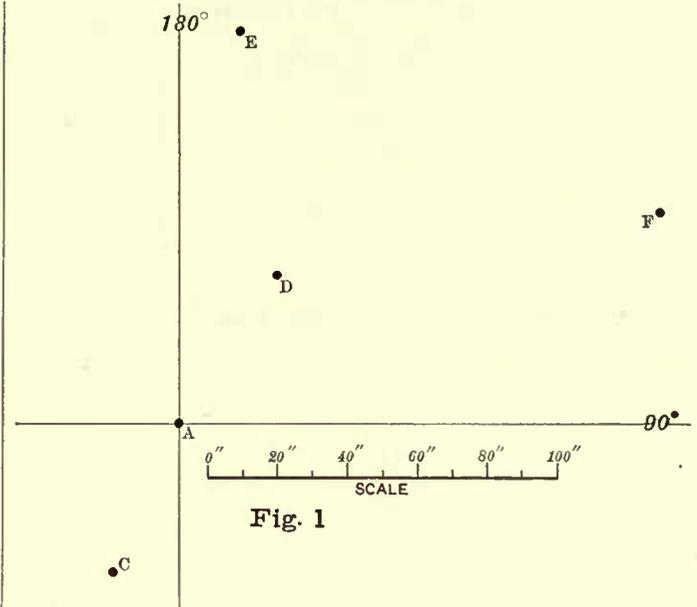


Fig. 1

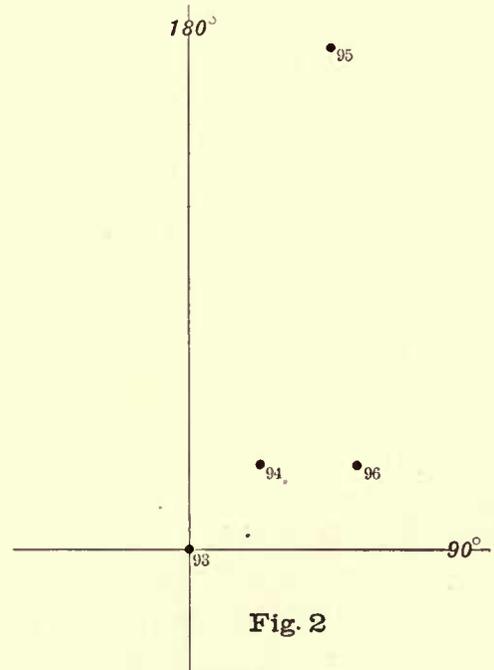


Fig. 2

It will be seen that it is impossible to identify the stars in one diagram with those of the other, except that *E* and No. 95 are probably the same. All of the stars in Fig. 1 are entitled from their magnitude to a place in the D.M. It is evident that there has been a great change in the relation of these stars since the meridian observations of ARGELANDER, or that there are very considerable

errors in the D.M. places of two or more of them. I have found it necessary, in the past twenty-five years, to compare the D.M. catalogues with the sky in the identification of small stars many hundreds of times, and I do not recall at this time any instance of serious error or omission. I have, therefore, a high degree of confidence in the substantial accuracy of this great work. Unfortunately, the new catalogues of the *Astronomischen Gesellschaft* are very defective with respect to the D.M. stars in the lower magnitudes. Of the first hundred stars given in the D.M. zone of  $62^\circ$ , less than one-third are found in the new catalogue covering this region, and all the stars in question are missing. So far as I know there are no meridian observations of them other than those in ARGLANDER, and hence there is no data for determining their previous relations to each other, and their proper motions. For this reason I have connected them together by the measures given above, so that hereafter the moving star or stars can be easily identified. It is certain that one of the components of the pair is moving, and there can be but little doubt of this being rectilinear motion; but that does not appear to be sufficient to entirely explain the difference between the two diagrams.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II; *Pop. Astronomy* VII, 1)...]

$\beta$  1158. Lalande 718

R.A.  $0^h 24^m 55^s$  }  
Decl.  $-10^\circ 45'$  }

B and C

|         |       |      |        |     |       |         |
|---------|-------|------|--------|-----|-------|---------|
| 1890.91 | 138.1 | 0.26 | 8.6... | 8.6 | 3 $n$ | $\beta$ |
| 1898.76 | 146.7 | 0.43 | 8.3... | 8.3 | 1 $n$ | $\beta$ |

A and BC (=H 1981)

|         |      |       |        |  |       |         |
|---------|------|-------|--------|--|-------|---------|
| 1890.91 | 86.6 | 79.31 | 6.9... |  | 3 $n$ | $\beta$ |
| 1898.74 | 86.5 | 78.86 | 7.0... |  | 2 $n$ | $\beta$ |

The wide pair constitutes the double star, H 1981. The duplicity of the companion was detected with the 36-inch. H gave the angle  $84^\circ 8'$ , and the estimated distance  $60''$ , with magnitudes 8 and 9. The magnitude of the smaller star in S.D. is 8.6. The magnitudes assigned to A cover a wide

range: LALANDE and SCHJELLERUP, 8; CORDOBA,  $7\frac{1}{2}$ ; SCHÖNFELD, 7.2; HEIS, 6-7.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...H (*Mem. R. A. S.* VI)...]

$\beta$  1226. D.M. ( $57^\circ$ ) 97

R.A.  $0^h 24^m 58^s$  }  
Decl.  $+57^\circ 29'$  }

|         |       |      |        |      |       |         |
|---------|-------|------|--------|------|-------|---------|
| 1891.58 | 190.8 | 0.40 | 8.5... | 10.5 | 3 $n$ | $\beta$ |
|---------|-------|------|--------|------|-------|---------|

Discovered with the 36-inch.

[ $\beta$  (XVIII)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  1227. D.M. ( $57^\circ$ ) 98

R.A.  $0^h 25^m 41^s$  }  
Decl.  $+57^\circ 41'$  }

A and B

|         |       |      |        |      |       |         |
|---------|-------|------|--------|------|-------|---------|
| 1891.59 | 206.1 | 2.82 | 7.3... | 11.6 | 3 $n$ | $\beta$ |
| 1897.04 | 202.9 | 2.67 | 7.3... | 11.5 | 3 $n$ | A       |

A and C

|         |      |       |     |                  |       |   |
|---------|------|-------|-----|------------------|-------|---|
| 1897.05 | 87.2 | 22.27 | ... | 11 $\frac{1}{2}$ | 2 $n$ | A |
|---------|------|-------|-----|------------------|-------|---|

A and D

|         |       |       |     |    |       |   |
|---------|-------|-------|-----|----|-------|---|
| 1897.05 | 116.6 | 32.69 | ... | 12 | 2 $n$ | A |
|---------|-------|-------|-----|----|-------|---|

Discovered with the 36-inch. The distant stars added by AITKEN.

[ $\beta$  (XVIII)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...]

$\beta$  780. D.M. ( $36^\circ$ ) 79

R.A.  $0^h 26^m 0^s$  }  
Decl.  $+37^\circ 5'$  }

|         |       |      |        |      |       |         |
|---------|-------|------|--------|------|-------|---------|
| 1881.93 | 144.2 | 2.32 | 8.5... | 9.8  | 3 $n$ | $\beta$ |
| 1886.87 | 144.1 | 2.37 | ...    |      | 1 $n$ | UL      |
| 1888.52 | 143.6 | 2.46 | 8.4... | 10.2 | 5 $n$ | Com     |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta^4$ ...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...]

**$\beta$  108.** O. Arg. N. 492

R.A.  $0^h 27^m 43^s$  }  
Decl.  $+ 62^\circ 15'$  }

|         |       |      |            |       |            |
|---------|-------|------|------------|-------|------------|
| 1875.83 | 358.1 | 4.20 | 7.6...10.7 | 6 $n$ | $\Delta$   |
| 1876.76 | 358.3 | 4.17 | 8.0... 9.5 | 1 $n$ | O $\Sigma$ |
| 1885.69 | 357.8 | 4.40 | ...        | 2 $n$ | H $\Sigma$ |
| 1888.68 | 359.0 | 4.28 | ...        | 3 $n$ | T          |
| 1898.69 | 358.1 | 4.30 | 7.0...10.5 | 1 $n$ | $\beta$    |

Discovered with the 6-inch. No evidence of change. The 40-inch shows four faint stars. The single settings are :

|       |   |       |      |
|-------|---|-------|------|
| 337.8 | : | 20.87 | 15 m |
| 213.6 | : | 24.06 | 13 m |
| 150.8 | : | 27.25 | 14 m |
| 218.9 | : | 41.75 | 10 m |

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...O $\Sigma$  (*Poulkowa Obsns.* x)...Tarrant (2991)...H $\Sigma$  ( )...]

 **$\beta$  490.** 13 *Ceti*

R.A.  $0^h 29^m 4^s$  }  
Decl.  $- 4^\circ 15'$  }

|         |      |       |             |       |         |
|---------|------|-------|-------------|-------|---------|
| 1877.78 | 65.3 | 38.12 | 6 ... 12-13 | 1 $n$ | $\beta$ |
| 1887.81 | 60.8 | 35.63 | ... 13      | 1 $n$ | Ho      |
| 1891.61 | 58.9 | 33.72 | 5.5...14.2  | 3 $n$ | $\beta$ |
| 1898.56 | 57.8 | 31.28 | ... 13.2    | 2 $n$ | $\beta$ |

The faint companion was noted with the 18½-inch. The principal star has a proper motion of  $0''.397$  in the direction of  $93^\circ 0'$  (AUWERS). This movement fully accounts for the change in the position of the companion as shown by the measures. The minimum distance of 18" will be reached about 1962. My first distance in 1877 was erroneously printed 37''.12.

In 1887 Ho thought that the principal star was a very close pair,  $93^\circ 4' : 0''.3 \pm$  (1887.81) 1 $n$ . In 1890 and 1891 I could not see any elongation with the 36-inch, and it does not appear to have been measured or seen since the time first referred to. It should be watched, but the probabilities are that it is not really double.

[ $\beta$  (x)... $\beta$ ... $\beta$  (3048,3113)... $\beta$  (*Pub. L. O.* II)...Hough (2977)...]

 **$\beta$  1096.** O. Arg. N. 534

R.A.  $0^h 29^m 46^s$  }  
Decl.  $+ 57^\circ 51'$  }

|         |       |       |            |       |         |
|---------|-------|-------|------------|-------|---------|
| A and B |       |       |            |       |         |
| 1889.61 | 267.7 | 0.22  | 9.5... 9.5 | 3 $n$ | $\beta$ |
| B and C |       |       |            |       |         |
| 1889.60 | 61.8  | 33.38 | ... 8.9    | 3 $n$ | $\beta$ |
| 1898.77 | 61.7  | 33.93 | ... 8.3    | 2 $n$ | $\beta$ |

Discovered with the 36-inch. The close pair is a difficult object.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  1097.** Radcliffe 159

R.A.  $0^h 30^m 30^s$  }  
Decl.  $+ 57^\circ 21'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1889.60 | 251.6 | 0.76 | 8.4... 8.4 | 4 $n$ | $\beta$ |
| 1891.56 | 251.7 | 0.48 | 8.1... 8.2 | 3 $n$ | $\beta$ |
| 1897.03 | 241.1 | 0.48 | 8+... 8+   | 1 $n$ | A       |
| 1898.00 | 252.4 | 0.60 | ...        | 2 $n$ | Hu      |

Discovered with the 36-inch. The magnitude in the *Radcliffe Catalogue* is 7.4, and in D.M. 7.0. So far there is no evidence of change.

[ $\beta$  (xvi)... $\beta$  (2956,3113)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...Hussey ( )...]

 **$\beta$  230.** W<sup>2</sup> 0.764

R.A.  $0^h 30^m 59^s$  }  
Decl.  $+ 26^\circ 39'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1891.70 | 324.1 | 3.91 | 8.4... 9.0 | 3 $n$ | $\beta$ |
| 1898.69 | 323.7 | 3.55 | 8.5... 9.0 | 1 $n$ | $\beta$ |

Discovered with the 6-inch. Unchanged.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...]

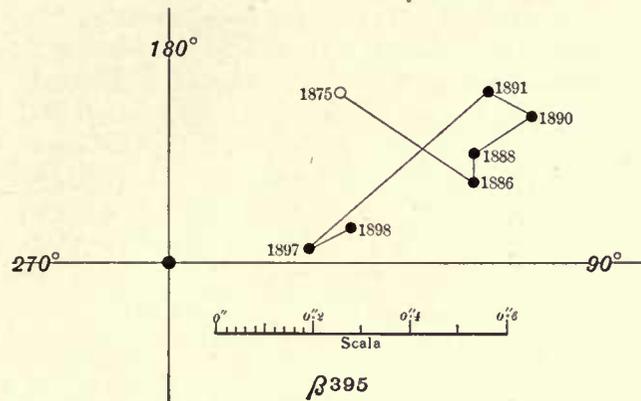
$\beta$  395. *Ceti* 82. B.A.C. 160

R.A.  $0^h 31^m 12^s$  }  
Decl.  $- 25^\circ 26'$  }

|         |                 |           |            |    |         |
|---------|-----------------|-----------|------------|----|---------|
| 1875.84 | $135^\circ \pm$ | $0.5 \pm$ | 6.0... 6.0 | 1n | $\beta$ |
| 1886.85 | 104.7           | 0.65      | 6.1... 6.3 | 2n | LM      |
| 1888.01 | 109.4           | ...       | 7... 7     | 1n | Pol     |
| 1888.89 | 109.6           | 0.67      | 6.0... 6.4 | 3n | Lv      |
| 1889.99 | 111.4           | 0.88      | 6.0... 6.0 | 2n | Hl      |
| 1890.82 | 112.6           | 0.74      | 6.0... 6.1 | 3n | $\beta$ |
| 1891.83 | 115.2           | 0.69      | ...        | 1n | Lv      |
| 1891.85 | 118.2           | 0.75      | 6.9... 7.2 | 3n | $\beta$ |
| 1897.65 | 278.2           | 0.22      | ...        | 2n | See     |
| 1897.67 | 272.8           | 0.25      | ...        | 1n | Cg      |
| 1897.82 | 85.9            | 0.39      | ...        | 1n | $\beta$ |
| 1897.92 | 273.7           | 0.27      | ...        | 3n | A       |
| 1897.92 | 275.1           | 0.31      | ...        | 3n | Hu      |
| 1898.59 | 280.4           | 0.38      | 6.2... 6.3 | 3n | A       |
| 1898.69 | 97.5            | 0.68      | 7.5... 7.5 | 1n | $\beta$ |

This interesting system was discovered with the 6-inch, and it was evident from the first that it was a physical pair from the large proper motion of the components, since if this movement belonged to one of the stars only, a few years preceding its discovery it would have been a wide and easy pair, and hence catalogued as a double star.

SEE, using the measures to 1897.67, has computed the orbit, and found a period of 16.3 years (*A.N.* 3455). This assumes a change in position-angle of about  $180^\circ$  between 1891 and 1897. From the slow motion in angle and distance between the date of discovery and the last measures in 1891, it seems very probable that in all the observations the companion star should be put in the same quadrant. It will be seen from the magnitude estimates when the distance was the greatest that the components are very nearly equal, and a correction of  $180^\circ$  may be considered as allowable in any of the measures. It is not material whether we consider the second or the fourth quadrant as the correct one for the smaller star. There is no question of the binary character of this pair, but if the change has been in a gradual approach of the two components, as seems most likely, the period will not be a short one. The measures of the next few years will show whether or not there has been any rapid angular motion. The principal measures are shown on the accompanying diagram.



Some of the values for the proper motion are:

|         |   |   |   |       |           |
|---------|---|---|---|-------|-----------|
| Stumpe  | - | - | - | 1.402 | in $91.3$ |
| Kustner | - | - | - | 1.379 | in $90.6$ |
| Porter  | - | - | - | 1.524 | in $90.2$ |
| Bossert | - | - | - | 1.409 | in $91.2$ |

[ $\beta$  (vii)... $\beta$  (2103,3048,3113)... $\beta$  (*Pub. L. O.* 11)...Pollock (*Pub. Sydney Obsy.*, 1891) (*Mem. R. A. S. L.*)...Lv...Lv (*Sid. Mess.* viii, 77) (*Proc. Haverford Coll. Obsy.*, 1891)... Hall (ii)...See (*A. J.* 412)...See (3455,3495)...Aitken (*A. J.* 424, 429)...Hussey (*A. J.* 427)...]

$\beta$  1159. D.M. ( $39^\circ$ ) 148

R.A.  $0^h 32^m 28^s$  }  
Decl.  $+ 40^\circ 1'$  }

|         |        |        |            |    |         |
|---------|--------|--------|------------|----|---------|
| 1890.68 | $41.7$ | $0.23$ | 9.7... 9.9 | 3n | $\beta$ |
|---------|--------|--------|------------|----|---------|

This very minute and difficult pair, discovered with the 36-inch, is involved in the extreme pre-ceding end of the great nebula in *Andromeda*. The magnitude in D.M. is 8.9.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* 11)...]

$\beta$  491.  $\delta$  *Andromedae*

R.A.  $0^h 32^m 54^s$  }  
Decl.  $+ 30^\circ 12'$  }

|         |       |       |           |    |         |
|---------|-------|-------|-----------|----|---------|
| 1878.40 | 299.3 | 27.86 | 3... 12.5 | 3n | $\beta$ |
| 1888.71 | 299.7 | 27.60 | ... 12.5  | 3n | $\beta$ |
| 1890.56 | 299.4 | 28.18 | ... 12.2  | 3n | $\beta$ |
| 1898.55 | 299.2 | 27.90 | ... 13    | 3n | $\beta$ |

Discovered with the 26-inch of the Naval Observatory. The proper motion of this star, according

to AUWERS, is  $0^{\circ}.151$  in the direction of  $120^{\circ}.7$ . It is evident from the measures that this movement is common to both stars. Assuming the measured distance of 1878 as correct, the distance of the companion, if fixed in space, should have been  $30^{\circ}.9$  at the date of my last measures in 1898. It is certain, therefore, that these stars form a physical system, although apparently relatively fixed for the last twenty years.

[ $\beta$  (x)... $\beta^{\circ}$ ... $\beta^3$ ... $\beta$  (2875,3048)... $\beta$  (Pub. L. O. II)...]

**$\beta$  257.** Lalande 1019

R.A.  $0^{\text{h}} 33^{\text{m}} 37^{\text{s}}$  }  
Decl.  $+ 46^{\circ} 36'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1876.04 | 236.6 | 0.48 | 7.9... 9.0 | 4 <i>n</i> | J       |
| 1891.68 | 237.1 | 0.65 | 8.1... 8.8 | 3 <i>n</i> | $\beta$ |
| 1898.00 | 244.3 | 0.66 | ...        | 2 <i>n</i> | Hu      |

Discovered with the 9.4-inch of the Dartmouth College Observatory. Change in angle is probable.

[ $\beta$  (v)... $\beta$  (Mon. Not. xxxv, 31)... $\Delta$  (1)... $\beta$  (3113)... $\beta$  (Pub. L. O. II)...Hussey ( )...]

**$\beta$  109.** Ceti 91

R.A.  $0^{\text{h}} 34^{\text{m}} 27^{\text{s}}$  }  
Decl.  $- 17^{\circ} 10'$  }

B and C

|         |       |          |              |            |         |
|---------|-------|----------|--------------|------------|---------|
| 1875.99 | 159.4 | 12 $\pm$ | 9.0... 9.0   | 1 <i>n</i> | Cin     |
| 1876.73 | 164.0 | 11.02    | 10.7... 11.2 | 3 <i>n</i> | J       |
| 1893.82 | 160.3 | 11.61    | 10.0... 11.0 | 1 <i>n</i> | W       |
| 1898.69 | 160.1 | 11.78    | 9.5... 9.6   | 1 <i>n</i> | $\beta$ |
| 1898.79 | 160.5 | 11.24    | 10.2... 10.9 | 5 <i>n</i> | Cg      |

A and C

|         |       |       |        |            |         |
|---------|-------|-------|--------|------------|---------|
| 1876.94 | 355.7 | 91.11 | 7.0... | 1 <i>n</i> | J       |
| 1893.82 | 356.6 | 91.53 | 7.0... | 1 <i>n</i> | W       |
| 1898.69 | 356.4 | 91.90 | 7.0... | 1 <i>n</i> | $\beta$ |
| 1898.67 | 355.9 | 92.21 | 6.7... | 1 <i>n</i> | Cg      |

A and B

|         |       |        |        |            |    |
|---------|-------|--------|--------|------------|----|
| 1898.79 | 354.8 | 103.05 | 6.8... | 4 <i>n</i> | Cg |
|---------|-------|--------|--------|------------|----|

Unimportant wide double companion; noted with the 6-inch. Lalande 1064.

[ $\beta$  (III)... $\beta$  (Mon. Not. xxxiv, 59)... $\Delta$  (1)...Cin<sup>3</sup>...Wilson ( )...Cogshall ( )...]

**$\beta$  231.**  $\circ$  Cassiopeiae

R.A.  $0^{\text{h}} 38^{\text{m}} 2^{\text{s}}$  }  
Decl.  $+ 47^{\circ} 38'$  }

|         |       |       |           |            |         |
|---------|-------|-------|-----------|------------|---------|
| 1876.31 | 303.9 | 32.81 | 5.5... 12 | 1 <i>n</i> | J       |
| 1878.47 | 303.7 | 32.16 | ...       | 1 <i>n</i> | $\beta$ |
| 1888.71 | 303.5 | 32.63 | ... 11.6  | 3 <i>n</i> | $\beta$ |
| 1898.00 | 303.1 | 32.66 | ...       | 2 <i>n</i> | Hu      |

Discovered with the 6-inch. AUWERS gives as the proper motion of the principal star  $0^{\circ}.018$  in the direction of  $145^{\circ}.9$ . The movement is too small to say with certainty whether the two are moving together.

[ $\beta$  (v)... $\beta$  (Mon. Not. xxxv, 31)... $\beta^{\circ}$ ... $\beta$  (2875)... $\beta$  (Pub. L. O. II)... $\Delta$  (1)...Hussey ( )...]

**$\beta$  492.** B.A.C. 201

R.A.  $0^{\text{h}} 38^{\text{m}} 27^{\text{s}}$  }  
Decl.  $+ 54^{\circ} 34'$  }

|         |        |      |             |            |            |
|---------|--------|------|-------------|------------|------------|
| 1878.73 | 152.6  | 1.90 | 6 ... 12    | 2 <i>n</i> | $\beta$    |
| 1885.69 | 150.70 | 2.23 | ...         | 2 <i>n</i> | H $\Sigma$ |
| 1889.55 | 152.7  | 2.11 | 5.7... 11.3 | 3 <i>n</i> | $\beta$    |
| 1898.65 | 151.5  | 2.12 | 6.0... 12.0 | 2 <i>n</i> | $\beta$    |

Discovered with the 26-inch at the Naval Observatory. ROGERS gives the proper motion of this star as  $0^{\circ}.066$  in the direction of  $317^{\circ}.3$ . The measures show relative fixity, and they are, therefore, moving together. A naked-eye star in Cassiopea.

[ $\beta$  (x)... $\beta^{\circ}$ ... $\beta$  (2956)... $\beta$  (Pub. L. O. II)...H $\Sigma$  ( )...]

**$\beta$  865.** D.M. ( $42^{\circ}$ ) 161

R.A.  $0^{\text{h}} 38^{\text{m}} 52^{\text{s}}$  }  
Decl.  $+ 42^{\circ} 45'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1880.78 | 197.4 | 1.21 | 8.5... 9.0 | 4 <i>n</i> | $\beta$ |
| 1891.83 | 197.4 | 1.30 | 8.3... 8.8 | 3 <i>n</i> | $\beta$ |
| 1898.00 | 195.5 | 1.30 | ...        | 2 <i>n</i> | Hu      |
| 1898.95 | 192.0 | 1.48 | ...        | 1 <i>n</i> | Bow     |

Discovered with the 18½-inch. Without change.  $\beta$  866 is closely following.

[ $\beta$  (xIII)... $\beta^3$ ... $\beta$  (3113)... $\beta$  (Pub. L. O. II)...Hussey ( ) ...Bowyer (Mon. Not. LIX, 400)...]

**β 493.** D.M. (50°) 137

R.A. 0<sup>h</sup> 39<sup>m</sup> 4<sup>s</sup> }  
Decl. + 50° 27' }

|         |      |      |            |    |    |
|---------|------|------|------------|----|----|
| 1878.67 | 51.4 | 0.85 | 9.0... 9.0 | 2n | β  |
| 1891.85 | 51.4 | 0.77 | 9.0... 9.1 | 2n | β  |
| 1891.92 | 55.6 | 0.5± | ...        | 1n | Sp |
| 1898.76 | 54.7 | 0.69 | 9.0... 9.2 | 1n | β  |

Discovered with the 18½-inch. The  $\rho$  of a small triangle of 9m stars. There seems to be no sensible change. There is a 3<sup>rd</sup> pair of stars 89" distant in the direction of 216°.8.

[β (x)...β<sup>1</sup>...β (3113)...β (Pub. L. O. II)...Sp (III)...]

**β 866.** D.M. (42°) 166

R.A. 0<sup>h</sup> 39<sup>m</sup> 43<sup>s</sup> }  
Decl. + 42° 45' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1880.78 | 68.2 | 1.26 | 9.2... 9.2 | 4n | β |
| 1891.83 | 69.6 | 1.39 | 9.0... 9.1 | 3n | β |

Discovered with the 18½-inch. Without change. β 865 is in the field  $\rho$ .

[β (XIII)...β<sup>3</sup>...β (3113)...β (Pub. L. O. II)...]

**β 494.** Lalande 1266

R.A. 0<sup>h</sup> 40<sup>m</sup> 53<sup>s</sup> }  
Decl. — 1° 54' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1878.20 | 168.5 | 1.38 | 8.1... 8.1 | 2n | β   |
| 1886.80 | 171.2 | 1.36 | 8.0... 8.0 | 3n | LM  |
| 1888.76 | 170.5 | 1.27 | 8.3... 8.4 | 4n | Lv  |
| 1888.87 | 171.4 | 1.39 | 8.0... 8.0 | 4n | T   |
| 1892.86 | 171.8 | 1.37 | 8.2... 8.2 | 1n | G1  |
| 1896.91 | 173.1 | 1.20 | ...        | 1n | Col |
| 1898.65 | 172.0 | 1.33 | 8.2... 8.3 | 3n | Bd  |
| 1898.93 | 180.5 | 1.62 | ...        | 1n | Sol |

Discovered with the 18½-inch. Apparently fixed.

[β (x)...β<sup>1</sup>...Lv<sup>1</sup>...LM...Tarrant (2991)...Glaserapp (II)...Boothroyd ( )...Coleman (Mem. R. A. S. LIII)...Solá (3563)...]

**β 495.** Lalande 1308

R.A. 0<sup>h</sup> 42<sup>m</sup> 25<sup>s</sup> }  
Decl. + 18° 2' }

|         |       |      |            |    |       |
|---------|-------|------|------------|----|-------|
| 1878.70 | 230.9 | 0.58 | 7.5... 7.5 | 1n | β     |
| 1883.80 | 223.8 | 0.5  | ...        | 2n | Per'y |
| 1885.14 | 225.8 | 0.60 | 7.3... 7.6 | 5n | En    |
| 1885.87 | 224.1 | 0.60 | ...        | 2n | HΣ    |
| 1887.98 | 225.0 | 0.54 | 6 ... 7    | 2n | H1    |
| 1889.92 | 225.5 | 0.63 | ...        | 5n | Sp    |
| 1891.66 | 224.9 | 0.65 | 7.5... 7.7 | 3n | β     |
| 1896.80 | 222.2 | 0.57 | ...        | 1n | Bow   |
| 1896.95 | 221.3 | 0.81 | ...        | 1n | L     |
| 1897.83 | 218.8 | 0.68 | ...        | 1n | Bow   |
| 1897.87 | 219.7 | 0.62 | ...        | 2n | L     |
| 1898.76 | 222.5 | 0.77 | 8.0... 8.2 | 1n | β     |
| 1898.82 | 220.3 | 0.85 | ...        | 3n | Bow   |

Discovered with the 18½-inch. The motion, if any, is very slow. The measures by HALL are erroneously credited to OΣ 20.

[β (x)...β<sup>1</sup>...β (3113)...β (Pub. L. O. II)...J. M. Perry (Eng. Mechanic xxxviii, 192; xxxix, 11)...Engelmann (2786)...HΣ ( )...Hall (II)...Lewis and Bowyer (Mon. Not. LIX, 400)...]

**β 301.** Lalande 1350

R.A. 0<sup>h</sup> 43<sup>m</sup> 21<sup>s</sup> }  
Decl. — 22° 3' }

A and B

|         |       |      |           |    |   |
|---------|-------|------|-----------|----|---|
| 1891.79 | 318.8 | 0.90 | 8.3... 14 | 3n | β |
|---------|-------|------|-----------|----|---|

A and C

|         |       |       |             |    |     |
|---------|-------|-------|-------------|----|-----|
| 1875.92 | 299.8 | 5±    | 9.0... 10.0 | 3n | Cin |
| 1891.78 | 300.7 | 11.23 | 8.3... 9.4  | 3n | β   |
| 1893.92 | 298.6 | 10.57 | 9 ... 10    | 1n | Sel |
| 1898.92 | 300.0 | 11.03 | 8.3... 8.8  | 1n | β   |

C was discovered with the 6-inch, and in measuring that with the 36-inch the close star was detected. It is difficult with the large instrument.

[β (VI)...β (2062,3113)...β (Pub. L. O. II)...Cin<sup>3</sup>...Sellors (3240)...]

**β 1160.** B.A.C. 230

R.A.  $0^h 43^m 24^s$  }  
Decl.  $-14^\circ 13'$  }

1890.69 113.1  $^{\circ}$  1.19 5.8...12.0 3 $n$  β

Discovered with the 36-inch. This is a naked-eye star in *Cetus*. The magnitude in Gould is 5.9. [β (xvii)...β (3047)...β (*Pub. L. O.* ii)...]

**β 232.** O. Arg. N. 794

R.A.  $0^h 43^m 38^s$  }  
Decl.  $+49^\circ 59'$  }

## A and B

1876.23 288.4  $^{\circ}$  0.48 8.0... 8.5 6 $n$  Δ  
1883.82 291.0 0.4 ... 1 $n$  Per'y  
1891.66 320.1 0.41 8.0... 8.1 3 $n$  β  
1892.84 319.7 0.62 ... 1 $n$  Bar  
1892.99 321.2 0.4± ... 1 $n$  Sp  
1896.09 325.1 0.3± ... 3 $n$  Sp  
1897.77 326.1 0.38 ... 2 $n$  D  
1898.65 340.7 0.31 8.0... 8.0 2 $n$  β

## AB and C

1875.99 292.8  $^{\circ}$  28.70 ... 10.2 3 $n$  Δ  
1891.66 293.8 28.40 ... 9.1 3 $n$  β  
1897.77 294.3 28.42 ... 2 $n$  D  
1898.65 293.6 28.01 ... 9.0 2 $n$  β

Discovered with the 6-inch. It is certain that the close pair is in moderately rapid motion. At the time of the discovery of this pair, in October, 1874, the angle of AB was estimated  $290^\circ$ , "nearly in the direction of C," thus confirming the position found by Δ in 1876.

[β (v)...β (*Mon. Not.* xxxv, 31)...J. J. M. Perry (*Eng. Mechanic* xxxix, 11)...Sp (iii)...β (3113)...β (*Pub. L. O.* ii)...Δ (1)...Barnard (*A.J.* 447)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 781.** Lalande 1337

R.A.  $0^h 44^m 2^s$  }  
Decl.  $+68^\circ 20'$  }

1881.51  $^{\circ}$  31.2 1.04 8.1... 8.6 3 $n$  β  
1886.86 28.2 1.18 ... 2 $n$  UL  
1888.44 26.5 1.04 8.3... 9.2 3 $n$  Com  
1891.59 30.0 0.88 8.1... 8.4 3 $n$  β

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. So far there has been no change.

[β (xii)...β<sup>4</sup>...β (3113)...β (*Pub. L. O.* ii)...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...]

**β 496.** Lalande 1416

R.A.  $0^h 45^m 18^s$  }  
Decl.  $+12^\circ 8'$  }

1878.74  $^{\circ}$  2.4  $^{\circ}$  5.12 7 ... 13 2 $n$  β  
1885.97 2.3 5.04 ... 1 $n$  HΣ  
1891.64 4.2 5.31 7.5...12.5 2 $n$  β

Discovered with the  $18\frac{1}{2}$ -inch. No sensible change.

[β (x)...β<sup>2</sup>...β (3113)...β (*Pub. L. O.* ii)...HΣ ( )...]

**β 1.** O. Arg. N. 819

R.A.  $0^h 45^m 50^s$  }  
Decl.  $+55^\circ 58'$  }

## A and B

1875.34  $^{\circ}$  81.0  $^{\circ}$  1.42 8.1...10.1 4 $n$  Δ  
1876.76 79.8 1.45 8 ... 10 1 $n$  OΣ  
1885.73 82.1 1.62 ... 2 $n$  HΣ  
1888.66 82.0 1.38 8.0...10.0 5 $n$  T  
1889.55 82.6 1.45 8.2... 9.8 3 $n$  β  
1892.96 83.8 1.48 8.1...10.1 2 $n$  J  
1898.66 79.2 1.63 8.4...10.0 2 $n$  β

## A and C

1875.34  $^{\circ}$  133.3  $^{\circ}$  3.70 ... 8.8 4 $n$  Δ  
1876.46 130.1 3.85 ... 9.0 1 $n$  OΣ  
1885.73 132.3 3.83 ... 2 $n$  HΣ  
1888.66 137.2 4.08 ... 9.0 5 $n$  T  
1889.55 134.2 3.82 ... 8.7 3 $n$  β  
1892.89 132.8 3.60 ... 8.6 2 $n$  J  
1898.58 137.6 3.67 ... 9.7 2 $n$  β

## A and D

1875.34  $^{\circ}$  192.9  $^{\circ}$  8.82 ... 9.5 4 $n$  Δ  
1876.46 192.7 8.87 ... 9.0 1 $n$  OΣ  
1885.73 192.7 8.93 ... 2 $n$  HΣ  
1888.67 193.5 8.76 ... 9.5 4 $n$  T  
1889.55 193.7 8.97 ... 8.7 3 $n$  β  
1892.89 193.2 8.83 ... 9.2 2 $n$  J  
1898.58 194.4 8.73 ... 2 $n$  β

## A and E

1888.67  $^{\circ}$  334.1  $^{\circ}$  16.53 ... 12.0 4 $n$  T  
1889.55 333.1 15.84 ... 12.5 3 $n$  β  
1898.58 332.9 15.86 ... 2 $n$  β

Discovered with the 6-inch. It is a pretty group, in the *np* edge of a large diffused nebula, discovered by BARNARD in 1881 (Dreyer 281). The components of this multiple seem to be fixed.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (2081)... $\Delta$  (1)... $O\Sigma$  (*Poulikova Obsns.* x)... $H\Sigma$  ( ) ...Tarrant (2991)...Jones (*Proc. Haverford Coll. Obsv.* 1892)...Barnard (2588)]

$\beta$  497. B.A.C. 239

R.A.  $0^h 45^m 55^s$  }  
Decl.  $+ 60^\circ 28'$  }

B and C

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1877.59 | 150.9 | 0.9  | 9.0...11.5 | 1 <i>n</i> | $\beta$ |
| 1891.52 | 149.8 | 0.76 | 9.0...11.5 | 2 <i>n</i> | $\beta$ |
| 1898.73 | 151.6 | 0.84 | 8.7...10.5 | 1 <i>n</i> | $\beta$ |

A and B

|         |       |        |            |            |         |
|---------|-------|--------|------------|------------|---------|
| 1878.66 | 171.6 | 121.20 | 6.0...     | 1 <i>n</i> | $\beta$ |
| 1888.08 | 171.4 | 123.17 | ...        | 2 <i>n</i> | Eng     |
| 1891.51 | 171.2 | 123.89 | 6.0... 8.7 | 3 <i>n</i> | $\beta$ |
| 1895.01 | 171.7 | 124.82 | ...        | 2 <i>n</i> | Eng     |
| 1898.72 | 171.6 | 125.06 | 5.7... 8.2 | 2 <i>n</i> | $\beta$ |

This distant double companion was detected with the 18½-inch. The bright star has an annual proper motion of 0".175 in the direction of 331°.2 (PORTER), and this corresponds to the the change of the distant star with reference to A. The small star B is D.M. (60°) 125.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)... $\beta$  (*A. & A.-P.* xiii, 16)...Engelhardt (*Obsns. Ast.* II, III)...]

$\beta$  498. Lalande 1459

R.A.  $0^h 46^m 33^s$  }  
Decl.  $+ 9^\circ 9'$  }

|         |       |      |            |            |           |
|---------|-------|------|------------|------------|-----------|
| 1878.26 | 156.2 | 2.53 | 8.0...12.0 | 2 <i>n</i> | $\beta$   |
| 1885.97 | 158.5 | 2.57 | ...        | 1 <i>n</i> | $H\Sigma$ |
| 1891.96 | 154.6 | 2.70 | 8.0...12.6 | 2 <i>n</i> | $\beta$   |

Discovered with the 18½-inch. No change is shown by the measures.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)... $H\Sigma$  ( )...]

$\beta$  734. *Ceti* 132

R.A.  $0^h 46^m 47^s$  }  
Decl.  $- 24^\circ 40'$  }

|         |       |       |            |            |         |
|---------|-------|-------|------------|------------|---------|
| 1879.68 | 348.9 | 10.74 | 6.0...11.0 | 3 <i>n</i> | $\beta$ |
| 1879.69 | 345.6 | 10.75 | 5.5... 9.5 | 1 <i>n</i> | Cin     |
| 1882.74 | 344.9 | 11.19 | 5.7... 9.5 | 3 <i>n</i> | W       |
| 1888.84 | 346.9 | 10.83 | 7 ... 10   | 2 <i>n</i> | $\beta$ |
| 1897.63 | 345.7 | 11.24 | ...        | 1 <i>n</i> | See     |
| 1898.71 | 347.1 | 10.68 | 6.0...11.5 | 1 <i>n</i> | $\beta$ |

Discovered with the 6-inch at Mt. Hamilton. There has been no change in the position of the small star. The principal star is 5½ m in GOULD (= Lalande 1477 = Lacaille 238).

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (2929)... $\beta$  (*Pub. L. O. I, II*)...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...See (3495)...]

$\beta$  1098. *v' Cassiopeiae*

R.A.  $0^h 47^m 53^s$  }  
Decl.  $+ 58^\circ 19'$  }

|         |      |       |            |            |         |
|---------|------|-------|------------|------------|---------|
| 1889.60 | 75.2 | 12.79 | 6 ... 13.5 | 3 <i>n</i> | $\beta$ |
| 1896.80 | 74.4 | 12.87 | 6 ... 14   | 1 <i>n</i> | A       |
| 1898.60 | 74.0 | 13.18 | ... 14     | 2 <i>n</i> | $\beta$ |

Discovered with the 36-inch. The principal star has a proper motion of 0".106 in the direction of 221°.2 (AUWERS). With the position of 1889, and this proper motion, the distance of the small star, if fixed in space, should be 13".6 in the position-angle of 73° at the date of the last measure in 1898.

( $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Aitken (3465)...]

$\beta$  500. Lalande 1539

R.A.  $0^h 48^m 53^s$  }  
Decl.  $+ 30^\circ 1'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1878.36 | 289.0 | 1.04 | 8.1... 8.1 | 2 <i>n</i> | $\beta$ |
| 1889.94 | 290.3 | 0.56 | ...        | 6 <i>n</i> | Sp      |
| 1893.34 | 112.2 | 0.78 | 8.2... 8.3 | 2 <i>n</i> | W       |
| 1896.72 | 289.8 | 0.62 | 8 ... 8    | 2 <i>n</i> | Lv      |

Discovered with the 18½-inch. Change is doubtful.

[ $\beta$  (x)... $\beta^1$ ...Sp (III)...Lv (*A. J.* 407)...Wilson ( )...]

**$\beta$  233.** O. Arg. S. 505

|         |       |                         |            |       |          |  |
|---------|-------|-------------------------|------------|-------|----------|--|
|         |       | R.A. $0^h 49^m 9^s$ }   |            |       |          |  |
|         |       | Decl. $- 18^\circ 6'$ } |            |       |          |  |
|         |       | "                       |            |       |          |  |
| 1876.77 | 268.6 | 1.42                    | 8.6... 9.4 | 4 $n$ | $\Delta$ |  |
| 1877.80 | 87.3  | 1.30                    | 8.0... 9.2 | 2 $n$ | Cin      |  |
| 1891.77 | 92.0  | 1.36                    | ... 9      | 2 $n$ | Col      |  |
| 1891.96 | 90.5  | 1.14                    | 8.0... 9.0 | 1 $n$ | $\beta$  |  |
| 1895.91 | 96.3  | ...                     | ...        | 3 $n$ | Dob      |  |
| 1897.75 | 90.0  | 1.46                    | ...        | 1 $n$ | See      |  |

Discovered with the 6-inch. Evidently without change.

[ $\beta$  (v)... $\beta$  (*Mon. Not. xxxv*, 31)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Cin<sup>4</sup>...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Doberck (3378)...See (3495)...]

 **$\beta$  1028.**  $\gamma$  Cassiopeiae

|         |       |                         |          |       |         |  |
|---------|-------|-------------------------|----------|-------|---------|--|
|         |       | R.A. $0^h 49^m 28^s$ }  |          |       |         |  |
|         |       | Decl. $+ 60^\circ 4'$ } |          |       |         |  |
|         |       | "                       |          |       |         |  |
|         |       | A and B                 |          |       |         |  |
| 1888.69 | 255.9 | 2.18                    | ... 11.0 | 6 $n$ | $\beta$ |  |
| 1889.53 | 255.4 | 2.15                    | ... 11.6 | 4 $n$ | $\beta$ |  |
| 1894.78 | 353.7 | 2.22                    | ...      | 3 $n$ | Bar     |  |
| 1896.86 | 248.6 | 1.97                    | ...      | 3 $n$ | A       |  |
| 1897.83 | 255.2 | 2.10                    | ...      | 2 $n$ | Hu      |  |
| 1898.57 | 256.5 | 2.02                    | ... 11.5 | 2 $n$ | $\beta$ |  |

A and C (=  $\beta$  499)

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1879.68 | 348.2 | 52.15 | ... 13.0 | 4 $n$ | $\beta$ |
| 1888.68 | 348.6 | 52.44 | ... 13.5 | 2 $n$ | $\beta$ |
| 1896.89 | 348.4 | 52.71 | ...      | 2 $n$ | A       |
| 1898.50 | 347.7 | 52.69 | ...      | 3 $n$ | $\beta$ |

The distant star was detected with the 18½-inch, and in measuring it with the 36-inch the close star was discovered. It should have been seen with the smaller telescope, as it was measurable with the 12-inch at L. O.

AUWERS gives for the proper motion of the large star  $0''.027$  in the direction of  $134^\circ.3$ . If the companion does not share in this motion, the angle at the date of the last measures in 1898 should be  $261^\circ.5$  and the distance  $2''.33$ . As the measures appear to show no relative change, it is very probable that B is moving with the principal star, and that they constitute a physical system. The distance of C is increasing as it should from

the movement of A. The computed place of C from the measures of 1879 and the proper motion of A is,  $347^\circ.9 : 52''.65$  for 1898.5, which is practically identical with the measures of that date.

[ $\beta$  (x, XIV)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2875,2956)... $\beta$  (*Pub. L. O.* II)... Hussey (*A. J.* 427)...Aitken (3465)...Barnard (*A. J.* 447)...]

 **$\beta$  1099.** B.A.C. 255

|         |       |                          |            |       |         |  |
|---------|-------|--------------------------|------------|-------|---------|--|
|         |       | R.A. $0^h 49^m 34^s$ }   |            |       |         |  |
|         |       | Decl. $+ 59^\circ 43'$ } |            |       |         |  |
|         |       | "                        |            |       |         |  |
| 1889.57 | 270.2 | 0.15                     | 6.1... 6.8 | 3 $n$ | $\beta$ |  |
| 1891.64 | 282.2 | 0.12                     | 6.2... 6.2 | 3 $n$ | $\beta$ |  |
| 1894.72 | 289.5 | 0.09                     | ...        | 3 $n$ | Bar     |  |
| 1898.57 | 307.3 | 0.26                     | ...        | 2 $n$ | $\beta$ |  |
| 1899.46 | 312.6 | 0.20                     | 6.0... 6.5 | 1 $n$ | A       |  |

This close and difficult pair was discovered with the 36-inch. It is a naked-eye star, 21' s of  $\gamma$  Cassiopeiae. Rapid angular motion is clearly shown by the measures, and it may belong to the class of short period binaries. It is important that careful measures with large apertures should be made each year.

[ $\beta$  (xvi)... $\beta$  (2956,3114)... $\beta$  (*Pub. L. O.* II)...Barnard (*A. J.* 447)...Aitken ( )...]

 **$\beta$  302.** P.O. 245

|         |       |                          |            |       |            |  |
|---------|-------|--------------------------|------------|-------|------------|--|
|         |       | R.A. $0^h 51^m 55^s$ }   |            |       |            |  |
|         |       | Decl. $+ 20^\circ 45'$ } |            |       |            |  |
|         |       | "                        |            |       |            |  |
| 1876.27 | 92.5  | 0.75                     | 6.7... 8.1 | 4 $n$ | $\Delta$   |  |
| 1876.76 | 84.1  | 0.90                     | 7.5... 8.5 | 1 $n$ | O $\Sigma$ |  |
| 1883.53 | 94.3  | 0.82                     | 6.8... 7.9 | 5 $n$ | En         |  |
| 1883.85 | 97.5  | 0.7                      | ...        | 1 $n$ | Per'y      |  |
| 1887.53 | 97.0  | 0.61                     | ...        | 6 $n$ | Sp         |  |
| 1888.32 | 99.9  | 0.89                     | ...        | 7 $n$ | H $\Sigma$ |  |
| 1889.02 | 97.1  | 0.66                     | ...        | 8 $n$ | Sp         |  |
| 1898.01 | 101.0 | 0.58                     | ...        | 2 $n$ | Br         |  |

Discovered with the 6-inch. A naked-eye star in *Pisces*. The angle appears to be increasing.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (1)...Englemann (2742)...O $\Sigma$  (*Poulkova Obsns.* x)...J. M. Perry (*Eng. Mechanic* xxxix, 11)...Sp (III)...Brown ( )...H $\Sigma$  ( )...]

**β 867.** Lalande 1719

R.A. 0<sup>h</sup> 53<sup>m</sup> 56<sup>s</sup> }  
Decl. + 11° 17' }

|         |       |      |        |     |                |    |
|---------|-------|------|--------|-----|----------------|----|
| 1880.21 | 174.8 | 0.96 | 8.1... | 8.6 | 3 <sup>n</sup> | β  |
| 1889.00 | 172.2 | 0.98 | 8.0... | 9.0 | 1 <sup>n</sup> | Lv |
| 1889.93 | 174.6 | 1.00 | ...    |     | 3 <sup>n</sup> | Sp |

Discovered with the 18½-inch.

[β (xiii)...β³...Lv²...Sp (ii)...]

**β 234.** O. Arg. S. 563

R.A. 0<sup>h</sup> 54<sup>m</sup> 36<sup>s</sup> }  
Decl. - 17° 43' }

A and B

|         |       |      |        |     |                  |     |
|---------|-------|------|--------|-----|------------------|-----|
| 1875.84 | 330.8 | 4.65 | 8.2... | 8.5 | 3 <sup>n</sup>   | Δ   |
| 1876.16 | 333.5 | 4.37 | 8.2... | 8.3 | 4-1 <sup>n</sup> | Cin |
| 1877.78 | 330.5 | 4.76 | 8.2... | 8.2 | 3-2 <sup>n</sup> | Cin |
| 1884.92 | 332.5 | 4.72 | 8.5... | 8.5 | 1 <sup>n</sup>   | W   |
| 1887.97 | 332.2 | 4.70 | 8.5... | 8.5 | 2 <sup>n</sup>   | Lv  |
| 1892.89 | 332.6 | 4.41 | 8.4... | 8.6 | 2 <sup>n</sup>   | Gl  |
| 1893.82 | 332.0 | 4.60 | 8.0... | 8.2 | 1 <sup>n</sup>   | W   |
| 1898.70 | 331.8 | 4.58 | 8.2... | 8.3 | 3 <sup>n</sup>   | Cg  |
| 1898.88 | 331.4 | 4.54 | 8.0... | 8.2 | 1 <sup>n</sup>   | β   |

A and C

|         |       |       |     |     |                |    |
|---------|-------|-------|-----|-----|----------------|----|
| 1876.30 | 132.4 | 60.28 | ... | 8.6 | 2 <sup>n</sup> | Δ  |
| 1892.89 | 132.1 | 60.66 | ... | 8.7 | 2 <sup>n</sup> | Gl |
| 1893.82 | 131.9 | 59.90 | ... | 8.0 | 1 <sup>n</sup> | W  |
| 1898.70 | 132.0 | 62.34 | ... | 8.6 | 3 <sup>n</sup> | Cg |
| 1898.89 | 131.6 | 60.41 | ... | 8.0 | 2 <sup>n</sup> | β  |

Discovered with the 6-inch. C is O.Arg.S. 565. Apparently fixed.

[β (v)...β (Mon. Not. xxxv, 31)...Δ (i)...Cin³...Cin⁴...Lv¹...Wilson (Cin<sup>10</sup>)...Glasenapp (ii)...Wilson ( ) ...Cogshall ( )...]

**β 1161.** Lalande 1766

R.A. 0<sup>h</sup> 55<sup>m</sup> 53<sup>s</sup> }  
Decl. + 51° 9' }

|         |       |      |        |     |                |   |
|---------|-------|------|--------|-----|----------------|---|
| 1890.71 | 324.2 | 0.48 | 6.9... | 7.7 | 3 <sup>n</sup> | β |
| 1897.90 | 331.0 | 0.5± | ...    |     | 2 <sup>n</sup> | A |
| 1898.74 | 330.5 | 0.57 | 7.5... | 8.5 | 2 <sup>n</sup> | β |

Discovered with the 36-inch. Some change is probable.

[β (xvii)...β (3047)...β (Pub. L. O. ii)...Aitken (A. J. 429)...]

**β 396.** B.A.C. 282

R.A. 0<sup>h</sup> 56<sup>m</sup> 14<sup>s</sup> }  
Decl. + 60° 26' }

|         |      |      |        |      |                |    |
|---------|------|------|--------|------|----------------|----|
| 1877.10 | 66.4 | 1.24 | 6.1... | 9.2  | 4 <sup>n</sup> | Δ  |
| 1879.40 | 65.8 | 1.21 | 6.2... | 10.0 | 4 <sup>n</sup> | β  |
| 1881.63 | 67.5 | 1.15 | 6.7... | 10.8 | 3 <sup>n</sup> | β  |
| 1885.69 | 66.0 | 1.21 | ...    |      | 2 <sup>n</sup> | HΣ |
| 1888.72 | 66.8 | 1.25 | 6.3... | 9.3  | 4 <sup>n</sup> | β  |
| 1889.53 | 66.4 | 1.28 | 6.0... | 10.0 | 3 <sup>n</sup> | β  |

Discovered with the 6-inch. A naked-eye star near γ *Cassiopeiae*. The components have a striking difference in color; Δ gives, *white : light blue*. Thus far there is no change in angle or distance.

[β (vii)...β¹...β³...β⁴...β (2103,2875,2956)...β (Pub. L. O. ii)...Δ (i)...HΣ ( )...]

**β 735.** Lacaille 296

R.A. 0<sup>h</sup> 58<sup>m</sup> 53<sup>s</sup> }  
Decl. - 34° 10' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1877.79 | 219.1 | 8.45 | 6.5... | 10.0 | 1 <sup>n</sup> | Cin |
| 1879.68 | 218.3 | 8.64 | 7.0... | 11.5 | 2 <sup>n</sup> | β   |
| 1891.83 | 220.3 | 8.68 | 6.0... | 10.5 | 3 <sup>n</sup> | β   |
| 1896.76 | 219.4 | 8.37 | ...    |      | 2 <sup>n</sup> | See |
| 1896.87 | 220.0 | 8.43 | ...    |      | 1 <sup>n</sup> | Hu  |

Discovered with the 6-inch at Mt. Hamilton. There is no evidence of change. This star had been previously seen by the Cincinnati observers. The magnitude of A is 6.5 in GOULD.

[β (xi)...β²...β (3114)...β (Pub. L. O. i, ii)...Cin⁴...Hussey (A. J. 397)...See (3495)...]

**β 1228.** D.M. (12°) 133

R.A. 0<sup>h</sup> 59<sup>m</sup> 30<sup>s</sup> }  
Decl. + 12° 41' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1891.59 | 268.0 | 0.82 | 8.3... | 8.9 | 3 <sup>n</sup> | β   |
| 1895.88 | 268.1 | 0.51 | ...    |     | 1 <sup>n</sup> | L   |
| 1896.81 | 265.1 | 0.60 | ...    |     | 1 <sup>n</sup> | A   |
| 1897.86 | 266.8 | 0.69 | ...    |     | 1 <sup>n</sup> | L   |
| 1897.98 | 265.2 | 0.86 | ...    |     | 1 <sup>n</sup> | Bow |
| 1898.87 | 275.7 | 0.89 | ...    |     | 3 <sup>n</sup> | Bow |
| 1898.94 | 268.5 | 0.80 | 8.5... | 9.5 | 1 <sup>n</sup> | A   |

Discovered with the 18½-inch in 1884, but not given in the catalogues of that time. The

measures are all too recent to show change, unless the motion is rapid.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Lewis and Bowyer (*Mon. Not. LVI, 359; LIX, 400*) (*Greenwich Obsns. 1895*)...Aitken (3465)...Aitken ( )...]

$\beta$  501. Lalande 1958

R.A.  $1^{\text{h}} 0^{\text{m}} 40^{\text{s}}$  }  
Decl.  $-5^{\circ} 17'$  }

|         |      |      |            |            |         |
|---------|------|------|------------|------------|---------|
| 1878.49 | 29.9 | 2.55 | 8.0...11.7 | 2 <i>n</i> | $\beta$ |
| 1891.94 | 31.3 | 2.73 | 8.1...11.5 | 3 <i>n</i> | $\beta$ |
| 1898.64 | 28.4 | 2.80 | 7.2...11.8 | 3 <i>n</i> | Cg      |

Discovered with the 18½-inch. No sensible change.

[ $\beta$  (x)... $\beta^{\text{a}}$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Cogshall ( )...]

$\beta$  397. Lalande 1943

R.A.  $1^{\text{h}} 0^{\text{m}} 54^{\text{s}}$  }  
Decl.  $+46^{\circ} 12'$  }

A and B

|         |       |      |            |            |          |
|---------|-------|------|------------|------------|----------|
| 1876.64 | 142.1 | 8.75 | 7.6... 9.8 | 2 <i>n</i> | $\Delta$ |
| 1891.70 | 141.9 | 8.70 | 7.3... 9.6 | 3 <i>n</i> | $\beta$  |
| 1893.56 | 142.9 | 8.54 | 7.3... 9.8 | 3 <i>n</i> | W        |
| 1898.63 | 142.6 | 8.86 | 7.2...10.2 | 2 <i>n</i> | $\beta$  |

A and C

|         |      |       |         |            |         |
|---------|------|-------|---------|------------|---------|
| 1891.70 | 63.8 | 16.63 | ...13   | 3 <i>n</i> | $\beta$ |
| 1898.63 | 65.4 | 16.63 | ...12.5 | 2 <i>n</i> | $\beta$ |

The nearest companion was found with the 6-inch, and the other added with the 36-inch. These stars appear to be relatively fixed. The double star H 2015 has the same R.A., but  $1^{\circ}$  *n* of this pair. There is no such pair in H's place, and there is certainly an error of  $1^{\circ}$  in his declination, making it identical with this pair. The description in H is:  $146^{\circ} 2 : 10'' \pm : 8.9...12$ .

[ $\beta$  (vii)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...Wilson ( )...]

$\beta$  502. W<sup>2</sup> O. 1077

R.A.  $1^{\text{h}} 2^{\text{m}} 13^{\text{s}}$  }  
Decl.  $+15^{\circ} 9'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1878.29 | 306.6 | 3.49 | 8.1...11.5 | 2 <i>n</i> | $\beta$ |
| 1892.00 | 305.6 | 3.24 | 8.2...11.2 | 2 <i>n</i> | $\beta$ |

Discovered with the 18½-inch. Unchanged.

[ $\beta$  (x)... $\beta^{\text{a}}$ ... (3114)... $\beta$  (*Pub. L. O. II*)...]

$\beta$  868. O. Arg. N. 1156

R.A.  $1^{\text{h}} 2^{\text{m}} 54^{\text{s}}$  }  
Decl.  $+51^{\circ} 24'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1880.68 | 233.8 | 9.37 | 8.0... 9.8 | 4 <i>n</i> | $\beta$ |
| 1891.70 | 233.7 | 9.25 | 7.9... 9.3 | 2 <i>n</i> | $\beta$ |
| 1898.79 | 233.4 | 9.15 | 8.0...10.3 | 1 <i>n</i> | $\beta$ |

Discovered with the 18½-inch. Unchanged.

[ $\beta$  (xiii)... $\beta^{\text{a}}$ ... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...]

$\beta$  303. *Piscium* 201

R.A.  $1^{\text{h}} 3^{\text{m}} 10^{\text{s}}$  }  
Decl.  $+23^{\circ} 9'$  }

|         |       |      |            |            |            |
|---------|-------|------|------------|------------|------------|
| 1876.35 | 283.7 | 0.59 | 7.1... 7.3 | 6 <i>n</i> | $\Delta$   |
| 1876.76 | 281.0 | 0.69 | 7.5... 7.5 | 1 <i>n</i> | O $\Sigma$ |
| 1877.08 | 104.6 | 0.56 | 7 ... 9    | 2 <i>n</i> | H1         |
| 1883.21 | 286.3 | 0.71 | 7.2... 7.8 | 5 <i>n</i> | En         |
| 1883.59 | 283.0 | 0.8  | ...        | 1 <i>n</i> | Per'y      |
| 1885.97 | 282.0 | ...  | ...        | 1 <i>n</i> | H $\Sigma$ |
| 1887.51 | 285.0 | 0.55 | ...        | 6 <i>n</i> | Sp         |
| 1887.92 | 103.0 | 0.61 | 7 ... 9    | 4 <i>n</i> | H1         |
| 1889.00 | 285.4 | 0.57 | ...        | 8 <i>n</i> | Sp         |
| 1891.96 | 284.8 | 0.71 | 7.2... 7.2 | 2 <i>n</i> | $\beta$    |
| 1892.85 | 284.5 | 0.93 | 7.0... 7.1 | 2 <i>n</i> | Jnes       |
| 1895.91 | 285.7 | 0.62 | 7.2... 7.2 | 3 <i>n</i> | Lew        |
| 1896.86 | 284.3 | 0.70 | ...        | 1 <i>n</i> | Dy         |
| 1897.00 | 287.0 | 0.59 | ...        | 1 <i>n</i> | Sp         |
| 1897.88 | 280.1 | 0.64 | ...        | 3 <i>n</i> | Bow        |
| 1897.89 | 286.2 | 0.49 | ...        | 2 <i>n</i> | Lew        |
| 1898.89 | 281.3 | 0.50 | ...        | 1 <i>n</i> | L          |
| 1898.92 | 280.9 | 0.64 | ...        | 3 <i>n</i> | Bow        |

Discovered with the 6-inch. Naked-eye star, HEIS 6.7 m. The measures show no change in either angle or distance. Lalande 2046.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...Hall (1, II)...Engelmann (2678)...Perry (*Eng. Mechanic xxxix, II*)...O $\Sigma$  (*Poulkova Obsns. X*)...H $\Sigma$  ( )...Jones (*Proc. Haverford Coll. Obsy. 1892*)...Lewis (*Mon. Not. LVI, 359*) (*Greenwich Obsns. 1895*)...Sp (III)...Lewis, etc. (*Mon. Not. LIX, 400*)...]

**β 235.** Lalande 2042

R.A. 1<sup>h</sup> 3<sup>m</sup> 29<sup>s</sup> }  
Decl. + 50° 22' }

A and *a*

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1875.65 | 74.0 | 0.48 | 7.0... 7.4 | 6 <sup>n</sup> | Δ  |
| 1878.65 | 76.9 | 0.84 | 7.8... 7.8 | 1 <sup>n</sup> | β  |
| 1883.75 | 78.5 | 0.59 | 7.2... 7.6 | 6 <sup>n</sup> | En |
| 1888.56 | 83.7 | 0.63 | ...        | 5 <sup>n</sup> | Sp |
| 1889.53 | 86.1 | 0.79 | 7.2... 7.3 | 3 <sup>n</sup> | β  |
| 1891.68 | 86.0 | 0.71 | 7.3... 7.4 | 3 <sup>n</sup> | β  |
| 1892.88 | 84.0 | 0.87 | 7.1... 7.4 | 3 <sup>n</sup> | J  |
| 1898.72 | 91.1 | 0.83 | ...        | 3 <sup>n</sup> | Hu |
| 1897.84 | 87.6 | 0.86 | ...        | 3 <sup>n</sup> | A  |

B and *b*

|         |      |      |              |                |   |
|---------|------|------|--------------|----------------|---|
| 1878.65 | 76.6 | 8.50 | 10.2... 12.0 | 1 <sup>n</sup> | β |
| 1898.54 | 78.7 | 8.64 | ...          | 2 <sup>n</sup> | β |

C and *c* (= OΣ 24)

|         |      |      |              |                |    |
|---------|------|------|--------------|----------------|----|
| 1845.73 | 46.9 | 7.1± | ...          | 2 <sup>n</sup> | Ma |
| 1847.91 | 45.0 | 7.80 | ... 11.2     | 2 <sup>n</sup> | OΣ |
| 1868.05 | 48.9 | 7.99 | 10.2... 11.5 | 3 <sup>n</sup> | Δ  |
| 1878.65 | 47.2 | 8.13 | 9.0... 11.0  | 1 <sup>n</sup> | β  |
| 1892.99 | 47.9 | 6.34 | 9.3... 10.4  | 1 <sup>n</sup> | J  |
| 1898.54 | 47.6 | 8.03 | ...          | 2 <sup>n</sup> | β  |

A and B

|         |       |       |             |                |      |
|---------|-------|-------|-------------|----------------|------|
| 1868.75 | 287.9 | 43.79 | 7.0... 10.5 | 2 <sup>n</sup> | Δ    |
| 1884.08 | 286.9 | 43.20 | 7.6... 9.8  | 5 <sup>n</sup> | Fr'z |
| 1898.54 | 286.1 | 43.43 | ...         | 2 <sup>n</sup> | β    |

A and C (= OΣ (app.) 12)

|         |      |       |            |                |      |
|---------|------|-------|------------|----------------|------|
| 1847.91 | 66.3 | 60.65 | 7.0... 8.9 | 2 <sup>n</sup> | OΣ   |
| 1868.05 | 66.9 | 60.86 | 7.0...     | 3 <sup>n</sup> | Δ    |
| 1883.48 | 66.7 | 60.06 | 7.3... 9.4 | 6 <sup>n</sup> | Fr'z |
| 1886.06 | 67.1 | 60.45 | 7.0... 8.8 | 3 <sup>n</sup> | Eng  |
| 1898.54 | 67.2 | 60.01 | ...        | 2 <sup>n</sup> | β    |

The close pair, and the minute companion to B, were discovered with the 6-inch. There appears to be a slow advance in the angle of A*a*, with little or no change in the distant stars.

[β (v)...β (Mon. Not. xxxv, 31)...β'...β (2956,3114)...β (Pub. L. O. II)...Δ (1, pp. 133, 315)...Δ (2086)...OΣ (Poulkova Obsns. IX)...Madler (Dorpat Obsns. XIII)...Engelmann (2678)...Franz (2649)...Engelhardt (2785) (Obsns. Ast. II)...Jones (Proc. Haverford Coll. Obsy. 1892)...Aitken (A. J. 429)...Sp (II)...Hussey ( )...]

**β 2.** W<sup>2</sup> I. 16

R.A. 1<sup>h</sup> 3<sup>m</sup> 46<sup>s</sup> }  
Decl. + 29° 14' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1875.71 | 155.7 | 2.07 | 9.3... 10.5 | 3 <sup>n</sup> | Δ |
| 1891.97 | 155.9 | 2.25 | 8.7... 9.0  | 1 <sup>n</sup> | β |

Discovered with the 6-inch.

[β (1)...β (Mon. Not. xxxiii, 351)...β (3114)...β (Pub. L. O. II)...Δ (1)...]

**β 1162.** D.M. (35°) 215

R.A. 1<sup>h</sup> 3<sup>m</sup> 52<sup>s</sup> }  
Decl. + 35° 18' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1890.68 | 140.3 | 0.34 | 9.2... 9.4 | 3 <sup>n</sup> | β |
|---------|-------|------|------------|----------------|---|

A difficult pair; discovered with the 36-inch. It is about 25' *nf* β *Andromedae*.

[β (xvii)...β (3047)...β (Pub. L. O. II)...]

**β 398.** O. Arg. N. 1200

R.A. 1<sup>h</sup> 4<sup>m</sup> 52<sup>s</sup> }  
Decl. + 47° 10' }

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1877.02 | 50.5 | 1.85 | 9.0... 9.1 | 3 <sup>n</sup> | Δ] |
| 1883.70 | 56.6 | 1.90 | 8.5... 8.8 | 6 <sup>n</sup> | En |
| 1891.51 | 50.3 | 1.84 | 8.9... 9.0 | 2 <sup>n</sup> | β  |
| 1893.06 | 52.5 | 1.73 | 9.2... 9.2 | 1 <sup>n</sup> | J  |

Discovered with the 6-inch. Without change.

[β (vii)...β (2103,3114)...β (Pub. L. O. II)...Δ (1)...Engelmann (2678)...Jones (A. J. 312)...]

**β 236.** D.M. (46°) 285

R.A. 1<sup>h</sup> 5<sup>m</sup> 6<sup>s</sup> }  
Decl. + 46° 21' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.81 | 114.3 | 5.19 | 8.3... 8.8 | 4 <sup>n</sup> | Δ  |
| 1882.10 | 114.0 | 5.91 | ...        | 1 <sup>n</sup> | Pt |
| 1885.12 | 114.8 | 5.65 | 8.5... 8.9 | 7 <sup>n</sup> | En |
| 1893.01 | 113.7 | 5.36 | 8.6... 8.8 | 3 <sup>n</sup> | W  |

Discovered with the 6-inch. Apparently fixed.

[β (v)...β (Mon. Not. xxxv, 31)...Δ (1)...Engelmann (2742)...Pritchett (Pub. Morrison Obsy. 1)...Wilson ( )...]

**β 258.** Lalande 2110

R.A. 1<sup>h</sup> 5<sup>m</sup> 33<sup>s</sup> }  
Decl. + 61° 4' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1875.20 | 260.4 | 0.79 | 6.2... 9.0  | 4 <sup>n</sup> | Δ  |
| 1881.63 | 264.4 | 0.89 | 7.2... 10.2 | 3 <sup>n</sup> | β  |
| 1885.69 | 262.1 | 0.89 | ...         | 2 <sup>n</sup> | HΣ |
| 1888.97 | 262.3 | 0.78 | ...         | 3 <sup>n</sup> | Sp |
| 1889.57 | 268.2 | 0.99 | 6.3... 9.7  | 3 <sup>n</sup> | β  |
| 1897.84 | 256.7 | 1.01 | ...         | 3 <sup>n</sup> | A  |

Discovered with the 6-inch. Change is uncertain. AITKEN speaks of a 12m star, 204° : 41".

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>4</sup>...β (2957)...β (*Pub. L. O.* II)...Δ (2086)...Δ (I)...HΣ ( )...Sp (III)...Aitken (*A. J.* 429)...]

**β 1100.** Lalande 2155

R.A. 1<sup>h</sup> 7<sup>m</sup> 9<sup>s</sup> }  
Decl. + 60° 18' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1889.54 | 43.6 | 0.48 | 7.4... 7.4 | 3 <sup>n</sup> | β |
| 1897.94 | 33.7 | 0.75 | ...        | 3 <sup>n</sup> | A |
| 1898.73 | 35.7 | 0.49 | 7.5... 7.7 | 1 <sup>n</sup> | β |

Discovered with the 36-inch. The measures indicate some motion.

[β (xvi)...β (2956)...β (*Pub. L. O.* II)...Aitken (*A. J.* 429)...]

**β 1029.** ζ *Piscium*

R.A. 1<sup>h</sup> 7<sup>m</sup> 27<sup>s</sup> }  
Decl. + 6° 56' }

## B and C

|         |       |      |          |                |    |
|---------|-------|------|----------|----------------|----|
| 1888.71 | 248.7 | 0.93 | ... 11   | 5 <sup>n</sup> | β  |
| 1888.99 | 248.0 | 0.7± | ...      | 3 <sup>n</sup> | Sp |
| 1890.92 | 248.8 | 0.85 | ... 13.5 | 3 <sup>n</sup> | β  |
| 1895.90 | 240.1 | ...  | ...      | 1 <sup>n</sup> | Dy |
| 1896.74 | 241.5 | 0.97 | ...      | 3 <sup>n</sup> | A  |
| 1898.73 | 241.7 | 0.88 | ...      | 1 <sup>n</sup> | β  |

## A and B (= Σ 100)

|         |      |       |            |                |   |
|---------|------|-------|------------|----------------|---|
| 1832.83 | 63.7 | 23.46 | 4.2... 5.3 | 5 <sup>n</sup> | Σ |
| 1866.04 | 63.8 | 23.77 | 4.2... 5.8 | 3 <sup>n</sup> | Δ |
| 1888.71 | 63.5 | 23.72 | ...        | 5 <sup>n</sup> | β |
| 1890.92 | 63.5 | 23.70 | ...        | 2 <sup>n</sup> | β |
| 1898.76 | 63.5 | 23.67 | ...        | 4 <sup>n</sup> | β |

The close pair was discovered with the 36-inch. AUWERS gives the proper motion of A as 0".123 in the direction of 114°.6, and this is obviously the movement of B, as these stars have remained relatively fixed since the first measures were made. The measures of C cover a sufficient time to show that the small star belongs to the system. The position of this star for 1898.7 with reference to B, if fixed, should be 268°.3 : 1".99 from the proper motion of the large star. It is evident from the measures that no such change has taken place, and that there is probably slow orbital motion. These three stars undoubtedly constitute a vast physical system. It would appear from the measures of the last seventy years that the proper motion of B is identical with that assigned to A from the meridian observations. From the position of B given by Σ in 1832, assuming that star to be fixed in space, its relation to A in its position in 1898.8 would be 44°.7 : 19".40.

[β (xiv)...β (2875, 3048)...β (*Pub. L. O.* II)...Sp (III)...Dyson (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Aitken (3395)...]

The measures of the wide pair (= Σ 100 = H<sup>1</sup> 1v.8 = Sh 16) are very numerous, and cover, first and last, more than a century. The early distances, however, are inaccurate and inconsistent, and the reliable results commence with the measures of Σ. A few only of the measures are given above, but sufficient to show the relative fixity of these stars. All the measures will be found in the following :

Madler (*Dorpat Obsns.* ix, x, XIII, xv) (*Fixstern Sys.* 1)... Herschel (*Mem. R. A. S.* XXXVIII)... Dawes (*Mem. R. A. S.* VIII, XIX) (*Ast. Obsns. at Bishop's Obsy.*)... Madler (324)... Kaiser (409)... Peters (1042)... Auwers (1393)... Bessel (*Beob. 38 Doppelsternen*)... Kaiser (*Annalen der Sternwarte* III, Leiden, 1872)... Fletcher (*Mem. R. A. S.* xxii)... Wichman (*Ergänzung-Heft, Astron. Nach.* 1849)... Secchi (*Catalogo di 1321 Stelle Doppie*)... Luther (*Königsberg Obsns.* I, II, III)... *Obsns. at Barclay's Obsy.* 1)... Engelmann (*Mess. von Neunzig Doppelsternen*, 1865)... Gledhill (*Mem. R. A. S.* XLII)... Wilson and Seabroke (*Mem. R. A. S.* XLII, XLVIII)... *Annals Harvard Obsy.* XIII... OΣ (*Poulkowa Obsns.* ix)... Duner (*Mesures Microm.* Lund., 1876)... Perrotin (*Annals Obsy. de Nice* II)... Engelhardt (*Obsns. Astron.* II)... Giacomelli (*Accad. dei Lincei*, 1890, vi)... Jedrzejewicz (2324)... Sp (II)... Δ (I, II)... Franz (2590)... Glasenapp (II, III)... Cohn (3240)... Hagen (3258)... Chofardet (3450)... Coleman (*Mem. R. A. S.* LIII)... Solá (3563)...]

**β 3.** D.M. (55°) 277

R.A. 1<sup>h</sup> 9<sup>m</sup> 39<sup>s</sup> }  
Decl. + 55° 52' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1875.48 | 28.0 | 4.37 | 7.8...10.2 | 4 <sup>n</sup> | Δ |
| 1888.68 | 29.4 | 4.18 | 7.7...10.3 | 2 <sup>n</sup> | T |
| 1893.01 | 28.5 | 4.58 | 7.7...10.3 | 3 <sup>n</sup> | W |

Discovered with the 6-inch. Without motion.

[β (1)...β (Mon. Not. xxxiii, 351)...Δ (1)...Tarrant (2991)  
Wilson ( )...]

**β 503.** Lalande 2307

R.A. 1<sup>h</sup> 10<sup>m</sup> 54<sup>s</sup> }  
Decl. + 9° 58' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.38 | 136.7 | 5.44 | 8.0...12.0 | 3 <sup>n</sup> | β  |
| 1885.93 | 136.8 | 5.83 | ...        | 1 <sup>n</sup> | HΣ |
| 1898.65 | 134.6 | 5.77 | 8.0...11.5 | 2 <sup>n</sup> | β  |

Discovered with the 18½-inch. Apparently fixed.

[β (x)...β¹...HΣ ( )...]

**β 504.** Lalande 2318

R.A. 1<sup>h</sup> 11<sup>m</sup> 9<sup>s</sup> }  
Decl. + 1° 12' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.35 | 277.3 | 1.40 | 7.7...11.7 | 3 <sup>n</sup> | β  |
| 1897.93 | 279.3 | 1.87 | ...        | 3 <sup>n</sup> | Br |

Discovered with the 18½-inch.

[β (x)...β¹...β³...Brown ( )...]

**β 782.** Lalande 2357

R.A. 1<sup>h</sup> 13<sup>m</sup> 20<sup>s</sup> }  
Decl. + 55° 35' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1881.57 | 79.2 | 2.95 | 8.0... 9.6 | 3 <sup>n</sup> | β   |
| 1885.70 | 77.5 | 2.96 | ...        | 2 <sup>n</sup> | HΣ  |
| 1886.86 | 76.2 | 2.82 | ...        | 2 <sup>n</sup> | UL  |
| 1888.41 | 76.7 | 3.16 | 8.0... 9.4 | 3 <sup>n</sup> | Com |
| 1893.20 | 80.9 | 2.96 | 8.1... 9.6 | 4 <sup>n</sup> | W   |

Discovered with the 15½-inch at the Washburn Observatory. Apparently without change.

[β (xii)...β⁴...Updegraff, Lamb and Comstock (*Pub. Washburn Obsv.* v, vi)...Wilson ( )...HΣ ( )...]

**β 1229.** Cord. G.C. 1244

R.A. 1<sup>h</sup> 13<sup>m</sup> 46<sup>s</sup> }  
Decl. - 35° 7' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1891.84 | 292.4 | 1.04 | 8.1... 8.4 | 3 <sup>n</sup> | β   |
| 1893.91 | 292.9 | 1.02 | 8.5... 8.5 | 2 <sup>n</sup> | Sel |
| 1896.82 | 291.3 | 0.96 | ...        | 2 <sup>n</sup> | See |
| 1896.84 | 291.6 | 1.12 | ...        | 1 <sup>n</sup> | Cg  |
| 1897.96 | 292.6 | 1.14 | ...        | 3 <sup>n</sup> | A   |

Discovered with the 12-inch. So far there has been no change.

[β (xviii)...β (3113)...β (*Pub. L. O.* II)...Sellors (3240)...  
See and Cogshall (3495)...Aitken (*A. J.* 429)...]

**β 4.** *Piscium* 255

R.A. 1<sup>h</sup> 14<sup>m</sup> 59<sup>s</sup> }  
Decl. + 10° 55' }

|         |       |        |            |                |                   |
|---------|-------|--------|------------|----------------|-------------------|
| 1872.81 | 100±  | 0.5±   | 8 ... 8.5  |                | β                 |
| 1876.76 |       | Single | 7          |                | 1 <sup>n</sup> OΣ |
| 1877.17 | 81.0  | 0.37   | 7.0... 7.5 | 1 <sup>n</sup> | β                 |
| 1879.66 | 119.1 | 0.5±   | 7.0... 7.0 | 1 <sup>n</sup> | Cin               |
| 1880.84 | 75.9  | 0.58   | 7.5... 8.5 | 3 <sup>n</sup> | β                 |
| 1886.73 | 73.6  | 0.48   | 6.6... 8.3 | 3 <sup>n</sup> | LM                |
| 1888.84 | 59.0  | 0.43   | 7.1... 7.1 | 3 <sup>n</sup> | Lv                |
| 1889.93 | 69.1  | 0.4±   | ...        | 5 <sup>n</sup> | Sp                |
| 1890.88 | 69.2  | 0.40   | 7.8... 8.8 | 4 <sup>n</sup> | β                 |
| 1898.73 | 67.4  | 0.36   | 7.0... 7.5 | 2 <sup>n</sup> | β                 |

AB and C

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1898.76 | 248.9 | 22.28 | ...13.5 | 1 <sup>n</sup> | β |
|---------|-------|-------|---------|----------------|---|

Discovered with the 6-inch. Slow retrograde motion is probable, with no sensible change in distance. In 1875 Δ could only see a doubtful elongation in 68°. This star is LALANDE 2435. The faint star first noted with the 36-inch.

[β (1)...β (Mon. Not. xxxiii, 351)...β¹...β³...β (3048)...β  
(*Pub. L. O.* II)...Cin⁶...OΣ (*Poulkowa Obsns.* x)...LM  
...Lv¹...Lv (*Sid. Mess.* VIII, 77)...]

**β 1101.** *ψ Cassiopeiae*

R.A. 1<sup>h</sup> 17<sup>m</sup> 27<sup>s</sup> }  
Decl. + 67° 30' }

A and B

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1889.52 | 41.2 | 3.19 | 4.5...13.5 | 4 <sup>n</sup> | β |
| 1891.52 | 44.9 | 2.93 | ...12.5    | 4 <sup>n</sup> | β |
| 1898.68 | 41.8 | 2.93 | ...13.0    | 3 <sup>n</sup> | β |

A and C (=  $\Sigma$  117 = H<sup>2</sup> V. 83)

|         | $\circ$ | "     |            |                |          |
|---------|---------|-------|------------|----------------|----------|
| 1783.62 | 100.2   | 33.42 | ...        | 1 <sup>n</sup> | H'       |
| 1831.04 | 101.8   | 32.22 | 4.4... 8.9 | 5 <sup>n</sup> | $\Sigma$ |
| 1866.38 | 105.1   | 29.56 | 5.1...     | 4 <sup>n</sup> | $\Delta$ |
| 1881.66 | 106.8   | 28.67 | ...        | 4 <sup>n</sup> | $\beta$  |
| 1889.52 | 107.4   | 28.01 | ...        | 4 <sup>n</sup> | $\beta$  |
| 1898.68 | 108.8   | 27.44 | ...        | 3 <sup>n</sup> | $\beta$  |

C and D (=  $\Sigma$  117)

|         | $\circ$ | "    |             |                |          |
|---------|---------|------|-------------|----------------|----------|
| 1831.04 | 253.3   | 3.01 | 8.9... 9.5  | 4 <sup>n</sup> | $\Sigma$ |
| 1867.28 | 254.8   | 2.79 | 9.7... 10.6 | 4 <sup>n</sup> | $\Delta$ |
| 1881.66 | 256.0   | 3.08 | 9.9... 10.2 | 4 <sup>n</sup> | $\beta$  |
| 1889.52 | 254.7   | 2.86 | 9.6... 9.8  | 4 <sup>n</sup> | $\beta$  |
| 1898.65 | 255.4   | 2.90 | ...         | 3 <sup>n</sup> | $\beta$  |

The close companion to the principal star of this well-known triple was discovered with the 36-inch. AUWERS gives the proper motion of the large star as 0".067 in the direction of 70°8, and this corresponds very nearly to the change in C, as shown by the measures. The distant stars, C and D, seem to be relatively fixed. A and B are moving together, and make a physical system.

[ $\beta$  (xvi)... $\beta$  (2956,3114)... $\beta$  (*Pub. L. O. II*)... $\beta^4$ ... $\beta$  (*Ast. and Astro-Physics XIII, 16*)...]

A and C make the double H<sup>2</sup> V. 83 (= Sh 18). D was discovered by  $\Sigma$ , the three stars making  $\Sigma$  117. These evidently form a perspective group. Only a few of the measures of the old components are given above. These and other observations can be found as follows:

Madler (*Fixstern-Systeme* 1, 43, 82) (*Dorpat Obsns.* XI, XIII, XV)...Herschel (*Mem. R. A. S.* IV)...*Greenwich Obsns.*, 1840...*Radcliffe Obsns.* XXII...Dawes (*Mem. R. A. S.* XXXV) (*Obsns. at Bishop's Obsy.*)...Secchi (*Catalogo di 1321 Stelle Doppie*)...Mitchell (Cin<sup>2</sup>)...Ferrari (*Misure Microm. Coll. Romano*, 1872-4)...Wilson and Seabroke (*Mem. R. A. S.* XLII, XLVI)...Ball (*Dunsink Obsns.* V)...Doberck (2196) (*Trans. R. I. Acad.* XXIX, Part 13)... $\Delta$  (1572)... $\Delta$  (11)...Tarrant (2898)...Flammarion (*Étoiles Doubles et Multiples*)...Hall (11)...Engelmann (2663)...Coleman (*Mem. R. A. S.* LIII)...]

 $\beta$  505.  $\theta$  Ceti

R.A. 1<sup>h</sup> 18<sup>m</sup> 1<sup>s</sup> }  
Decl. — 8° 48' }

|         | $\circ$ | "     |          |                |         |
|---------|---------|-------|----------|----------------|---------|
| 1877.70 | 60.5    | 58.8  | 3 ... 14 | 1 <sup>n</sup> | $\beta$ |
| 1891.94 | 59.7    | 60.12 | ... 13.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.69 | 59.5    | 60.64 | ... 13.7 | 2 <sup>n</sup> | $\beta$ |

A minute companion noted with the 18½-inch. The proper motion of the principal star is given by AUWERS as 0".233 in the direction of 206°0. With this proper motion and the position of the small star from the measures of 1898, its place at the date of the observation in 1877 should have been 62° : 56".6. That was only a single measure, and the companion noted as "excessively faint." The small star is certainly fixed in space.

[ $\beta$  (x)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

 $\beta$  1163. Ceti 199

R.A. 1<sup>h</sup> 18<sup>m</sup> 18<sup>s</sup> }  
Decl. — 7° 32' }

|         | $\circ$ | "    |            |                |         |
|---------|---------|------|------------|----------------|---------|
| 1890.68 | 192.3   | 0.19 | 6.0... 6.2 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 36-inch. In GOULD 5. W<sup>1</sup> I. 271.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...]

 $\beta$  1102. O. Arg. N. 1510

R.A. 1<sup>h</sup> 19<sup>m</sup> 39<sup>s</sup> }  
Decl. + 59° 40' }

B and C

|         | $\circ$ | "    |              |                |         |
|---------|---------|------|--------------|----------------|---------|
| 1889.58 | 336.3   | 0.84 | 10.3... 10.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.61 | 336.1   | 0.85 | 9.5... 9.5   | 1 <sup>n</sup> | $\beta$ |

A and BC

|         | $\circ$ | "     |        |                |         |
|---------|---------|-------|--------|----------------|---------|
| 1889.58 | 265.4   | 60.29 | 8.5... | 3 <sup>n</sup> | $\beta$ |
| 1898.54 | 265.0   | 60.67 | 8.0... | 2 <sup>n</sup> | $\beta$ |

Discovered with the 36-inch. The measures show no change. The principal star is Radcliffe 430. It is 1<sup>m</sup> 41<sup>s</sup>  $f\delta$  Cassiopeiae, and 2' 58"  $n$ .

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...]

 $\beta$  999.  $\omega$  Andromedae

R.A. 1<sup>h</sup> 20<sup>m</sup> 29<sup>s</sup> }  
Decl. + 44° 47' }

A and B

|         | $\circ$ | "    |             |                |         |
|---------|---------|------|-------------|----------------|---------|
| 1881.84 | 91.9    | 2.29 | ... 12      | 4 <sup>n</sup> | $\beta$ |
| 1888.70 | 95.4    | 2.64 | ... 11.8    | 3 <sup>n</sup> | $\beta$ |
| 1892.01 | 100.2   | 2.28 | 5.3... 11.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.38 | 96.7    | 2.71 | ...         | 3 <sup>n</sup> | $\beta$ |

A and C

|         |       |        |     |    |   |
|---------|-------|--------|-----|----|---|
| 1881.84 | 110.3 | 134.26 | ... | 2n | β |
| 1888.75 | 110.3 | 132.49 | ... | 3n | β |
| 1891.97 | 110.3 | 130.93 | ... | 1n | β |
| 1897.82 | 110.4 | 128.84 | ... | 2n | β |

C and D (= β 82)

|         |       |      |              |    |   |
|---------|-------|------|--------------|----|---|
| 1881.84 | 140.1 | 5.04 | 10.7...10.7  | 3n | β |
| 1888.75 | 137.9 | 4.96 | 10.2...10.2  | 3n | β |
| 1892.03 | 139.0 | 4.53 | 10.5...10.5  | 2n | β |
| 1897.82 | 138.3 | 5.07 | ...          | 2n | β |
| 1898.87 | 136.8 | 5.32 | 10.5... 10.5 | 1n | L |

The distant double companion was noted with the 6-inch in 1872, and the close companion to the bright star with the 12-inch at Mt. Hamilton in 1881. The principal star has a considerable proper motion:

|         |   |   |   |       |    |       |
|---------|---|---|---|-------|----|-------|
| Bonn    | - | - | - | 0.347 | in | 107.1 |
| Bossert | - | - | - | 0.355 | in | 106.3 |

The measures of 1881 and 1897 give an annual movement of 0".339 in the direction of 110°.3. It is obvious from the observations of AB that the small star is moving in space with the other, and that they form a physical system, with probably slow direct angular motion. The distant stars, CD, are apparently unchanged relatively.

[β (II, XIII)...β (Mon. Not. XXXIII, 437)...β<sup>3</sup>...β (2875,3114)...β (A. & A.-P. XIII, 15)...β (Pub. L. O. II)...Lewis (Mon. Not. LIX, 400)...]

β 1164. 95 Piscium

R.A. 1<sup>h</sup> 21<sup>m</sup> 26<sup>s</sup> }  
Decl. + 4° 44' }

|         |       |       |            |    |    |
|---------|-------|-------|------------|----|----|
| 1890.82 | 168.4 | 0.39  | 6.7... 7.0 | 3n | β  |
| 1892.97 | 167.4 | 0.33± | ...        | 4n | Sp |
| 1895.49 | 162.4 | 0.43  | ...        | 2n | L  |
| 1896.53 | 171.0 | 0.32± | ...        | 2n | Sp |
| 1898.73 | 163.0 | 0.36  | 6.5... 7.0 | 1n | β  |
| 1898.94 | 160.2 | 0.40  | 7.0... 7.5 | 1n | A  |

Discovered with the 36-inch. In B.A.C, 7 m; in D.M., 8.0; and Boss, 7.3. The principal star has some proper motion:

|        |   |   |   |       |    |       |
|--------|---|---|---|-------|----|-------|
| Boss   | - | - | - | 0.162 | in | 193.2 |
| Porter | - | - | - | 0.155 | in | 202.7 |

These stars certainly make a binary system, as they are evidently moving in space together. So far there is but little relative change. Assuming as correct the relation shown in the first set of measures, the distance should be 0".94 and the angle 36° in 1898 if the proper motion belonged to only one star.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Lewis (Mon. Not. LVI, 359) (Greenwich Obsns. 1895)...Sp (III)...Aitken (...)]

β 399. Ceti 211

R.A. 1<sup>h</sup> 21<sup>m</sup> 48<sup>s</sup> }  
Decl. - 11° 31' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1876.90 | 302.3 | 1.56 | 6.3...10.0 | 3n | Δ  |
| 1886.61 | 301.6 | 1.66 | 5.8... 8.4 | 4n | LM |
| 1893.81 | 307.0 | 1.78 | 6.2... 9.5 | 2n | W  |
| 1898.65 | 301.7 | 1.66 | 6.4... 9.2 | 3n | Bd |
| 1898.72 | 305.4 | 1.84 | 6.0... 9.0 | 2n | β  |

Discovered with the 6-inch. A naked-eye star; The change, if any, is slight. HE1s, 6-7 m. L 2675.

[β (vii)...β (2103)...Δ (i)...LM...Wilson (...)...Boothroyd (...)]

β 1230. Lacaille 427

R.A. 1<sup>h</sup> 24<sup>m</sup> 43<sup>s</sup> }  
Decl. - 26° 50' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1891.84 | 224.5 | 2.62 | 7.0...12.5 | 4n | β  |
| 1898.69 | 225.9 | 2.90 | 6.7...12.2 | 3n | Cg |
| 1898.80 | 221.0 | 2.91 | 6.2...11.5 | 2n | β  |

Discovered with the 12-inch. In GOULD 6.2 m.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Cogshall (...)]

β 1165. W<sup>2</sup> I. 510

R.A. 1<sup>h</sup> 25<sup>m</sup> 4<sup>s</sup> }  
Decl. + 40° 27' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1890.83 | 62.4 | 1.82 | 8.4...12.1 | 4n | β |
| 1898.71 | 66.5 | 1.86 | 8.0...10.5 | 1n | β |

Discovered with the 12-inch.

[β (xvii)...β (3047)...β (Pub. L. O. II)...]

**β 506. η Piscium**

R.A. 1<sup>h</sup> 25<sup>m</sup> 4<sup>s</sup> }  
Decl. + 14° 44' }

|         |      |      |   |      |                |   |
|---------|------|------|---|------|----------------|---|
| 1878.73 | 12.9 | 1.02 | 4 | 11.0 | 4 <sup>n</sup> | β |
| 1880.12 | 14.2 | 1.16 |   | 10.7 | 3 <sup>n</sup> | β |
| 1888.73 | 16.5 | 1.10 |   | 10.0 | 3 <sup>n</sup> | β |
| 1890.78 | 14.8 | 0.99 |   | 11.0 | 3 <sup>n</sup> | β |
| 1895.88 | 25.0 | 0.63 |   | 10.5 | 1 <sup>n</sup> | L |
| 1897.88 | 14.1 | 1.16 |   |      | 1 <sup>n</sup> | L |

Discovered with the 18½-inch. Down to this time there is no evidence of relative motion. The proper motion of the principal star is very small. The value, according to AUWERS, is 0".0035 in the direction of 124°.6. The time covered by the measures is too short to show whether or not this movement belongs to the small star. It will probably turn out to be a physical pair.

[β (x)...β¹...β³...β (2875,3048)...β (Pub. L. O. II)...Lewis (Mon. Not. LVI, 359; LIX, 400) (Greenwich Obsns. 1895)...]

**β 507. D.M. (26°) 264**

R.A. 1<sup>h</sup> 29<sup>m</sup> 18<sup>s</sup> }  
Decl. + 26° 9' }

|         |       |      |     |      |                |     |
|---------|-------|------|-----|------|----------------|-----|
| 1879.91 | 155.9 | 2.16 | 7.8 | 10.6 | 3 <sup>n</sup> | β   |
| 1891.99 | 151.2 | 2.01 | 8.0 | 11.0 | 3 <sup>n</sup> | β   |
| 1895.87 | 156.9 | 2.16 |     |      | 1 <sup>n</sup> | L   |
| 1897.81 | 153.5 | 2.20 |     |      | 1 <sup>n</sup> | Bow |
| 1897.97 | 158.6 | 1.75 |     |      | 1 <sup>n</sup> | Bry |
| 1897.97 | 158.3 | 2.24 |     |      | 1 <sup>n</sup> | L   |
| 1897.87 | 158.9 | 1.56 |     |      | 1 <sup>n</sup> | L   |

Discovered with the 18½-inch. The magnitude in D.M. is 8.6. No change is shown by the measures.

[β (x)...β¹...β³...β (3114)...β (Pub. L. O. II)...Lewis (Mon. Not. LVI, 359) (Greenwich Obsns. 1895)...Lewis, Bowyer and Bryant (Mon. Not. LIX, 400)...]

**β 1000. O. Arg. S. 935**

R.A. 1<sup>h</sup> 20<sup>m</sup> 27<sup>s</sup> }  
Decl. — 30° 32' }

|         |       |      |     |      |                |   |
|---------|-------|------|-----|------|----------------|---|
| 1881.84 | 336.4 | 1.80 | 7.6 | 12.0 | 2 <sup>n</sup> | β |
| 1891.84 | 356.4 | 1.44 | 8.0 | 13.0 | 3 <sup>n</sup> | β |
| 1898.69 | 8.8   | 1.40 | 7.0 | 12.0 | 1 <sup>n</sup> | β |

Discovered with the 12-inch at Mt. Hamilton in 1881. The companion is in rapid motion, but the character of the movement is uncertain at this time. It is probably a binary, as the change does not at all correspond to what appears to be the proper motion of A, as shown by the measures of an 8½ m star, *nf*, O. Arg. S. 938:

A and O. Arg. S. 938

|         |      |        |                  |
|---------|------|--------|------------------|
| 1850    | 19.1 | 146.51 | O. Arg. S.       |
| 1875    | 20.9 | 142.41 | Cord. G.C.       |
| 1891.85 | 20.5 | 142.09 | 3 <sup>n</sup> β |
| 1898.69 | 20.7 | 141.61 | 2 <sup>n</sup> β |

The first two positions are derived from meridian observations. A comparison of O. Arg. S. with the mean place from the micrometrical measures, assuming that the change is due to the movement of A, gives the proper motion of that star, 0".132 in the direction of 340°.9. The smaller star may have some proper motion of its own. The measures of AB in the next few years will show whether or not the motion is rectilinear. The 40-inch shows a 14 m star, 329°.5 : 28".0.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...]

**β 869. Lalande 2935**

R.A. 1<sup>h</sup> 30<sup>m</sup> 3<sup>s</sup> }  
Decl. + 3° 42' }

|         |       |      |     |      |                |    |
|---------|-------|------|-----|------|----------------|----|
| 1880.06 | 198.2 | 5.13 | 8.0 | 11.7 | 5 <sup>n</sup> | β  |
| 1892.00 | 197.9 | 5.31 | 8.1 | 11.2 | 3 <sup>n</sup> | β  |
| 1898.78 | 196.6 | 5.25 | 8   | 12   | 3 <sup>n</sup> | Bd |

Discovered with the 18½-inch. Apparently fixed.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...Boothroyd ( )...]

**β 1166. Lalande 2980**

R.A. 1<sup>h</sup> 31<sup>m</sup> 45<sup>s</sup> }  
Decl. + 38° 3' }

A and B

|         |       |      |     |      |                |    |
|---------|-------|------|-----|------|----------------|----|
| 1890.82 | 345.8 | 2.63 | 8.4 | 11.5 | 3 <sup>n</sup> | β  |
| 1898.70 | 349.7 | 2.69 | 8.5 | 11.2 | 2 <sup>n</sup> | β  |
| 1898.71 | 346.6 | 3.02 |     |      | 2 <sup>n</sup> | Hu |

A and C

1898.70 8.9 24.82 ... 13.5 2n β

Discovered with the 12-inch.

[β (xvii)...β (3047)...β (*Pub. L. O. II*)...Hussey ( )...]

β 508. D.M. (26°) 276

R.A. 1<sup>h</sup> 32<sup>m</sup> 27<sup>s</sup> }  
Decl. + 26° 20' }

1877.72 71.1 1.02 9.0... 9.5 1n β  
1890.47 63.1 0.6± ... 6n Sp  
1898.82 64.6 0.68 ... 3n Hu

Discovered with the 18½-inch.

[β (x)...β<sup>1</sup>...Sp (III)...Hussey ( )...]

β 783. O. Arg. N. 1777

R.A. 1<sup>h</sup> 32<sup>m</sup> 39<sup>s</sup> }  
Decl. + 73° 56' }

1881.71 318.0 0.95 8.5... 8.9 4n β  
1888.82 315.5 0.96 9.0... 9.9 3n Com

Discovered with the 15½-inch.

[β (xii)...β<sup>3</sup>...Comstock (*Pub. Washburn Obsy. VI*)...]

β 5. 103 *Piscium*

R.A. 1<sup>h</sup> 32<sup>m</sup> 47<sup>s</sup> }  
Decl. + 16° 1' }

1875.52 289.4 1.34 7.0... 9.0 4n J  
1876.76 287.7 1.40 7.0... 9.5 1n OΣ  
1880.78 297.3 1.31 6.9... 9.3 3n β  
1883.85 292.5 1.4 ... 1n Per  
1887.92 294.3 1.26 7.0... 9.2 2n T  
1888.68 295.1 1.31 7.0... 9.0 2n T  
1889.01 292.8 1.15 6.9... 9.2 2n Lv  
1889.95 292.0 1.07 ... 3n Sp  
1898.00 290.7 1.38 ... 3n Br

Discovered with the 6-inch. No relative change is shown by the measures. The principal star has a proper motion of 0".040 in the direction of 228°.3 (AUWERS). If the small star was fixed, its position at the date of the last measures in 1898

would be 330°.4 : 1".20. It is therefore certain that the two stars are moving together, and that they form a physical system.

[β (i)...β<sup>3</sup>...Δ (i)...Lv<sup>1</sup>...J. J. M. Perry (*Eng. Mech.* xxxix, 11)...Tarrant (2899,2991)...OΣ (*Poulkowa Obsns.* x)...Sp (III)...Brown ( )...]

β 1167. W<sup>2</sup> I. 716

R.A. 1<sup>h</sup> 33<sup>m</sup> 16<sup>s</sup> }  
Decl. + 38° 7' }

1890.82 56.2 1.25 9.3... 10.7 3n β  
1898.73 56.2 1.32 ... 3n Hu

Discovered with the 12-inch. The magnitude in D.M. is 8.8.

[β (xvii)...β (3047)...β (*Pub. L. O. II*)...Hussey ( )...]

β 1103. 44 *Cassiopeiae*

R.A. 1<sup>h</sup> 35<sup>m</sup> 13<sup>s</sup> }  
Decl. + 59° 57' }

1889.54 3.8 1.73 6.2... 12.5 3n β  
1898.61 4.6 1.73 ... 13.0 1n β

Discovered with the 36-inch. KRUEGER gives the proper motion of the large star as 0".060 in the direction of 103°.1. If the companion was fixed in space, its position with reference to A at the date of the last measures would be 347°.3 : 1".89. The measures show clearly that the two stars are moving together.

[β (xvi)...β (2956)...β (*Pub. L. O. II*)...]

β 1104. Groombridge 370

R.A. 1<sup>h</sup> 36<sup>m</sup> 2<sup>s</sup> }  
Decl. + 52° 17' }

1889.60 197.2 2.86 7.2... 11.8 3n β  
1898.72 194.5 2.97 7.0... 11.7 2n β  
1898.73 195.2 3.04 ... 3n Hu

Discovered with the 12-inch. Apparently unchanged.

[β (xvi)...β (2956)...β (*Pub. L. O. II*)...Hussey ( )...]

**β 870.** B.A.C. 525

R.A. 1<sup>h</sup> 36<sup>m</sup> 23<sup>s</sup> }  
Decl. + 56° 56' }

|         |      |      |        |     |                |    |
|---------|------|------|--------|-----|----------------|----|
| 1880.81 | 68.9 | 1.02 | 6.9... | 8.3 | 3 <sup>n</sup> | β  |
| 1888.82 | 59.5 | 0.76 | ...    |     | 3 <sup>n</sup> | Sp |
| 1891.60 | 59.7 | 1.11 | 6.6... | 8.9 | 3 <sup>n</sup> | β  |
| 1898.61 | 54.4 | 1.20 | ...    |     | 1 <sup>n</sup> | β  |

Discovered with the 18½-inch. The measures show slow angular motion. The proper motion of this star from KRUEGER is 0.036 in the direction of 152°.9. This is sufficient to show that the components are moving together, as otherwise at the date of the last measure the position of B would be, 35° : 1.15.

[β (xii)...β<sup>3</sup>...β (3114)...β (*Pub. L. O. II*)...Sp (iii)...]

**β 453.** D.M. (56°) 338

R.A. 1<sup>h</sup> 37<sup>m</sup> 7<sup>s</sup> }  
Decl. + 56° 31' }

|         |       |      |        |     |                |   |
|---------|-------|------|--------|-----|----------------|---|
| 1880.81 | 224.1 | 0.91 | 8.8... | 9.1 | 3 <sup>n</sup> | β |
| 1891.60 | 228.5 | 0.86 | 8.4... | 8.5 | 3 <sup>n</sup> | β |

Discovered with the 6-inch. There is a pair of small stars 5' *n* of this, D.M. (56°) 337, found and measured by Δ in 1877; 332°.9 : 2.74 : 9.4...10.9 (1877.47) 4<sup>n</sup>.

[β (ix)...β (*Mon. Not. xxxviii*, 78)...Δ (i, p. 372)...β<sup>3</sup>...β (3114)...β (*Pub. L. O. II*)...]

**β 509.** Lalande 3170

R.A. 1<sup>h</sup> 37<sup>m</sup> 25<sup>s</sup> }  
Decl. + 8° 58' }

|         |       |      |        |     |                |    |
|---------|-------|------|--------|-----|----------------|----|
| 1878.42 | 93.5  | 0.71 | 8.4... | 8.7 | 3 <sup>n</sup> | β  |
| 1890.47 | 258.0 | 0.70 | ...    |     | 3 <sup>n</sup> | Sp |
| 1891.74 | 259.2 | 0.70 | 8.4... | 8.7 | 3 <sup>n</sup> | β  |
| 1895.91 | 257.5 | 0.74 | ...    |     | 1 <sup>n</sup> | L  |
| 1897.92 | 251.8 | 0.83 | ...    |     | 3 <sup>n</sup> | A  |
| 1897.94 | 251.6 | 0.80 | ...    |     | 1 <sup>n</sup> | Br |
| 1899.00 | 254.8 | 0.59 | 8.0... | 8.4 | 1 <sup>n</sup> | β  |

Discovered with the 18½-inch. Slow retrograde motion. In a low-power field with Σ 155, 28°.9 *p* and 5.6 *n*.

[β (x)...β<sup>3</sup>...β (3114)...β (*Pub. L. O. II*)...Sp (iii)...Lewis (*Mon. Not. lvi*, 359) (*Greenwich Obsns.* 1895)...Aitken (*A. J.* 429)...Brown ( )...]

**β 6.** Lalande 3205

R.A. 1<sup>h</sup> 38<sup>m</sup> 43<sup>s</sup> }  
Decl. — 7° 22' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1875.55 | 167.1 | 2.58 | 6.4... | 9.2 | 4 <sup>n</sup> | Δ   |
| 1877.80 | 166.8 | 2.70 | 7.0... | 9.0 | 2 <sup>n</sup> | Cin |
| 1886.92 | 166.1 | 2.62 | 6.8... | 8.8 | 2 <sup>n</sup> | LM  |
| 1888.65 | 167.6 | 2.65 | 6.9... | 9.6 | 3 <sup>n</sup> | Lv  |
| 1893.81 | 168.0 | 2.61 | 7.0... | 9.7 | 3 <sup>n</sup> | W   |

Discovered with the 6-inch. Without change.

[β (i)...β (*Mon. Not. xxxiii*, 351)...Δ (i)...Cin<sup>4</sup>...LM...Lv<sup>4</sup>...Wilson ( )...]

**β 784.** D.M (22°) 269

R.A. 1<sup>h</sup> 39<sup>m</sup> 34<sup>s</sup> }  
Decl. + 22° 18' }

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1881.70 | 46.7 | 1.86 | 8.9... | 9.5 | 3 <sup>n</sup> | β   |
| 1887.79 | 47.9 | 2.16 | 87...  | 9.5 | 3 <sup>n</sup> | Com |
| 1893.84 | 45.7 | 1.26 | 8.5... | 9.5 | 1 <sup>n</sup> | W   |

Discovered with the 15½-inch at the Washburn Observatory. Probably without change.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy.* vi)...Wilson ( )...]

**β 736.** D.M. (38°) 347

R.A. 1<sup>h</sup> 39<sup>m</sup> 38<sup>s</sup> }  
Decl. + 38° 20' }

A and B

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1879.94 | 209.0 | 0.86 | 8.5... | 10.3 | 3 <sup>n</sup> | β  |
| 1890.90 | 209.3 | 0.77 | 8.5... | 11.0 | 3 <sup>n</sup> | β  |
| 1898.76 | 207.5 | 0.82 | 8.4... | 8.7  | 1 <sup>n</sup> | β  |
| 1898.77 | 210.5 | 0.86 | ...    |      | 3 <sup>n</sup> | Hu |

A and C (= Σ 157)

|         |       |       |        |     |                |    |
|---------|-------|-------|--------|-----|----------------|----|
| 1832.93 | 115.5 | 12.26 | 8.5... | 9.0 | 3 <sup>n</sup> | Σ  |
| 1845.08 | 113.9 | 11.49 | ...    |     | 1 <sup>n</sup> | Ma |
| 1850.72 | 117.5 | 12.69 | ...    |     | 1 <sup>n</sup> | Ma |
| 1865.49 | 116.0 | 12.19 | 8.3... | 9.2 | 3 <sup>n</sup> | Δ  |
| 1879.87 | 115.8 | 12.40 | 8.7... | 9.2 | 2 <sup>n</sup> | β  |
| 1890.90 | 115.9 | 12.56 | ...    | 8.7 | 3 <sup>n</sup> | β  |
| 1898.75 | 115.4 | 12.55 | 8.5... | 9.6 | 3 <sup>n</sup> | β  |
| 1898.77 | 116.6 | 12.79 | ...    |     | 3 <sup>n</sup> | Hu |
| 1898.87 | 116.2 | 12.48 | 8.5... |     | 1 <sup>n</sup> | L  |

The duplicity of the principal star of Σ 157 was discovered with the 6-inch. Thus far no change

is shown. The distant star appears to be fixed. The foregoing are all the measures of AC.

[ $\beta$  (XI)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 1, II)... $\Delta$  (II)  
...Madler (*Dorpat Obsns.* XIII) (*Fixstern-Systeme* 1)...  
Hussey ( )...Lewis (*Mon. Not.* LIX, 400)...]

$\beta$  871. Lalande 3289

R.A.  $1^h 41^m 49^s$  }  
Decl.  $- 1^\circ 33'$  }

|         |       |           |            |       |         |
|---------|-------|-----------|------------|-------|---------|
| 1879.79 | 350.3 | 1.4 $\pm$ | 8.5... 9.5 | 3 $n$ | Cin     |
| 1879.88 | 352.6 | 1.88      | 8.4... 9.0 | 4 $n$ | $\beta$ |
| 1886.66 | 351.3 | 2.28      | 8.4... 9.2 | 3 $n$ | LM      |
| 1888.30 | 352.0 | 1.97      | 8.1... 9.4 | 3 $n$ | Lv      |
| 1898.68 | 352.3 | 2.08      | 8.0... 9.0 | 3 $n$ | Cg      |

Discovered with the 18½-inch. Apparently without motion.

[ $\beta$  (XIII)... $\beta^3$ ...Cin<sup>6</sup>...LM...Lv<sup>1</sup>...Cogshall ( )...]

$\beta$  510. Rumker 430

R.A.  $1^h 42^m 4^s$  }  
Decl.  $+ 15^\circ 43'$  }

A and B

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1878.06 | 337.4 | 1.59 | 8.0... 12.0 | 1 $n$ | $\beta$ |
| 1891.92 | 335.3 | 1.54 | 8.1... 10.5 | 3 $n$ | $\beta$ |
| 1895.90 | 333.9 | 2.08 | ...         | 1 $n$ | Lew     |

A and C (= H<sup>3</sup> V. 92)

|         |       |       |        |       |                |
|---------|-------|-------|--------|-------|----------------|
| 1783.04 | 322.7 | 51.27 | ...    | 1 $n$ | H <sup>1</sup> |
| 1878.06 | 326.4 | 53.56 | ...    | 1 $n$ | $\beta$        |
| 1891.92 | 327.2 | 53.35 | 8.2... | 3 $n$ | $\beta$        |

The close pair was discovered with the 18½-inch. The measures of both companions are insufficient to determine the question of motion, but the change, if any, is very slow. All the measures of AC are given above.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.*, 1895)...]

$\beta$  511. S.D. (2°) 299

R.A.  $1^h 42^m 40^s$  }  
Decl.  $- 2^\circ 1'$  }

B and C

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1878.29 | 316.0 | 3.69 | 8.4... 12.5 | 3 $n$ | $\beta$ |
| 1878.94 | 310.1 | 4.20 | 8.5... 13   | 1 $n$ | $\beta$ |
| 1891.92 | 317.4 | 3.91 | 8.2... 11.6 | 3 $n$ | $\beta$ |
| 1898.71 | 315.2 | 3.81 | ... 13.0    | 2 $n$ | $\beta$ |
| 1898.72 | 315.2 | 4.11 | ... 13.2    | 3 $n$ | Bd      |

A and B (=  $\Sigma$  171)

|         |       |       |            |       |          |
|---------|-------|-------|------------|-------|----------|
| 1829.91 | 157.6 | 27.89 | 8.5... 8.5 | 2 $n$ | $\Sigma$ |
| 1847.07 | 158.7 | ...   | ...        | 1 $n$ | Ma       |
| 1865.44 | 159.1 | 29.14 | 8.2... 8.6 | 5 $n$ | $\Delta$ |
| 1879.05 | 159.6 | 29.68 | 8.5... 8.5 | 7 $n$ | $\beta$  |
| 1891.92 | 159.9 | 30.23 | 8.2...     | 3 $n$ | $\beta$  |
| 1898.71 | 160.0 | 30.83 | 8.5... 8.5 | 2 $n$ | $\beta$  |
| 1898.72 | 160.1 | 30.40 | 8.0... 8.3 | 3 $n$ | Bd       |

The close companion to B was discovered with the 18½-inch. There is probably no change to this time. The distance of AB is increasing. The motion is undoubtedly rectilinear. This change from 1829 to 1898 gives for the proper motion of A, 0.046 in the direction of 2°4. All the measures of AB are given above.

[ $\beta$  (X)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\beta$  (A. & A.-P. XIII, 17)... $\Delta$  (II)...Madler (*Fixstern-Systeme* II)... Boothroyd ( )...]

$\beta$  1016. D.M. (32°) 324

R.A.  $1^h 42^m 52^s$  }  
Decl.  $+ 32^\circ 29'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1890.90 | 207.8 | 0.59 | 8.5... 8.5 | 3 $n$ | $\beta$ |
| 1897.95 | 202.5 | 0.46 | ...        | 2 $n$ | Bow     |
| 1897.86 | 202.6 | 0.47 | ...        | 1 $n$ | L       |
| 1898.79 | 209.6 | 0.67 | ...        | 3 $n$ | Hu      |
| 1898.93 | 208.3 | 0.60 | ...        | 1 $n$ | Bow     |

Discovered with the 18½-inch

[ $\beta$  (XIII)... $\beta^3$  (app.)... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Hussey ( )...]

$\beta$  1001. O. Arg. S. 1090

R.A.  $1^h 43^m 5^s$  }  
Decl.  $- 18^\circ 59'$  }

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1881.55 | 2.7   | 1.32 | 8.0... 11.5 | 3 $n$ | $\beta$ |
| 1893.81 | 358.2 | 0.98 | 8.2... 11.5 | 1 $n$ | W       |
| 1898.89 | 6.0   | 0.97 | 8.2... 12.7 | 2 $n$ | Cg      |

Discovered with the 12-inch. Probably no change.

[ $\beta$  (XIII)... $\beta^3$ ...Wilson ( )...Cogshall ( )...]

**$\beta$  1168.** W<sup>1</sup>. I. 758

R.A. 1<sup>h</sup> 43<sup>m</sup> 48<sup>s</sup> }  
Decl. - 10° 58' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.71 | 203.0 | 0.32 | 8.0... 8.3 | 4 <sup>n</sup> | $\beta$ |
| 1898.89 | 210.3 | 0.35 | 8.2... 8.2 | 2 <sup>n</sup> | A       |
| 1899.00 | 202.0 | 0.72 | 8 ... 9.0  | 1 <sup>n</sup> | Bd      |

Discovered with the 36-inch. It is 1<sup>m</sup> 44<sup>s</sup>  $\rho$  and 2'.4  $\varsigma$  of  $\zeta$  Ceti.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Aitken ( )... Boothroyd ( )...]

 **$\beta$  1169.** D.M. (51°) 420

R.A. 1<sup>h</sup> 44<sup>m</sup> 17<sup>s</sup> }  
Decl. + 51° 46' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1890.85 | 206.4 | 2.20 | 8.5... 12.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.71 | 203.5 | 2.35 | 8.4... 11.3 | 2 <sup>n</sup> | $\beta$ |
| 1898.73 | 206.7 | 2.32 | ...         | 3 <sup>n</sup> | Hu      |

Discovered with the 12-inch.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Hussey ( )...]

 **$\beta$  259.** W<sup>1</sup>. I. 805

R.A. 1<sup>h</sup> 46<sup>m</sup> 20<sup>s</sup> }  
Decl. - 16° 19' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.82 | 236.0 | 4.51 | 8.7... 11.2 | 3 <sup>n</sup> | $\Delta$ |
| 1877.86 | 236.8 | 4.25 | 8.2... 9.7  | 3 <sup>n</sup> | Cin      |
| 1889.97 | 239.7 | 4.52 | 8.0... 10.4 | 2 <sup>n</sup> | Lv       |
| 1898.69 | 237.8 | 4.56 | 7.7... 9.8  | 3 <sup>n</sup> | Cg       |

Discovered with the 9.4-inch of the Dartmouth College Observatory. Probably without change.

[ $\beta$  (v)... $\Delta$  (1)...Cin<sup>4</sup>...Lv<sup>1</sup>...Cogshall ( )...]

 **$\beta$  260.** Lalande 3444

R.A. 1<sup>h</sup> 46<sup>m</sup> 45<sup>s</sup> }  
Decl. + 14° 51' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.81 | 228.0 | 0.56 | 8.3... 9.0 | 3 <sup>n</sup> | $\Delta$ |
| 1884.97 | 230.6 | 0.64 | 8.0... 8.0 | 2 <sup>n</sup> | Ho       |
| 1892.86 | 232.7 | 0.70 | 8.0... 8.0 | 1 <sup>n</sup> | J        |
| 1893.73 | 232.6 | 0.70 | 8.0... 8.1 | 1 <sup>n</sup> | W        |
| 1897.98 | 234.0 | 0.70 | ...        | 2 <sup>n</sup> | Br       |

Discovered with the 6 inch. The change, if any, is very slow.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\Delta$  (1)...Hough (2978)... Jones (*Proc. Haverford Coll. Obsy.* 1892)...Brown ( )... Wilson ( )...]

 **$\beta$  512.** D.M. (18°) 244

R.A. 1<sup>h</sup> 47<sup>m</sup> 12<sup>s</sup> }  
Decl. + 18° 42' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1878.01 | 27.3  | 1.45 | 9.0... 13   | 2 <sup>n</sup> | $\beta$ |
| 1890.58 | 23.8  | 1.64 | 8.6... 11.7 | 3 <sup>n</sup> | $\beta$ |
| 1895.87 | 292.0 | 1.25 | 8.6... 11.7 | 1 <sup>n</sup> | L       |
| 1897.86 | 17.2  | 1.84 | 8.6... 11.7 | 1 <sup>n</sup> | L       |
| 1898.88 | 18.3  | 1.97 | 8.0... 12.5 | 1 <sup>n</sup> | A       |
| 1898.96 | 23.8  | 1.54 | 8.9... 13.2 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. This star is a distant companion to  $\gamma$  Arietis. The measures are not sufficient to decide as to relative motion. There seems to be an error in the angle of 1895. The following are all the measures connecting the star with  $\gamma$  Arietis:

 $\gamma$  Arietis (A) and  $\beta$  512

|         |      |        |                |         |
|---------|------|--------|----------------|---------|
| 1823.86 | 85.6 | 228.76 | 1 <sup>n</sup> | Sh      |
| 1878.71 | 84.3 | 223.82 | 1 <sup>n</sup> | $\beta$ |
| 1898.92 | 83.9 | 223.23 | 1 <sup>n</sup> | $\beta$ |

The principal star of  $\gamma$  Arietis has a proper motion of 0".107 in the direction of 152°.4 (AUWERS), and this substantially accounts for the change.

[ $\beta$  (x)... $\beta$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)...Lewis (*Mon. Not.* LVI, 359; LIX, 400) (*Greenwich Obsns.* 1895)...Aitken ( )...]

 **$\beta$  183.** Lalande 3487

R.A. 1<sup>h</sup> 47<sup>m</sup> 21<sup>s</sup> }  
Decl. - 17° 20' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.92 | 226.4 | ...  | 8.5... 10.5 | 1 <sup>n</sup> | Cin      |
| 1876.03 | 227.9 | 2.69 | 8.4... 9.4  | 4 <sup>n</sup> | $\Delta$ |
| 1877.79 | 226.9 | ...  | 8.0... 9.0  | 1 <sup>n</sup> | Cin      |
| 1879.77 | 226.7 | 2.42 | 8.0... 9.5  | 1 <sup>n</sup> | Cin      |
| 1882.76 | 229.6 | 2.72 | 8.5... 9.5  | 1 <sup>n</sup> | W        |
| 1885.95 | 227.5 | 2.40 | 8 ... 11    | 1 <sup>n</sup> | LM       |
| 1893.81 | 227.6 | 2.62 | 8.0... 9.8  | 2 <sup>n</sup> | W        |
| 1898.85 | 229.2 | 2.60 | 8 ... 8.7   | 3 <sup>n</sup> | Bd       |

Discovered with the 6-inch. Evidently fixed.

[ $\beta$  (iv)... $\beta$  (*Mon. Not.* xxxiv, 382)... $\Delta$  (1)...Cin<sup>3</sup>...Cin<sup>4</sup>... Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...LM...Wilson ( )...Boothroyd ( )...]

$\beta$  7. 58 Ceti

R.A.  $1^h 51^m 43^s$  }  
Decl.  $- 2^\circ 39'$  }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.53 | 12.1 | 2.86 | 7.0...12.0 | 3 <sup>n</sup> | $\Delta$ |
| 1877.78 | 11.4 | 2.85 | 6.7...10.8 | 3 <sup>n</sup> | Cin      |
| 1880.94 | 12.8 | 2.73 | 6.2...11.0 | 2 <sup>n</sup> | $\beta$  |
| 1886.91 | 10.9 | 3.10 | 7.0...10.8 | 4 <sup>n</sup> | LM       |
| 1888.99 | 12.6 | 2.63 | 7.0...11.5 | 2 <sup>n</sup> | T        |
| 1898.63 | 20.5 | 2.70 | 6.0...10.7 | 2 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. AUWERS gives the proper motion of this star as  $0''.025$  in the direction of  $36^\circ 8$ . The position of the small star, if fixed in space, should be at the date of the last measures in 1898,  $6^\circ 2 : 2''.35$ . It is probable that the two stars are moving together.

[ $\beta$  (1)... $\beta$  (Mon. Not. xxxiii, 351)... $\beta^3$ ... $\Delta$  (1)...Cin...LM...Tarrant (2991)...]

$\beta$  513. 48 Cassiopeiae

R.A.  $1^h 52^m 7^s$  }  
Decl.  $+ 70^\circ 19'$  }

A and B

|         |       |           |            |                |            |
|---------|-------|-----------|------------|----------------|------------|
| 1878.69 | 265.0 | 1.05      | 5.0... 7.0 | 1 <sup>n</sup> | $\Delta$   |
| 1878.70 | 264.4 | 1.04      | ...        | 3 <sup>n</sup> | $\beta$    |
| 1879.23 | 264.5 | 0.96      | 5.0... 7.0 | 1 <sup>n</sup> | O $\Sigma$ |
| 1879.56 | 265.6 | 1.00      | ... 8.0    | 2 <sup>n</sup> | $\beta$    |
| 1881.67 | 271.9 | 0.76      | ... 7.5    | 1 <sup>n</sup> | $\beta$    |
| 1883.78 | 269.7 | 1.07      | ... 7.0    | 5 <sup>n</sup> | En         |
| 1885.77 | 284.9 | ...       | ...        | 1 <sup>n</sup> | H $\Sigma$ |
| 1886.03 | 270.1 | 1.03      | ... 7.3    | 4 <sup>n</sup> | T          |
| 1888.70 | 298.1 | 0.83      | ... 6.3    | 4 <sup>n</sup> | $\beta$    |
| 1888.99 | 304.9 | 0.80      | ... 8      | 3 <sup>n</sup> | H1         |
| 1889.30 | 294.5 | 0.69      | ...        | 2 <sup>n</sup> | T          |
| 1889.52 | 304.4 | 0.76      | ... 9      | 3 <sup>n</sup> | $\beta$    |
| 1890.23 | 301.0 | 0.57      | ...        | 2 <sup>n</sup> | T          |
| 1890.62 | 308.6 | 0.55      | ... 7.5    | 4 <sup>n</sup> | $\beta$    |
| 1891.61 | 313.5 | 0.58      | ... 7.7    | 4 <sup>n</sup> | $\beta$    |
| 1892.99 | 317.2 | 0.5 $\pm$ | ...        | 1 <sup>n</sup> | Sp         |
| 1893.47 | 322.2 | 0.65      | ...        | 2 <sup>n</sup> | Bar        |
| 1896.09 | 333.7 | 0.5 $\pm$ | ...        | 2 <sup>n</sup> | Sp         |
| 1898.92 | 5.9   | 0.36      | 5.2... 7.2 | 3 <sup>n</sup> | A          |

A and C

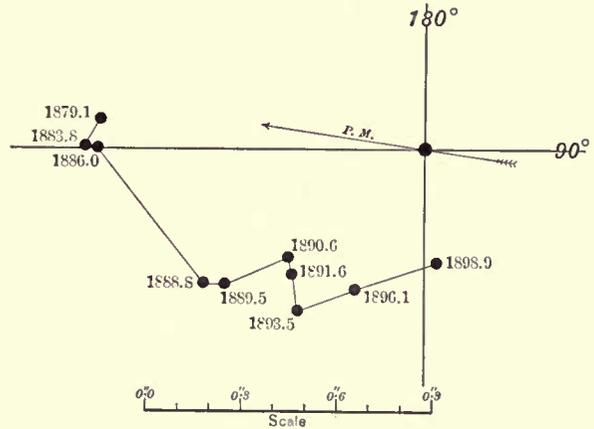
|         |      |       |          |                |         |
|---------|------|-------|----------|----------------|---------|
| 1878.80 | 49.4 | 23.98 | ... 13.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.62 | 51.2 | 23.67 | ... 13.6 | 3 <sup>n</sup> | $\beta$ |
| 1898.78 | 50.3 | 23.81 | ... 13.0 | 3 <sup>n</sup> | $\beta$ |

A and D

|         |      |       |        |                |         |
|---------|------|-------|--------|----------------|---------|
| 1898.86 | 83.3 | 47.09 | ... 13 | 1 <sup>n</sup> | $\beta$ |
|---------|------|-------|--------|----------------|---------|

This most interesting binary was discovered with the 18½-inch, but at that time it was easily seen with the 6-inch. It is now (1898) a very difficult object, and only measurable with a large aperture under the best conditions. The motion of the companion has been nearly a quadrant since the first measures, and it may prove to have a short period, but a much larger arc is required to give even a rough approximation of the orbit.

The principal positions are shown on the following diagram :



48 Cassiopeiae.  $\beta$  513

AUWERS gives the proper motion of this star  $0''.069$  in the direction of  $262^\circ 2$ . If the small star did not have this movement its position at the date of the measures in 1896 should be  $68^\circ 3 : 0''.16$ . It is obvious that the smaller star has the same proper motion, and at the same time a retrograde motion, around the principal star. If the change shown by the measures was due to the difference of two proper motions, it would have been an easy pair at the time of the observations of  $\Sigma$  and O $\Sigma$ , and therefore catalogued as a double star long ago. It is probable that the distance at the time of discovery was about maximum.

[ $\beta$  (x)... $\beta^1$ ... $\beta^2$ ... $\beta^3$ ... $\beta^4$ ... $\beta$  (2875,2957,3048,3114)... $\beta$  (Pub. L. O. II)... $\Delta$  (1)...H $\Sigma$  ( )...O $\Sigma$  (Poulkova Obsns. x)...Engelmann (2678)...Tarrant (2876,3186)...Hall (II)...Barnard (A. J. 447)...Sp (III)...Aitken ( )...]



**$\beta$  514.** Lalande 3698

R.A.  $1^h 53^m 57^s$  }  
Decl.  $- 13^\circ 54'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1877.69 | 135.3 | 6.20 | 8.0...12.0 | 1n | $\beta$ |
| 1891.92 | 134.2 | 6.36 | 8.1...10.0 | 3n | $\beta$ |
| 1898.84 | 133.0 | 6.31 | 8.0...10.2 | 3n | Bd      |

Discovered with the  $18\frac{1}{2}$ -inch. By a clerical error the angle in  $\beta$  (X) is erroneously printed  $285^\circ.5$ . The components seem to be fixed.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Boothroyd ( )...]

 **$\beta$  785.** 49 *Cassiopeiae*

R.A.  $1^h 54^m 4^s$  }  
Decl.  $+ 75^\circ 32'$  }

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1881.70 | 245.7 | 5.22 | 6.0...13   | 4n | $\beta$    |
| 1885.87 | 243.4 | 5.82 | ...        | 2n | H $\Sigma$ |
| 1888.83 | 247.3 | 5.13 | 6.0...13   | 4n | Com        |
| 1889.52 | 243.7 | 5.40 | 5.1...13.2 | 3n | $\beta$    |
| 1898.65 | 244.3 | 5.35 | 6.0...12.5 | 2n | $\beta$    |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. The proper motion of this star is given by AUWERS as  $0''.041$  in the direction of  $242^\circ.2$ . This is nearly in the direction of the small star, and would, therefore, affect only the distance. If the small star was fixed in space, the distance at the date of the last measures in 1898 would be  $5''.90$ . The measures show no change in this respect, and there is no doubt that the two are moving together.

[ $\beta$  (xii)... $\beta^1$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O. II*)...Comstock (*Pub. Washburn Obsy.* vi)...H $\Sigma$  ( )...]

 **$\beta$  872.** Lalande 3694

R.A.  $1^h 54^m 28^s$  }  
Decl.  $+ 32^\circ 44'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1880.75 | 182.1 | 5.25 | 8.1...11.6 | 4n | $\beta$ |
| 1891.97 | 185.5 | 4.95 | 8.3...11.8 | 2n | $\beta$ |
| 1898.71 | 186.5 | 4.62 | 8.3...12.0 | 2n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. The measures indicate change.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

 **$\beta$  515.** Lalande 3707

R.A.  $1^h 54^m 38^s$  }  
Decl.  $+ 15^\circ 59'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1878.38 | 243.3 | 1.51 | 7.7...12.5 | 2n | $\beta$ |
| 1892.00 | 244.4 | 1.31 | 8.1...11.3 | 3n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. Without change.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

 **$\beta$  873.** *Radcliffe* 597

R.A.  $1^h 56^m 7^s$  }  
Decl.  $+ 63^\circ 48'$  }

|         |      |      |            |    |         |
|---------|------|------|------------|----|---------|
| 1880.77 | 29.1 | 2.03 | 7.3...10.9 | 6n | $\beta$ |
| 1891.51 | 27.2 | 2.12 | 7.0...10.9 | 3n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. Apparently fixed.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

 **$\beta$  516.** Lalande 3851

R.A.  $1^h 59^m 6^s$  }  
Decl.  $- 1^\circ 33'$  }

|         |       |           |            |    |         |
|---------|-------|-----------|------------|----|---------|
| 1877.92 | 285.0 | 1.07      | 8.0... 8.0 | 2n | $\beta$ |
| 1886.83 | 287.4 | 0.84      | 8.2... 8.4 | 3n | LM      |
| 1888.85 | 282.6 | 0.69      | 7.8... 8.5 | 3n | Lv      |
| 1890.48 | 288.0 | 0.7 $\pm$ | ...        | 4n | Sp      |
| 1892.91 | 288.1 | 0.6 $\pm$ | ...        | 1n | Sp      |
| 1893.77 | 286.2 | 0.93      | 8.0... 8.1 | 2n | W       |
| 1898.70 | 289.4 | 0.90      | 8.8... 8.8 | 3n | Cg      |

Discovered with the  $18\frac{1}{2}$ -inch. Change is uncertain.

[ $\beta$  (x)... $\beta^1$ ...LM...Lv $^1$ ...Sp (iii)...Wilson ( )...Cogshall ( )...]

 **$\beta$  874.** 5 *Persei*

R.A.  $2^h 3^m 8^s$  }  
Decl.  $+ 57^\circ 5'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1880.60 | 273.6 | 5.60 | 6.5...12.5 | 3n | $\beta$ |
| 1891.51 | 274.1 | 5.40 | 6.0...13.2 | 3n | $\beta$ |
| 1898.57 | 272.0 | 5.34 | 6.0...13.5 | 2n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. KRUEGER gives the annual proper motion of this star  $0''.060$  in the

direction of  $277^{\circ}$ . This would change only the distance of the companion. If the small star was fixed, the distance should have decreased  $1''$  from 1880 to 1898. The measures show no material change in the position of B, so that it is certain, if this value of the proper motion is substantially correct, that the two stars are moving together, and probably make a physical system.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (Observatory III, 582)... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...]

$\beta$  1275. O. Arg. N. 2491

R.A.  $2^h 6^m 21^s$  }  
Decl.  $+ 54^{\circ} 45'$  }

1898.66  $203.7^{\circ}$   $3.26''$  7.5...13.0  $4n$   $\beta$

Discovered with the 40-inch in looking for the next pair,  $\beta$  786.

$\beta$  786. D.M. ( $55^{\circ}$ ) 563

R.A.  $2^h 9^m 18^s$  }  
Decl.  $+ 55^{\circ} 12'$  }

1881.57  $353.0^{\circ}$   $4.89''$  8.5... 9.9  $4n$   $\beta$   
1886.86  $350.6^{\circ}$   $5.07''$  ...  $2n$  UL  
1888.06  $349.7^{\circ}$   $5.30''$  8.2... 9.7  $3n$  Com  
1898.60  $351.1^{\circ}$   $5.20''$  8.5... 8.7  $2n$   $\beta$

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. There seems to be no material change.

[ $\beta$  (XII)... $\beta^4$ ...Updegraff, Lamb and Comstock (Pub. Washburn Obsy. v, vi)...]

$\beta$  1170.  $\chi$  Persei

R.A.  $2^h 9^m 39^s$  }  
Decl.  $+ 56^{\circ} 57'$  }

B and C

1890.74  $313.3^{\circ}$   $0.27''$  11.5...11.7  $3n$   $\beta$

A and BC

1879.55  $352.6^{\circ}$   $70.47''$  ...10.5  $2n$   $\beta$   
1890.74  $353.3^{\circ}$   $70.39''$  6.2...11.0  $3n$   $\beta$   
1898.60  $353.6^{\circ}$   $70.22''$  6.0...10.7  $2n$   $\beta$

A and D (= S 409)

1824.99  $136.5^{\circ}$   $124.53''$  ...  $1n$  S  
1879.54  $136.3^{\circ}$   $122.66''$  ... 9.0  $1n$   $\beta$   
1898.60  $136.2^{\circ}$   $123.12''$  ... 8.6  $2n$   $\beta$

The close pair was discovered with the 36-inch. It is a difficult pair even with that aperture. A is the principal star in the great cluster in *Perseus*. A and D make the double star, South 409. All the measures of this are given above.

The principal star has a proper motion of  $0.020$  in the direction of  $239^{\circ}.8$  (KRUEGER). The distant companions have no connection with it.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta^3$ ... $\beta$  (Pub. L. O. II)...]

$\beta$  437. Lalande 4291

R.A.  $2^h 12^m 26^s$  }  
Decl.  $+ 3^{\circ} 39'$  }

1877.95  $32.4^{\circ}$   $7.16''$  8.0...12.5  $2n$   $\beta$   
1879.66  $29.6^{\circ}$   $5.81''$  8.0...12.0  $1n$  Cin  
1891.96  $33.4^{\circ}$   $7.19''$  8.0...11.3  $3n$   $\beta$   
1898.73  $31.7^{\circ}$   $7.12''$  8.3...11.5  $1n$   $\beta$

Discovered with the  $18\frac{1}{2}$ -inch. The components appear to be relatively fixed.

[ $\beta$  (VIII)... $\beta$  (Am. Jour. Sci., July 1877)... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...Cin...]

$\beta$  1171. D.M. ( $56^{\circ}$ ) 556

R.A.  $2^h 12^m 46^s$  }  
Decl.  $+ 56^{\circ} 18'$  }

1890.71  $21.4^{\circ}$   $1.01''$  8.6...13.2  $3n$   $\beta$

Discovered with the 36-inch. In the great *Perseus* cluster; the *s* star of two about  $1'$  apart. It is  $9.2m$  in D.M.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (Pub. L. O. II)...]

$\beta$  875.  $\eta$  Persei

R.A.  $2^h 14^m 0^s$  }  
Decl.  $+ 55^{\circ} 18'$  }

1880.61  $162.0^{\circ}$   $11.58''$  5.5...12.3  $3n$   $\beta$   
1891.51  $161.0^{\circ}$   $11.64''$  5.8...13.5  $3n$   $\beta$   
1898.70  $161.7^{\circ}$   $11.40''$  6.0...13.0  $2n$   $\beta$

Discovered with the  $18\frac{1}{2}$ -inch. The proper motion, according to KRUEGER, is  $0.023$  in the

direction of  $241^{\circ}8$ . The measures show no relative motion, but it is probably only an optical pair.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (*Ast. Reg.* XVIII, 286)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  8. W<sup>2</sup> II. 210

R.A.  $2^h 14^m 59^s$  }  
Decl.  $+ 8^{\circ} 20'$  }

|         |       |      |        |     |                |          |
|---------|-------|------|--------|-----|----------------|----------|
| 1875.31 | 200.4 | 0.96 | 8.3... | 9.2 | 4 <sup>n</sup> | $\Delta$ |
| 1880.92 | 204.3 | 0.90 | 8.0... | 9.0 | 1 <sup>n</sup> | $\beta$  |
| 1888.87 | 204.8 | 1.07 | 8.0... | 9.1 | 5 <sup>n</sup> | Lv       |
| 1898.78 | 207.2 | 1.37 | 7.8... | 9.0 | 3 <sup>n</sup> | Cg       |

Discovered with the 6-inch. Apparently unchanged.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\beta^3$ ... $\Delta$  (1)...Lv<sup>1</sup>...Lv (*Sid. Mess.* VIII, 77)...Cogshall ( )...]

$\beta$  876. D.M. ( $32^{\circ}$ ) 433

R.A.  $2^h 16^m 46^s$  }  
Decl.  $+ 32^{\circ} 58'$  }

A and B

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1880.13 | 235.4 | 1.19 | 7.5... | 12.3 | 4 <sup>n</sup> | $\beta$ |
| 1891.87 | 231.1 | 1.04 | 7.7... | 11.9 | 2 <sup>n</sup> | $\beta$ |
| 1895.87 | 233.6 | 1.00 | 7.7... | 11.9 | 1 <sup>n</sup> | L       |
| 1898.74 | 237.3 | 1.17 | ...    |      | 2 <sup>n</sup> | Hu      |

C and D (=  $\Sigma$  258)

|         |      |      |        |      |                |          |
|---------|------|------|--------|------|----------------|----------|
| 1832.53 | 26.8 | 5.89 | 9.5... | 10.2 | 3 <sup>n</sup> | $\Sigma$ |
| 1845.44 | 25.6 | 5.97 | ...    |      | 1 <sup>n</sup> | Ma       |
| 1867.00 | 28.7 | 5.89 | 9.7... | 10.3 | 3 <sup>n</sup> | $\Delta$ |
| 1880.13 | 28.7 | 6.01 | ...    |      | 4 <sup>n</sup> | $\beta$  |
| 1891.87 | 28.1 | 6.09 | 8.9... | 9.1  | 2 <sup>n</sup> | $\beta$  |
| 1895.87 | 33.7 | 6.14 | 8.9... | 9.2  | 1 <sup>n</sup> | L        |
| 1898.75 | 28.2 | 6.21 | ...    |      | 3 <sup>n</sup> | Hu       |

A and C

|         |       |       |        |  |                |          |
|---------|-------|-------|--------|--|----------------|----------|
| 1832.18 | 143.6 | 70.26 | 7.5... |  | 2 <sup>n</sup> | $\Sigma$ |
| 1867.99 | 145.0 | 70.28 | 7.3... |  | 3 <sup>n</sup> | $\Delta$ |
| 1879.49 | 145.4 | 70.31 | ...    |  | 2 <sup>n</sup> | $\beta$  |
| 1891.87 | 146.2 | 70.06 | ...    |  | 2 <sup>n</sup> | $\beta$  |
| 1898.74 | 146.3 | 70.74 | ...    |  | 2 <sup>n</sup> | Hu       |

The duplicity of the principal star of  $\Sigma$  258 was detected with the  $18\frac{1}{2}$ -inch. The above are all

the measures of the  $\Sigma$  components. Evidently they are relatively fixed.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Hussey ( ) ...Madler (*Fixstern-Systeme* I)... $\Delta$  (II)...]

$\beta$  738. Lacaille 720

R.A.  $2^h 18^m 0^s$  }  
Decl.  $- 30^{\circ} 25'$  }

|         |       |      |        |     |                |                   |
|---------|-------|------|--------|-----|----------------|-------------------|
| 1879.70 | 182.6 | 0.64 | 7.5... | 7.5 | 2 <sup>n</sup> | $\beta$           |
| 1891.80 | 174.3 | 0.55 | 7.1... | 7.4 | 3 <sup>n</sup> | $\beta$           |
| 1899.00 | 184.1 | 0.79 | 7      | ... | 8              | 1 <sup>n</sup> Bd |

Discovered with the 6-inch at Mt. Hamilton in 1879. The magnitude in LACAILLE is  $6\frac{1}{2}$ , and  $7\frac{1}{4}$  in GOULD. PORTER gives the proper motion  $0''.165$  in the direction of  $217^{\circ}3$ . It is obvious that this is common to both components. The relative motion is slow.

[ $\beta$  (XI)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)...Boothroyd ( )...]

$\beta$  517. *Ceti* 374

R.A.  $2^h 18^m 54^s$  }  
Decl.  $- 4^{\circ} 26'$  }

A and B

|         |       |       |        |      |                |         |
|---------|-------|-------|--------|------|----------------|---------|
| 1877.99 | 248.4 | 10.82 | 7.5... | 12.5 | 1 <sup>n</sup> | $\beta$ |
| 1878.99 | 247.4 | 10.84 | 6.7... | 12.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.69 | 248.6 | 11.13 | 7.0... | 10.5 | 2 <sup>n</sup> | $\beta$ |
| 1898.76 | 248.8 | 11.33 | 7.0... | 12.0 | 2 <sup>n</sup> | A       |
| 1898.91 | 248.4 | 11.37 | 6.5... | 9.5  | 1 <sup>n</sup> | Bd      |

A and C

|         |       |       |     |      |                |         |
|---------|-------|-------|-----|------|----------------|---------|
| 1878.99 | 286.9 | 54.97 | ... | 11.5 | 1 <sup>n</sup> | $\beta$ |
| 1898.69 | 289.1 | 55.54 | ... | 10.5 | 2 <sup>n</sup> | $\beta$ |
| 1898.76 | 289.0 | 56.29 | ... | 12.2 | 2 <sup>n</sup> | A       |
| 1898.91 | 289.2 | 56.11 | ... | 9.5  | 1 <sup>n</sup> | Bd      |

Discovered with the  $18\frac{1}{2}$ -inch. There seems to be no material change. The principal star is Lalande 4486.

[ $\beta$  (X)... $\beta^2$ ... $\beta^3$ ...Aitken ( )...Boothroyd ( )...]

**β 739.** O. Arg. S. 1542

R.A. 2<sup>h</sup> 19<sup>m</sup> 33<sup>s</sup> }  
Decl. — 30° 24' }

|         |       |      |        |     |                |   |
|---------|-------|------|--------|-----|----------------|---|
| 1879.68 | 264.5 | 2.13 | 8.1... | 8.7 | 3 <sup>n</sup> | β |
| 1891.77 | 266.0 | 1.45 | 8.1... | 8.4 | 3 <sup>n</sup> | β |
| 1897.04 | 261.4 | 1.69 | ...    |     | 2 <sup>n</sup> | A |

Discovered with the 6-inch on Mt. Hamilton in 1879. There is but little, if any, change.

[β (xi)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...Aitken (3465)...]

**β 1172.** D.M. (56°) 635

R.A. 2<sup>h</sup> 21<sup>m</sup> 27<sup>s</sup> }  
Decl. + 56° 42' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1890.71 | 238.3 | 1.64 | 8.4... | 10.9 | 3 <sup>n</sup> | β |
|---------|-------|------|--------|------|----------------|---|

Discovered with the 36-inch; in the borders of the cluster in *Perseus*.

[β (xvii)...β (3047)...β (Pub. L. O. II)...]

**β 518.** *Ceti* 389

R.A. 2<sup>h</sup> 23<sup>m</sup> 11<sup>s</sup> }  
Decl. + 9° 2' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1878.00 | 138.4 | 1.57 | 6.5... | 11.0 | 3 <sup>n</sup> | β |
| 1891.75 | 138.7 | 1.70 | 6.4... | 11.3 | 3 <sup>n</sup> | β |

Discovered with the 18½-inch. A naked-eye star in *Cetus*. It has no appreciable proper motion. B.A.C. 764.

[β (x)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...]

**β 519.** W<sup>2</sup> II. 367

R.A. 2<sup>h</sup> 23<sup>m</sup> 38<sup>s</sup> }  
Decl. — 2° 48' }

|         |      |      |        |      |                |     |
|---------|------|------|--------|------|----------------|-----|
| 1877.95 | 61.2 | ...  | 8.5... | 10.0 | 1 <sup>n</sup> | Cin |
| 1878.40 | 58.8 | 0.80 | 8.2... | 9.7  | 2 <sup>n</sup> | β   |
| 1886.69 | 55.2 | 1.17 | 8.3... | 9.5  | 3 <sup>n</sup> | LM  |
| 1891.86 | 54.4 | 0.69 | 8.3... | 8.9  | 2 <sup>n</sup> | β   |
| 1898.79 | 59.2 | 0.86 | 8.2... | 9.2  | 3 <sup>n</sup> | A   |
| 1898.91 | 57.5 | 0.93 | 8.5... | 9.3  | 3 <sup>n</sup> | Bd  |

Discovered with the 18½-inch. Change is uncertain.

[β (x)...β<sup>2</sup>...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Cin<sup>4</sup>...LM...Aitken ( )...Boothroyd ( )...]

**β 304.** Lalande 4613

R.A. 2<sup>h</sup> 24<sup>m</sup> 5<sup>s</sup> }  
Decl. + 36° 56' }

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1878.90 | 282.3 | 17.70 | 7.5... | 11.5 | 1 <sup>n</sup> | β |
| 1880.77 | 283.9 | 18.02 | 7.5... | 11.5 | 1 <sup>n</sup> | β |
| 1891.99 | 282.8 | 19.09 | 7.7... | 11.2 | 3 <sup>n</sup> | β |
| 1898.18 | 282.4 | 19.30 | ...    |      | 2 <sup>n</sup> | β |

Discovered with the 6-inch. The distance is increasing, and the change in a pair of this kind would be almost necessarily due to proper motion. The measures indicate an annual movement of about 0.08 in the direction of 102°.

[β (vi)...β<sup>2</sup>...β (2062,3114)...β (Pub. L. O. II)...]

**β 520.** Lalande 4858

R.A. 2<sup>h</sup> 30<sup>m</sup> 49<sup>s</sup> }  
Decl. — 4° 6' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1877.96 | 210.2 | 0.78 | 9.0... | 10.5 | 1 <sup>n</sup> | β  |
| 1888.94 | 199.8 | 0.89 | 8.6... | 10.5 | 1 <sup>n</sup> | LM |
| 1898.81 | 201.7 | 0.92 | 8.4... | 10.2 | 4 <sup>n</sup> | A  |
| 1898.82 | 207.0 | 0.88 | 8.5... | 10.5 | 2 <sup>n</sup> | Bd |

Discovered with the 6-inch.

[β (x)...β<sup>2</sup>...LM...Aitken ( )...Boothroyd ( )...]

**β 305.** *Persei* 58

R.A. 2<sup>h</sup> 30<sup>m</sup> 53<sup>s</sup> }  
Decl. + 37° 12' }

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1875.82 | 205.2 | 20.80 | 7.0... | 11.2 | 4 <sup>n</sup> | Δ |
| 1888.71 | 205.5 | 20.77 | 7.0... | 10.7 | 2 <sup>n</sup> | β |

Discovered with the 6-inch. The measures by Δ, given above, are credited by him to β 304, which is in the same vicinity. LALANDE 4830.

[β (vi)...Δ (1)...β (2062,2957)...β (Pub. L. O. II)...]

**β 521. Persei 67**

R.A.  $2^h 34^m 59^s$  }  
Decl.  $+ 47^\circ 45'$  }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1878.66 | 153.7 | 5.86 | 6.2...11.2 | 2n | β  |
| 1885.95 | 153.1 | 5.63 | ...        | 2n | HΣ |
| 1891.97 | 154.5 | 5.62 | 6.5...11.5 | 2n | β  |

A naked-eye star in *Perseus*, HEIS 6-7 m (= L 4942). Discovered with the 18½-inch. Without change.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...HΣ ( )...]

**β 522. μ Arietis**

R.A.  $2^h 35^m 36^s$  }  
Decl.  $+ 19^\circ 30'$  }

|         |       |       |            |    |   |
|---------|-------|-------|------------|----|---|
| 1878.75 | 265.8 | 19.10 | 6 ... 12.5 | 1n | β |
| 1892.00 | 263.1 | 19.25 | 6 ... 13.3 | 3n | β |
| 1898.71 | 263.9 | 19.36 | 5½...13    | 1n | β |

Discovered with the 18½-inch. The proper motion of this star is  $0''.042$  in the direction of  $162^\circ 3$  (AUWERS). The change is undoubtedly due to the proper motion of A.

[β (x)...β<sup>1</sup>...β (3114)... (*Pub. L. O. II*)...]

**β 306. Arietis 307**

R.A.  $2^h 36^m 53^s$  }  
Decl.  $+ 25^\circ 8'$  }

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1876.43 | 15.9 | 3.08 | 7 ... 11   | 4n | HI  |
| 1876.74 | 18.1 | 2.99 | 6.7...10   | 1n | OΣ  |
| 1876.79 | 17.3 | 2.93 | 6.4...11.0 | 4n | Δ   |
| 1881.78 | 19.6 | 3.10 | 6.5...11.0 | 2n | Ho  |
| 1886.00 | 17.5 | 3.18 | ...        | 2n | HΣ  |
| 1887.95 | 21.5 | 3.03 | 7 ... 11   | 3n | HI  |
| 1892.85 | 18.9 | 3.11 | ...        | 3n | Bar |

Discovered with the 6 inch. This is a naked-eye star in *Aries* (B.A.C. 834). It has no sensible proper motion. The measures show no change.

[β (VI)...β (2062)...Δ (I)...OΣ (*Poulkowa Obsns. x*)...HΣ ( )...Hall (2147)...Hall (I, II)...Hough (2978)...Barnard (*A. J.* 447)...]

**β 261. Lacaille 846**

R.A.  $2^h 38^m 32^s$  }  
Decl.  $- 28^\circ 25'$  }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1875.95 | 102.4 | 3.10 | 7.7...10.0 | 3n | Cin |
| 1877.91 | 97.7  | 3.02 | 7.4...8.9  | 2n | Cin |
| 1885.19 | 99.3  | 2.87 | 8.0...9.5  | 3n | W   |
| 1891.72 | 100.1 | 2.77 | ...        | 1n | Col |
| 1898.77 | 100.1 | 2.88 | 7.6...9.4  | 4n | Cg  |

Discovered with the 9-4-inch at the Dartmouth College Observatory. Apparently unchanged.

[β (v)...β (*Mon. Not.* xxxv, 31)...Cin<sup>3</sup>...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Cogshall ( )...]

**β 9. Lalande 5107**

R.A.  $2^h 39^m 40^s$  }  
Decl.  $+ 35^\circ 3'$  }

|         |       |      |           |    |     |
|---------|-------|------|-----------|----|-----|
| 1875.94 | 160.6 | 1.52 | 6.3...8.4 | 6n | Δ   |
| 1876.74 | 164.2 | 1.62 | 6.5...8.0 | 1n | OΣ  |
| 1883.72 | 162.6 | 1.73 | 6.4...8.5 | 6n | En  |
| 1885.95 | 162.3 | 1.63 | ...       | 3n | HΣ  |
| 1893.12 | 162.6 | 1.28 | ...       | 1n | Maw |

Discovered with the 6-inch. No evidence of motion. The proper motion of this star, if any, is small.

[β (i)...β (*Mon. Not.* xxxiii, 351)...Δ (i)...Engelmann (2678)...OΣ (*Poulkowa Obsns. x*)...Maw (*Mem. R. A. S.* 11)...HΣ ( )...]

**β 83. Lalande 5140**

R.A.  $2^h 40^m 0^s$  }  
Decl.  $- 5^\circ 28'$  }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.03 | 121.3 | 1.40 | 7.5...10.1 | 4n | Δ   |
| 1877.91 | 122.2 | 1.00 | 7.2...9.5  | 2n | Cin |
| 1886.85 | 116.2 | 0.98 | 7.1...8.7  | 4n | LM  |
| 1888.77 | 109.4 | 1.01 | 7.8...9.8  | 2n | Lv  |
| 1891.77 | 111.7 | 0.90 | 7.9...9.1  | 3n | β   |
| 1891.78 | 117.1 | 1.03 | 8.5...10.5 | 2n | Col |
| 1892.88 | 112.6 | 0.86 | 8.0...8.8  | 1n | J   |
| 1896.06 | 106.6 | 0.83 | ...        | 3n | Sp  |
| 1898.76 | 104.8 | 0.98 | 7.2...9.2  | 2n | A   |

Discovered with the 6-inch. Change in both angle and distance is clearly shown by the measures, and it is certainly a binary system.

[β (II)...β (*Mon. Not.* xxxiii, 437)...β (3114)...β (*Pub. L. O. II*)...Cin<sup>4</sup>...LM...Lv<sup>1</sup>...Collins and Jones (*Proc. Haverford Coll. Obsy.*, 1891, 1892)...Sp (III)...Aitken ( )...]

**β 307.** Lalande 5133

R.A. 2<sup>h</sup> 40<sup>m</sup> 29<sup>s</sup> }  
Decl. + 29° 11' }

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1876.79 | 315.6 | 14.97 | 7.1...11.5 | 4 <sup>n</sup> | Δ  |
| 1877.18 | 315.9 | 15.44 | 8...11     | 3 <sup>n</sup> | H1 |
| 1877.72 | 315.4 | 14.91 | 7.0...11.5 | 1 <sup>n</sup> | β  |
| 1880.92 | 316.0 | 15.49 | 7.0...11.8 | 1 <sup>n</sup> | β  |

Discovered with the 6-inch. The principal star was thought to be slightly elongated with the same instrument on Mt. Hamilton in 1879, and it was entered in the list of new pairs discovered at that place as β 740. A subsequent examination with the 18½-inch at Chicago failed to show any certain elongation. It appeared round with the 36-inch in 1890, and Sp found it single in 1887, 1888, and 1889. It may, therefore, be rejected as a close pair.

[β (VI, XI)...β<sup>1</sup>...β<sup>3</sup>...β (2062,3048)...β (*Pub. L. O.* 1, II)  
...Hall (I)...Sp (III)...]

**β 262.** W<sup>2</sup> II. 944

R.A. 2<sup>h</sup> 40<sup>m</sup> 33<sup>s</sup> }  
Decl. + 30° 33' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.29 | 65.7  | 1.57 | 8.0...10.0 | 6 <sup>n</sup> | Δ   |
| 1881.85 | 68.4  | 1.34 | 7...8      | 2 <sup>n</sup> | Ho  |
| 1884.75 | 72.4  | 1.93 | 8.1...9.9  | 6 <sup>n</sup> | En  |
| 1891.75 | 61.6  | 1.64 | 8.2...9.5  | 4 <sup>n</sup> | β   |
| 1895.89 | 59.7  | 1.59 | 8.2...9.6  | 2 <sup>n</sup> | L   |
| 1896.84 | 65.6  | 1.35 | ...        | 1 <sup>n</sup> | Bow |
| 1897.89 | 62.3  | 1.50 | ...        | 4 <sup>n</sup> | Bow |
| 1898.73 | 63.7  | 1.60 | 8.2...9.1  | 2 <sup>n</sup> | β   |
| 1898.97 | 247.2 | ...  | ...        | 1 <sup>n</sup> | Bow |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The  $\beta$  star of a small quadrilateral triangle. But little, if any, change.

[β (V)...β (*Mon. Not.* xxxv, 31)...β (3114)...β (*Pub. L. O.* II)...Δ (1)...Engelmann (2742)...Hough (2978)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Bowyer (*Mon. Not.* LIX, 400)...]

**β 1002.** O. Arg. S. 1810

R.A. 2<sup>h</sup> 41<sup>m</sup> 29<sup>s</sup> }  
Decl. — 15° 53' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1881.84 | 333.7 | 1.78 | 8.0...11.3 | 3 <sup>n</sup> | β  |
| 1886.76 | 336.6 | 1.64 | 8.0...11.8 | 1 <sup>n</sup> | LM |
| 1898.87 | 333.6 | 1.56 | 7.8...12.7 | 2 <sup>n</sup> | Cg |

Discovered with the 12-inch.

[β (XIII)...β<sup>3</sup>...LM...Cogshall ( )...]

**β 523.** D.M. (33°) 517

R.A. 2<sup>h</sup> 41<sup>m</sup> 55<sup>s</sup> }  
Decl. + 33° 28' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1877.85 | 210.3 | 2.25 | 9.0...11.0 | 1 <sup>n</sup> | β |
| 1898.76 | 208.6 | 1.65 | 9.0...9.9  | 3 <sup>n</sup> | β |

Discovered with the 18½-inch. In the field with Σ 310.

[β (X)...β<sup>1</sup>...]

**β 10.** Lalande 5276

R.A. 2<sup>h</sup> 44<sup>m</sup> 23<sup>s</sup> }  
Decl. — 5° 29' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1874.82 | 99.2  | 2.66 | 7.2...11.1 | 4 <sup>n</sup> | Δ   |
| 1877.85 | 96.2  | 2.80 | 7.2...10.2 | 2 <sup>n</sup> | Cin |
| 1879.68 | 100.1 | 2.56 | 8.0...12.0 | 1 <sup>n</sup> | Cin |
| 1898.01 | 98.6  | 2.88 | ...        | 1 <sup>n</sup> | Br  |

Discovered with the 6-inch. Without change.

[β (1)...β (*Mon. Not.* xxxiii, 351)...Δ (1)...Cin<sup>4</sup>...Cin<sup>6</sup>...Brown ( )...]

**β 877.** γ *Fornacis*

R.A. 2<sup>h</sup> 44<sup>m</sup> 32<sup>s</sup> }  
Decl. — 25° 3' }

A and B

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1880.93 | 144.4 | 11.53 | 6...13     | 4 <sup>n</sup> | β  |
| 1891.96 | 145.5 | 12.03 | 6...12.7   | 2 <sup>n</sup> | β  |
| 1898.94 | 143.7 | 11.69 | 6.5...11.8 | 3 <sup>n</sup> | Bd |

A and C (= H 2161)

|         |       |       |         |                |    |
|---------|-------|-------|---------|----------------|----|
| 1830    | 169.4 | 45±   | 6...11  | 1 <sup>n</sup> | H  |
| 1880.68 | 157.0 | 48.85 | ...11.2 | 4 <sup>n</sup> | β  |
| 1891.96 | 155.6 | 47.24 | ...10.5 | 2 <sup>n</sup> | β  |
| 1898.94 | 153.3 | 46.71 | ...10.7 | 3 <sup>n</sup> | Bd |

The faint companion was detected with the 18½-inch. The foregoing are all the measures of the Herschel star. PORTER finds the proper motion of A, 0".155 in the direction of 205°.9. The measures of C give 0".178 in 203°.8. It is certain, therefore, that A and B are moving together, and that C is not a member of the system.

[β (XIII)...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* II)...Boothroyd ( )...Herschel (Fifth Catalogue, *Mem. R. A. S.* VI)...]

$\beta$  524. 20 Persei

R.A.  $2^h 46^m 8^s$  }  
Decl.  $+ 37^\circ 51'$  }

A and B

|         |       |            |             |    |            |
|---------|-------|------------|-------------|----|------------|
| 1878.72 | 336.0 | 0.25 >     | ...         | 4n | $\beta$    |
| 1880.53 | 321.4 | 0.22       | 6 ... 6.7   | 3n | $\beta$    |
| 1881.67 | 334.9 | 0.28       | 6 ... 6.5   | 1n | $\beta$    |
| 1883.31 | 336.2 | 0.20       | ...         | 7n | En         |
| 1886.23 | 300.4 | 0.3 $\pm$  | ...         | 1n | H $\Sigma$ |
| 1889.59 | 291.3 | 0.17       | 5.5 ... 6.0 | 1n | $\beta$    |
| 1890.61 | 287.6 | 0.18       | 5.0 ... 6.0 | 3n | $\beta$    |
| 1891.79 | 281.7 | 0.15       | 5.7 ... 7.0 | 3n | $\beta$    |
| 1895.72 | 257.9 | 0.1 >      | ...         | 2n | Bar        |
| 1895.72 | 251.5 | 0.16 $\pm$ | ...         | 2n | See        |
| 1896.09 | 190.2 | 0.22       | ...         | 1n | L          |
| 1897.82 | 62.5  | 0.16       | ...         | 1n | $\beta$    |
| 1898.02 | 184.5 | Elong.     | ...         | 2n | L          |
| 1898.92 | 47.6  | 0.12       | ...         | 1n | A          |
| 1899.18 | 31.4  | 0.12       | ...         | 1n | A          |

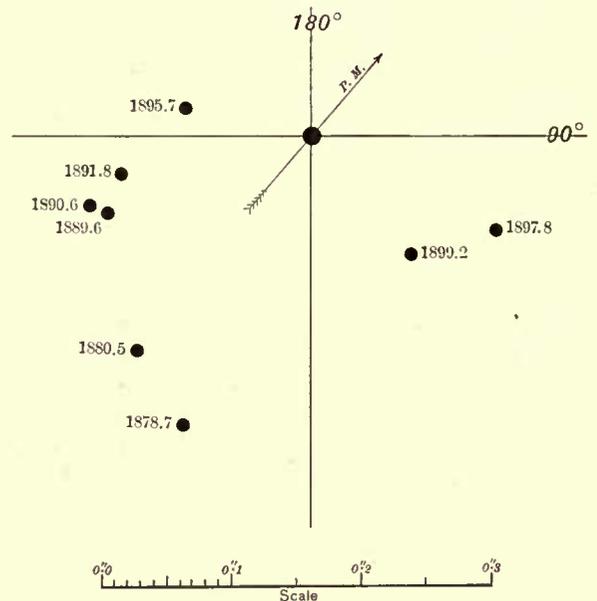
AB and C (=  $\Sigma$  318)

|         |       |       |              |    |            |
|---------|-------|-------|--------------|----|------------|
| 1829.14 | 236.8 | 14.08 | 5.5 ... 10.0 | 2n | $\Sigma$   |
| 1851.79 | 238.2 | 13.99 | 5.6 ... 9.0  | 1n | O $\Sigma$ |
| 1878.15 | 236.1 | 14.04 | ...          | 1n | $\beta$    |
| 1880.82 | 236.9 | 14.00 | ... 8.8      | 1n | $\beta$    |
| 1881.68 | 237.3 | 14.02 | ... 9.2      | 2n | $\beta$    |
| 1890.61 | 237.2 | 14.08 | ... 9.2      | 3n | $\beta$    |
| 1898.82 | 237.5 | 13.90 | ...          | 3n | $\beta$    |

The duplicity of the principal star was discovered with the 18½-inch. It is at all times a difficult pair, and the motion is rapid. It is now known to be one of the most interesting binaries in the heavens. The distance never much exceeds 0".2, so that it is always a difficult pair, and beyond the reach of most telescopes. With the measures down to 1891 I made an attempt to find an approximate orbit, which gave a period of 27.7 years, and GLASENAPP, from the same apparent ellipse, found substantially the same elements. These results are of somewhat doubtful value from uncertainty in the adjustment of the measures as to quadrants. As the components are of about the same magnitude, some of the angles may require a correction of 180°. It is possible that all the positions since 1891 should be in the first quadrant, and that being so, the distance should gradually increase until the first revolution since discovery is completed. The apparent orbit will be very eccentric, and the period

probably more than 30 years. Even if the described arc is not less than 270°, as it would appear from the most probable arrangement of the measures, the data would be insufficient for even an approximate determination of the orbit, as there would be nothing to define the limits of the apparent ellipse in the unexpired part of the orbit. The measures of the next few years will remedy this, and furnish material for getting the elements of the orbit with substantial accuracy.

In the following diagram I have given the principal measures with what seems now to be the most probable arrangement with reference to each other. The measures of the next few years will determine the form of the orbit:



AUWERS gives the proper motion of 20 Persei, 0".081 in the direction of 141°.1. This would change the position-angle of C more than 20° in the interval covered by the measures if that star was fixed in space. As the measures show no relative change, the Herschel companion must be a member of the system.

[ $\beta$  (x) ...  $\beta^2$  ...  $\beta^3$  ...  $\beta^4$  ...  $\beta$  (2957,3048,3114) ...  $\beta$  (*Pub. L. O.* II, pp. 31, 235) ...  $\beta$  (*Ast. & A.-P.* XII, 404) ... Engelmann (2678) ... Barnard (*A. J.* 447) ... See (*A. J.* 359) ... Lewis (*Mon. Not.* LIX, 400) ... Aitken ( ) ... Glasenapp (*Ast. & A.-P.* XII, 499) ... H $\Sigma$  ( ) ... ]

There are other measures than those cited of the wide pair (= H<sup>1</sup> III. 60 = S 420 =  $\Sigma$  318). All

the observations will be found in the references above given, in the original catalogues of HERSCHEL, SOUTH and STRUVE, and in the following :

Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* XI, XII, XIII) ... Herschel II (*Mem. R. A. S.* IV) ... OΣ (*Poulkowa Obsns.* IX) ... Ball (*Dunsink Obsns.* Part v) ... Δ (II) ...]

**β 1173. Arietis 133**

R.A. 2<sup>h</sup> 51<sup>m</sup> 38<sup>s</sup> }  
Decl. + 23° 39' }

A and B

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1890.88 | 325.4 | 0.13 | 7.7 ... 7.8 | 3 <sup>n</sup> | β  |
| 1898.88 | 331.3 | 0.15 | ...         | 1 <sup>n</sup> | Hu |

AB and C

|         |       |      |        |                |    |
|---------|-------|------|--------|----------------|----|
| 1890.88 | 283.6 | 4.63 | ... 13 | 3 <sup>n</sup> | β  |
| 1898.88 | 284.7 | 4.86 | ...    | 1 <sup>n</sup> | Hu |
| 1898.96 | 288.3 | 4.32 | ... 13 | 1 <sup>n</sup> | β  |

A fine triple; discovered with the 36-inch. The close pair is very difficult. The principal star (Lalande 5468) is 6.8 m in D.M.

[β (xvii) ... β (3047) ... β (*Pub. L. O.* II) ... Hussey ( ) ...]

**β 741. Lacaille 932**

R.A. 2<sup>h</sup> 51<sup>m</sup> 58<sup>s</sup> }  
Decl. - 25° 27' }

A and B

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1879.69 | 158.2 | 0.57 | 7.7 ... 7.9 | 4 <sup>n</sup> | β |
| 1891.77 | 165.6 | 1.26 | 7.8 ... 8.0 | 3 <sup>n</sup> | β |
| 1898.69 | 167.4 | 1.39 | 8.0 ... 8.2 | 2 <sup>n</sup> | β |

AB and C (= S 423)

|         |       |       |             |                |    |
|---------|-------|-------|-------------|----------------|----|
| 1824.95 | 219.1 | 27.75 | 8½ ... 9    | 2 <sup>n</sup> | S  |
| 1851.04 | 221.4 | 27.70 | 7.3 ... 7.5 | 2 <sup>n</sup> | WJ |
| 1879.69 | 221.4 | 27.80 | ... 7.9     | 2 <sup>n</sup> | β  |
| 1884.83 | 222.3 | 27.55 | ...         | 1 <sup>n</sup> | W  |
| 1891.77 | 221.1 | 28.04 | ... 7.9     | 3 <sup>n</sup> | β  |
| 1898.69 | 222.1 | 28.11 | ... 8.0     | 2 <sup>n</sup> | β  |

The duplicity of the principal star of SOUTH'S wide pair was discovered with the 6-inch. The

measures show decided motion in angle and distance.

[β (xi) ... β<sup>2</sup> ... β (3114) ... β (*Pub. L. O.* I, II) ...]

There has been no change in the position of the distant star. The principal measures are given above. The following references relate to the wide pair :

[Dunlop (*Mem. R. A. S.* III) ... Jacob (same, xvii) ... Powell (same, xxv) ... Herschel (same, vi) (*Cape Obsns.*) ... Worster and Jacob (*Madras Obsns.* first series) ... Glasenapp (II) ... Cin<sup>4</sup> ... Cin<sup>5</sup> ... Wilson (Cin<sup>10</sup>) ...]

**β 525. B.A.C. 920**

R.A. 2<sup>h</sup> 52<sup>m</sup> 0<sup>s</sup> }  
Decl. + 21° 8' }

|         |       |        |             |                |     |
|---------|-------|--------|-------------|----------------|-----|
| 1877.72 | 105.1 | 0.59   | 7.0 ... 7.0 | 1 <sup>n</sup> | β   |
| 1879.69 | 107.3 | 0.39   | 7.5 ... 7.5 | 1 <sup>n</sup> | β   |
| 1881.87 | 119.2 | ...    | ...         | 1 <sup>n</sup> | Big |
| 1883.30 | 100.2 | 0.26   | ...         | 8 <sup>n</sup> | En  |
| 1886.16 | 109.0 | 0.45   | ...         | 2 <sup>n</sup> | HΣ  |
| 1888.69 | 100.2 | 0.45   | 7.0 ... 7.0 | 5 <sup>n</sup> | T   |
| 1890.06 | 114.6 | 0.4 ±  | ...         | 3 <sup>n</sup> | T   |
| 1890.58 | 124.6 | 0.3 ±  | ...         | 9 <sup>n</sup> | Sp  |
| 1890.87 | 122.2 | 0.33   | 7.2 ... 7.3 | 3 <sup>n</sup> | β   |
| 1891.74 | 121.3 | 0.29   | 7.5 ... 7.5 | 3 <sup>n</sup> | β   |
| 1895.89 | 125.9 | 0.23   | ...         | 2 <sup>n</sup> | Lew |
| 1896.06 | 128.3 | 0.35 ± | ...         | 1 <sup>n</sup> | Sp  |
| 1896.66 | 134.4 | 0.33   | ...         | 3 <sup>n</sup> | Lew |
| 1897.91 | 132.6 | 0.29   | ...         | 4 <sup>n</sup> | Lew |
| 1898.05 | 142.5 | 0.35 ± | ...         | 1 <sup>n</sup> | Sp  |
| 1898.10 | 127.3 | 0.30   | ...         | 3 <sup>n</sup> | Lew |
| 1898.80 | 134.5 | 0.32   | ...         | 3 <sup>n</sup> | Hu  |
| 1898.95 | 131.0 | 0.40   | ...         | 1 <sup>n</sup> | Bry |

Discovered with the 26 inch at the Naval Observatory. An interesting binary near ε Arietis. The *Berlin Catalogue* gives the proper motion of this star, 0".062 in the direction of 130°. The distance is decreasing, and rapid change in the angle may be expected.

[β (x) ... β<sup>1</sup> ... β<sup>2</sup> ... β (3048, 3114) ... β (*Pub. L. O.* II) ... Engelmann (2678) ... Tarrant (2991, 3186) ... Bigourdan (*Paris Obsns.* 1883) ... Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895) ... Sp (III) ... Lewis and Bryant (*Mon. Not.* LIX, 400) ... Hussey ( ) ... HΣ ( ) ...]

**β 11. ρ<sup>2</sup> Eridani**

R.A. 2<sup>h</sup> 56<sup>m</sup> 49<sup>s</sup> }  
Decl. — 8° 9' }

|         |      |      |             |            |          |
|---------|------|------|-------------|------------|----------|
| 1875.64 | 87.2 | 2.72 | 5.4... 9.6  | 5 <i>n</i> | <i>J</i> |
| 1877.82 | 85.9 | 2.45 | 5.5... 8.8  | 2 <i>n</i> | Cin      |
| 1879.95 | 85.1 | 2.47 | 6.0... 10.2 | 3 <i>n</i> | β        |
| 1884.83 | 81.8 | 2.64 | 5.8... 9.0  | 1 <i>n</i> | W        |
| 1886.82 | 81.8 | 2.72 | 6.2... 9.2  | 2 <i>n</i> | LM       |
| 1887.88 | 86.5 | 2.49 | 5.0... 10.0 | 2 <i>n</i> | T        |
| 1888.05 | 84.5 | ...  | 6.0... 10.3 | 1 <i>n</i> | Lv       |
| 1888.86 | 85.0 | 2.47 | 5.5... 9.5  | 2 <i>n</i> | T        |
| 1891.80 | 84.8 | 2.64 | 4.5... 8.5  | 2 <i>n</i> | Col      |
| 1898.83 | 83.8 | 2.41 | 6.2... 11.3 | 3 <i>n</i> | Cg       |

Discovered with the 6-inch. There appears to be no sensible change in either angle or distance. This star has no appreciable proper motion.

[β (1)...β (*Mon. Not.* xxxiii, 351)...β<sup>3</sup>...*A* (1)...*A* (2081) ...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...LM...Lv...Tarrant (2899, 2991)...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Cogshall (...)]

**β 1174. Lalande 5683**

R.A. 2<sup>h</sup> 57<sup>m</sup> 46<sup>s</sup> }  
Decl. — 11° 27' }

|         |       |      |             |            |   |
|---------|-------|------|-------------|------------|---|
| 1890.82 | 305.9 | 1.22 | 7.7... 11.3 | 3 <i>n</i> | β |
| 1898.69 | 298.9 | 1.21 | 8.0... 12.0 | 1 <i>n</i> | β |

Discovered with the 12-inch. The principal star has a considerable proper motion:

Rad<sup>3</sup> - - - 0.163 in 169.6  
Porter - - - 0.201 in 178.3

The measures are sufficient to show that this is a physical system, since the two stars are moving together.

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...]

**β 1175. Lalande 5636**

R.A. 2<sup>h</sup> 57<sup>m</sup> 49<sup>s</sup> }  
Decl. + 43° 14' }

|         |       |      |            |            |   |
|---------|-------|------|------------|------------|---|
| 1890.68 | 280.9 | 0.26 | 7.3... 8.7 | 3 <i>n</i> | β |
|---------|-------|------|------------|------------|---|

Discovered with the 36-inch.

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...]

**β 526. β Persei (ALGOL)**

R.A. 3<sup>h</sup> 0<sup>m</sup> 22<sup>s</sup> }  
Decl. + 40° 30' }

A and B

|         |       |       |             |            |   |
|---------|-------|-------|-------------|------------|---|
| 1878.81 | 155.3 | 59.06 | Var... 12.7 | 3 <i>n</i> | β |
| 1891.97 | 155.4 | 57.48 | ... 13.5    | 2 <i>n</i> | β |
| 1898.96 | 155.4 | 58.79 | ...         | 1 <i>n</i> | β |

A and C

|         |       |       |          |            |   |
|---------|-------|-------|----------|------------|---|
| 1878.81 | 144.8 | 68.07 | ... 12.5 | 3 <i>n</i> | β |
| 1891.97 | 144.3 | 68.38 | ... 14.2 | 1 <i>n</i> | β |
| 1898.96 | 144.8 | 67.19 | ...      | 1 <i>n</i> | β |

A and D

|         |       |       |          |            |   |
|---------|-------|-------|----------|------------|---|
| 1879.30 | 192.6 | 81.91 | ... 10.5 | 4 <i>n</i> | β |
| 1891.97 | 192.5 | 81.51 | ... 11.0 | 2 <i>n</i> | β |
| 1898.96 | 192.4 | 81.78 | ... 11.5 | 1 <i>n</i> | β |

D and E

|         |       |       |          |            |   |
|---------|-------|-------|----------|------------|---|
| 1878.81 | 116.2 | 10.80 | ... 12.5 | 3 <i>n</i> | β |
| 1891.97 | 115.0 | 11.52 | ... 12.5 | 2 <i>n</i> | β |
| 1898.96 | 118.0 | 11.98 | ... 12.0 | 1 <i>n</i> | β |

The faint stars near the well-known variable *Algol* were noted with the 18½-inch. No elongation of the principal star, or any close companion, could be seen with the 36-inch under favorable conditions. The large star has a small proper motion, 0.013 in the direction of 242.3 (*AUWERS*). There is no possibility of these faint stars being other than optical companions.

[β (x)...β<sup>r</sup>...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* 11)...]

**β 527. W<sup>r</sup> 11. 1057**

R.A. 3<sup>h</sup> 0<sup>m</sup> 35<sup>s</sup> }  
Decl. — 13° 43' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1877.83 | 60.4  | 0.85 | 8.0... 8.5 | 1 <i>n</i> | β   |
| 1877.95 | 237.6 | 0.76 | 7.8... 8.3 | 1 <i>n</i> | Cin |
| 1892.03 | 66.0  | 0.83 | 8.1... 8.4 | 3 <i>n</i> | β   |
| 1898.88 | 65.3  | 0.81 | 8.2... 8.2 | 3 <i>n</i> | Bd  |

Discovered with the 18½-inch; closely *sp* Σ 356.

[β (x)...β<sup>r</sup>...β (3114)...β (*Pub. L. O.* 11)...Cin<sup>4</sup>...Booth royd (...)]

**β 528.** W<sup>1</sup> II. 1086

R.A. 3<sup>h</sup> 2<sup>m</sup> 25<sup>s</sup> }  
Decl. - 4° 3' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1877.97 | 197.5 | 1.01 | 8.5... | 8.5 | 2 <sup>n</sup> | β   |
| 1886.84 | 12.5  | 0.91 | 8.2... | 8.3 | 1 <sup>n</sup> | LM  |
| 1889.02 | 197.3 | ...  | 8.5... | 8.6 | 1 <sup>n</sup> | Lv  |
| 1891.72 | 195.4 | 1.00 | ...    | ... | 1 <sup>n</sup> | Col |
| 1898.82 | 197.6 | 0.95 | 8.8... | 8.8 | 3 <sup>n</sup> | Cg  |

Discovered with the 18½-inch. In the field with Σ 358.

[β (x)...β<sup>1</sup>...LM...Lv<sup>1</sup>...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Cogshall ( )...]

**β 1030.** W<sup>2</sup> III. 5

R.A. 3<sup>h</sup> 3<sup>m</sup> 12<sup>s</sup> }  
Decl. + 21° 17' }

|         |       |      |        |     |                 |     |
|---------|-------|------|--------|-----|-----------------|-----|
| 1888.83 | 164.6 | 0.58 | 8.4... | 8.4 | 3 <sup>n</sup>  | β   |
| 1890.64 | 168.9 | 0.5± | ...    | ... | 10 <sup>n</sup> | Sp  |
| 1895.92 | 165.0 | 0.71 | ...    | ... | 2 <sup>n</sup>  | Lew |
| 1896.52 | 161.7 | 0.48 | ...    | ... | 2 <sup>n</sup>  | Lew |
| 1897.89 | 162.6 | 0.53 | ...    | ... | 2 <sup>n</sup>  | Lew |
| 1897.93 | 160.9 | 0.76 | ...    | ... | 3 <sup>n</sup>  | A   |
| 1898.11 | 159.9 | 0.42 | ...    | ... | 1 <sup>n</sup>  | Lew |
| 1898.12 | 154.2 | 0.48 | ...    | ... | 1 <sup>n</sup>  | Bow |

Discovered with the 36-inch. The measures taken together do not indicate any sensible motion.

[β (xiv)...β (2875)...β (*Pub. L. O.* II)...Sp (III)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Aitken (*A. J.* 429)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

**β 1176.** 48 *Cephei* (H)

R.A. 3<sup>h</sup> 5<sup>m</sup> 9<sup>s</sup> }  
Decl. + 77° 17' }

A and B

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1890.65 | 277.6 | 1.18 | 5.7... | 12.5 | 3 <sup>n</sup> | β |
|---------|-------|------|--------|------|----------------|---|

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1890.63 | 227.9 | 10.95 | ... | 13.3 | 2 <sup>n</sup> | β |
|---------|-------|-------|-----|------|----------------|---|

Discovered with the 36-inch. The close pair is difficult. The principal star (B.A.C. 979) has a proper motion, according to AUWERS, of 0.073 in the direction of 137°.5. A measure of AB at this time would show at once whether this movement is common to both components.

[β (xvii)...β (3047)...β (*Pub. L. O.* II)...]

**β 400.** *Eridani* 103

R.A. 3<sup>h</sup> 5<sup>m</sup> 18<sup>s</sup> }  
Decl. - 4° 16' }

|         |      |       |        |      |                |   |
|---------|------|-------|--------|------|----------------|---|
| 1877.95 | 53.2 | 21.69 | 7.0... | 11.5 | 1 <sup>n</sup> | β |
| 1879.01 | 53.1 | 22.19 | 6.4... | 12.0 | 3 <sup>n</sup> | β |
| 1891.96 | 54.1 | 22.74 | 7.0... | 11.7 | 2 <sup>n</sup> | β |
| 1898.71 | 53.7 | 22.61 | 6.2... | 11.7 | 2 <sup>n</sup> | β |

Discovered with the 6-inch. This is a naked-eye star, Heis 6 m (= Lalande 5925 = W<sup>1</sup> 111. 50).

[β (vii)...β (2103)...β<sup>1</sup>...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* II)...]

**β 530.** *Arietis* 161

R.A. 3<sup>h</sup> 7<sup>m</sup> 18<sup>s</sup> }  
Decl. + 22° 30' }

B and C

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1879.21 | 195.8 | 1.77 | 9.7... | 10.4 | 4 <sup>n</sup> | β   |
| 1892.00 | 194.2 | 1.70 | 9.7... | 10.1 | 3 <sup>n</sup> | β   |
| 1896.85 | ...   | 1.68 | ...    | ...  | 1 <sup>n</sup> | Bow |
| 1896.93 | 197.0 | 1.84 | ...    | ...  | 1 <sup>n</sup> | Lew |
| 1898.11 | 193.3 | 2.23 | ...    | ...  | 1 <sup>n</sup> | Lew |
| 1898.75 | 194.0 | 1.66 | 8.7... | 9.2  | 2 <sup>n</sup> | β   |

A and B (= Σ 366 *rej.*)

|         |      |       |        |                |   |
|---------|------|-------|--------|----------------|---|
| 1879 21 | 41.5 | 48.88 | 7.0... | 4 <sup>n</sup> | β |
| 1892.00 | 40.9 | 48.40 | 7.8... | 2 <sup>n</sup> | β |
| 1898.75 | 40.8 | 48.08 | 7.1... | 2 <sup>n</sup> | β |

The distant companion of this rejected pair of Σ was found to be double with the 18½-inch. Thus far the measures indicate no change. The above are all the measures of AB. Lalande 5961.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* II)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

**β 529.** Lalande 6006

R.A. 3<sup>h</sup> 8<sup>m</sup> 9<sup>s</sup> }  
Decl. - 9° 1' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1877.89 | 220.0 | 2.40 | 8.0... | 12.0 | 2 <sup>n</sup> | β  |
| 1891.86 | 222.4 | 3.11 | 8.0... | 12.2 | 2 <sup>n</sup> | β  |
| 1898.76 | 222.4 | 2.94 | 8.5... | 11.5 | 1 <sup>n</sup> | β  |
| 1898.82 | 220.7 | 3.50 | 7.5... | 13.7 | 2 <sup>n</sup> | Cg |

Discovered with the 18½-inch.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* II)...Cogshall ( )...]

**$\beta$  84.** W<sup>3</sup> III. 147

R.A. 3<sup>h</sup> 10<sup>m</sup> 5<sup>s</sup> }  
Decl. — 6° 22' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.85 | 10.3 | 0.44 | 7.2... 7.4 | 5 <sup>n</sup> | $\Delta$ |
| 1877.83 | 25.7 | ...  | 6.0... 8.0 | 2 <sup>n</sup> | Cin      |
| 1879.39 | 32.4 | 0.72 | 6.4... 7.5 | 5 <sup>n</sup> | $\beta$  |
| 1879.69 | 27.9 | 0.56 | 7.2... 8.5 | 1 <sup>n</sup> | $\beta$  |
| 1879.78 | 30.6 | 0.73 | 6.0... 8.0 | 1 <sup>n</sup> | Cin      |
| 1886.71 | 27.1 | 0.76 | 6.2... 8.0 | 3 <sup>n</sup> | LM       |
| 1888.52 | 22.4 | 0.51 | 7.0... 8.0 | 4 <sup>n</sup> | T        |
| 1888.94 | 21.5 | 0.58 | 6.4... 7.7 | 2 <sup>n</sup> | Lv       |
| 1889.05 | 21.8 | 0.59 | ...        | 2 <sup>n</sup> | T        |
| 1889.52 | 26.0 | 0.66 | ...        | 5 <sup>n</sup> | Sp       |
| 1890.89 | 27.3 | 0.73 | 6.8... 7.3 | 4 <sup>n</sup> | $\beta$  |
| 1897.05 | 21.4 | 0.87 | 7.0... 8.0 | 1 <sup>n</sup> | A        |
| 1898.02 | 17.8 | 0.57 | 6.8... 8.3 | 1 <sup>n</sup> | Bry      |

Discovered with the 6-inch. This is a naked-eye star in *Cetus*; Argelander and Heis, 6m. While the measures are somewhat discordant for so easy a pair, they do not point to any sensible change.

[ (II)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3048)  
... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)... $\Delta$  (2081)...Cin<sup>4</sup>...Cin<sup>6</sup>  
...I.M...Lv<sup>1</sup>...Farrant (2991)...Glasenapp (II)...Sp  
III)...Aitken (3465)...Bryant (*Mon. Not.* I.IX, 400)...]

**1039.** Lalande 6084

R.A. 3<sup>h</sup> 11<sup>m</sup> 0<sup>s</sup> }  
Decl. + 7° 13' }

|         |       |      |           |                |         |
|---------|-------|------|-----------|----------------|---------|
| 1889.00 | 209.4 | 1.87 | 7.0... 13 | 3 <sup>n</sup> | $\beta$ |
| 1898.92 | 208.2 | 2.43 | 7.0... 13 | 1 <sup>n</sup> | A       |

Discovered with the 36-inch.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 **$\beta$  1177.** D.M. (—1°) 473

R.A. 3<sup>h</sup> 12<sup>m</sup> 45<sup>s</sup> }  
Decl. — 1° 28' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1890.82 | 24.7 | 0.38 | 9.1... 9.1 | 3 <sup>n</sup> | $\beta$ |
|---------|------|------|------------|----------------|---------|

Discovered with the 36-inch while examining 95 *Ceti* (= A.C. 2). This new pair is 31<sup>s</sup>.7 *f* and 5' 42" *s* of that star. The magnitude in D.M. is 9.3.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  742.**

R.A. 3<sup>h</sup> 17<sup>m</sup> }  
Decl. + 48° 50' }

This star was suspected to be a very close pair with the 6-inch on Mt. Hamilton in 1879. I made a careful search with the 36-inch in 1891 without finding any close pair in or near this place. The suspected elongation was probably not real.

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  1178.** *Tauri* 7

R.A. 3<sup>h</sup> 17<sup>m</sup> 20<sup>s</sup> }  
Decl. + 4° 27' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1890.89 | 347.8 | 0.99 | 6.6... 12.3 | 3 <sup>n</sup> | $\beta$ |
|---------|-------|------|-------------|----------------|---------|

Discovered with the 36-inch. The magnitude in D.M. is 7.7, and in BOSS 7.3, while GOULD gives 6.6. It is Lalande 6267.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  531.** Lalande 6275

R.A. 3<sup>h</sup> 17<sup>m</sup> 26<sup>s</sup> }  
Decl. — 8° 13' }

|         |      |      |             |                |         |
|---------|------|------|-------------|----------------|---------|
| 1877.92 | 60.1 | 2.43 | 6.7... 12.3 | 2 <sup>n</sup> | $\beta$ |
| 1891.75 | 53.6 | 2.94 | 6.5... 11.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.74 | 57.4 | 2.88 | 6.7... 11.2 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. A naked-eye star in *Eridanus*; Heis 6-7 m, S.D. 6.5 m. It has a considerable proper motion, which obviously belongs to both opponents:

|        |   |   |       |          |
|--------|---|---|-------|----------|
| Stumpe | - | - | 0.250 | in 180.0 |
| Porter | - | - | 0.225 | in 189.5 |

[ $\beta$  (x)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  12.** Lalande 6313

R.A. 3<sup>h</sup> 18<sup>m</sup> 47<sup>s</sup> }  
Decl. — 14° 25' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.40 | 271.8 | 2.35 | 7.5... 10.4 | 4 <sup>n</sup> | $\Delta$ |
| 1877.83 | 273.3 | 2.36 | 6.9... 9.0  | 3 <sup>n</sup> | Cin      |
| 1886.88 | 274.8 | 2.45 | 7.1... 9.1  | 4 <sup>n</sup> | LM       |
| 1888.53 | 272.6 | 2.31 | 7.2... 9.5  | 2 <sup>n</sup> | Lv       |
| 1898.85 | 272.4 | 2.14 | 7.3... 9.7  | 3 <sup>n</sup> | Bd       |

Discovered with the 6-inch. Without change.

[ $\beta$  (i)... $\beta$  (*Mon. Not.* xxxiii, 351)...Cin<sup>4</sup>...LM...Lv<sup>1</sup>...  
Boothroyd ( )...]

**β 1179.** 34 *Persei*

R.A. 3<sup>h</sup> 20<sup>m</sup> 47<sup>s</sup> }  
Decl. + 49° 6'

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1890.64 | 163.4 | 0.68 | 5.9...11.6 | 4 <sup>n</sup> | β  |
| 1898.73 | 164.5 | 0.70 | ...        | 3 <sup>n</sup> | Hu |

Discovered with the 36-inch. A difficult pair. The proper motion of this star is 0.<sup>s</sup>034 in the direction of 175°0 (AUWERS) The measures show that this is common to both stars.

[β (xvii)...β (3047)...β (*Pub. L. O. II*)...Hussey ( )...]

**β 878.** 66 *Arietis*

R.A. 3<sup>h</sup> 21<sup>m</sup> 28<sup>s</sup> }  
Decl. + 22° 23'

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1881.06 | 78.0 | 1.10 | 6.0...12.2 | 2 <sup>n</sup> | β   |
| 1890.89 | 76.1 | 1.29 | 5.8...13.7 | 3 <sup>n</sup> | β   |
| 1897.88 | 74.1 | 1.05 | ...        | 1 <sup>n</sup> | Lew |

Discovered with the 18½-inch. A more difficult pair than the distance and magnitude would indicate. This star has a considerable proper motion:

|        |   |   |       |          |
|--------|---|---|-------|----------|
| Auwers | - | - | 0.120 | in 185.3 |
| Porter | - | - | 0.115 | in 186.9 |

It is apparent from the measures that this is a physical pair. If the small star was fixed in space, the proper motion of A in the interval would decrease the position-angle 36°, and add 0.<sup>s</sup>7 to the distance.

[β (xiii)...β<sup>3</sup>...β (3048)...β (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX, 400*)...]

**β 879.** B.A.C. 1076

R.A. 3<sup>h</sup> 22<sup>m</sup> 3<sup>s</sup> }  
Decl. + 10° 58'

|         |      |       |            |                |   |
|---------|------|-------|------------|----------------|---|
| 1878.98 | 71.0 | 24.65 | 6.5...12.5 | 3 <sup>n</sup> | β |
| 1898.72 | 70.4 | 24.50 | 6.5...11.2 | 2 <sup>n</sup> | β |
| 1898.76 | 71.8 | 24.70 | 6.5...12.2 | 2 <sup>n</sup> | A |

A distant attendant noted with the 18½-inch. Lalande 6400.

[β (xiii)...β<sup>3</sup>...Aitken ( )...]

**β 1180.** Lalande 6417

R.A. 3<sup>h</sup> 22<sup>m</sup> 23<sup>s</sup> }  
Decl. - 4° 59'

A and B

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1890.82 | 24.8 | 0.44 | 8.3... 9.3 | 3 <sup>n</sup> | β |
|---------|------|------|------------|----------------|---|

A and C

|         |       |      |         |                |   |
|---------|-------|------|---------|----------------|---|
| 1890.82 | 117.9 | 7.13 | ...11.5 | 3 <sup>n</sup> | β |
| 1899.09 | 119.4 | 7.07 | ...10.5 | 2 <sup>n</sup> | β |

Discovered with the 36-inch.

[β (xvii)...β (3048)...β (*Pub. L. O. II*)...]

**β 787.** Lalande 6473

R.A. 3<sup>h</sup> 25<sup>m</sup> 49<sup>s</sup> }  
Decl. + 48° 13'

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.69 | 228.5 | 2.05 | 8.0...12.0 | 3 <sup>n</sup> | β   |
| 1885.96 | 227.3 | 2.35 | ...        | 1 <sup>n</sup> | HΣ  |
| 1888.59 | 233.1 | 2.02 | 7.9...12.4 | 3 <sup>n</sup> | Com |
| 1898.70 | 245.6 | 2.39 | ...        | 1 <sup>n</sup> | Hu  |
| 1899.13 | 243.3 | 2.40 | 8.0...11.5 | 1 <sup>n</sup> | β   |

Discovered with the 15½-inch at the Washburn Observatory. There seems to be some change in the angle.

HUSSEY measures a third star, 175°8 : 12.<sup>s</sup>70 (1898.70) 1<sup>n</sup>. I could not see this on one night with the 40-inch, but measured 11 m star in nearly the same direction, 175°6 : 36.<sup>s</sup>78 (1899.13) 1<sup>n</sup>.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy. vi*)...HΣ ( )...Hussey ( )...]

**β 788.** D.M. (42°) 786

R.A. 3<sup>h</sup> 27<sup>m</sup> 9<sup>s</sup> }  
Decl. + 42° 11'

A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.69 | 306.2 | 2.78 | 8.3...10.5 | 4 <sup>n</sup> | β   |
| 1888.06 | 302.2 | 2.66 | 8.5...10.2 | 3 <sup>n</sup> | Com |

A and C

|         |      |       |         |                |     |
|---------|------|-------|---------|----------------|-----|
| 1881.69 | 82.2 | 34.44 | ... 8.8 | 4 <sup>n</sup> | β   |
| 1887.99 | 82.4 | 34.00 | ... 8.8 | 2 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy. vi*)...]

**$\beta$  532.** Lalande 6585

R.A.  $3^h 27^m 25^s$  }  
Decl.  $- 10^\circ 27'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.29 | 266.7 | 3.05 | 7.7...12.5 | 3 <sup>n</sup> | $\beta$ |
| 1891.86 | 271.2 | 3.05 | 8.1...11.7 | 2 <sup>n</sup> | $\beta$ |
| 1898.89 | 271.4 | 2.99 | 8.5...14.0 | 2 <sup>n</sup> | Cg      |

Discovered with the 18½-inch. There is an 8 m star 80" distant in the direction of  $310^\circ$ .

[ $\beta$  (x)... $\beta^1$ ... $\beta^2$ ... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cogshall ( )...]

 **$\beta$  533.** B.A.C. 1101

R.A.  $3^h 28^m 9^s$  }  
Decl.  $+ 31^\circ 17'$  }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1878.67 | 149.3 | 0.43 | 7.0... 7.0 | 1 <sup>n</sup> | $\beta$    |
| 1878.91 | 66.1  | 0.42 | 6.8... 7.0 | 1 <sup>n</sup> | $\beta$    |
| 1883.12 | 59.8  | 0.25 | 7.2        | 5 <sup>n</sup> | En         |
| 1886.15 | 47.4  | 0.53 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1890.61 | 50.7  | 0.5± | ...        | 5 <sup>n</sup> | Sp         |
| 1891.69 | 52.2  | 0.51 | 8.0... 8.0 | 3 <sup>n</sup> | $\beta$    |
| 1896.11 | 50.3  | 0.56 | ...        | 1 <sup>n</sup> | Sp         |
| 1898.12 | 49.7  | 0.51 | ...        | 2 <sup>n</sup> | Bow        |
| 1897.99 | 50.2  | 0.60 | ...        | 1 <sup>n</sup> | Hu         |
| 1808.41 | 49.1  | 0.55 | 8.5... 8.5 | 2 <sup>n</sup> | L          |
| 1898.82 | 52.4  | 0.64 | ...        | 3 <sup>n</sup> | Hu         |
| 1898.97 | 53.0  | 0.51 | ...        | 1 <sup>n</sup> | Bry        |

Discovered with the 18½-inch. There is evidently an error in reading my first angle. There may be some motion in angle. This star has an annual movement of 0.031 in the direction of  $196^\circ 6$ , and this must belong to both components.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)... Engelmann (2678)...H $\Sigma$  ( )...Sp (111)...Hussey (*A. J.* 427)... Lewis and Bowyer (*Mon. Not.* LIX, 400)... Hussey ( )...]

 **$\beta$  1040.** Lalande 6591

R.A.  $3^h 28^m 49^s$  }  
Decl.  $+ 29^\circ 35'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1888.91 | 337.0 | 3.54 | 8.0...11.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.73 | 338.0 | 3.56 | 8.3...12.0 | 1 <sup>n</sup> | $\beta$ |

Discovered with the 36-inch. The magnitude in D.M. is 7.4.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...]

 **$\beta$  308.** W<sup>r</sup> III. 564

R.A.  $3^h 32^m 4^s$  }  
Decl.  $- 8^\circ 2'$  }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1876.02 | 332.9 | 1.65 | 9 ... 10    | 3 <sup>n</sup> | H1       |
| 1876.84 | 329.9 | 1.50 | 8.7... 9.7  | 3 <sup>n</sup> | $\Delta$ |
| 1877.87 | 329.5 | 1.80 | 8.2... 9.0  | 1 <sup>n</sup> | Cin      |
| 1886.67 | 331.7 | 1.78 | 8.2... 9.4  | 3 <sup>n</sup> | LM       |
| 1888.05 | 331.8 | 1.80 | 9 ... 10    | 2 <sup>n</sup> | H1       |
| 1898.86 | 330.8 | 1.88 | 8.7... 10.1 | 3 <sup>n</sup> | Cg       |

Discovered with the 6-inch. Probably fixed This is Lalande 6709.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (1)...Cin<sup>4</sup>...LM...Hall (1, 11)... Cogshall ( )...]

 **$\beta$  1231.** D.M. (65°) 359

R.A.  $3^h 32^m 45^s$  }  
Decl.  $+ 65^\circ 36'$  }

A and B

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1891.84 | 15.1 | 2.64 | 8.2...12.5 | 5 <sup>n</sup> | $\beta$ |
| 1898.89 | 13.1 | 2.61 | 8.0...13.0 | 1 <sup>n</sup> | A       |

A and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1891.84 | 252.4 | 83.75 | ... 8.3 | 5 <sup>n</sup> | $\beta$ |
| 1898.89 | 252.6 | 84.06 | ... 8.0 | 1 <sup>n</sup> | A       |

Discovered with the 12-inch. C is D.M. (65°) 358.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11)... Aitken ( )...]

 **$\beta$  1181.** Lalande 6685

R.A.  $3^h 32^m 54^s$  }  
Decl.  $+ 45^\circ 30'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.66 | 270.5 | 0.35 | 8.1... 8.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.70 | 88.9  | 0.40 | ...        | 1 <sup>n</sup> | Hu      |

Discovered with the 36-inch. Near O $\Sigma$  59.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* 11)...Hussey ( )...]

**β 534.** Lalande 6741

R.A. 3<sup>h</sup> 33<sup>m</sup> 1<sup>s</sup> }  
Decl. - 8° 54' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1879.24 | 195.3 | 2.40 | 7.5... 11.1 | 4 <sup>n</sup> | β  |
| 1891.86 | 193.1 | 2.58 | 8.0... 11.7 | 2 <sup>n</sup> | β  |
| 1898.87 | 194.1 | 2.66 | 8.0... 12.5 | 2 <sup>n</sup> | Bd |

Discovered with the 18½-inch. No material change.

[β (x)...β²...β³...β (3114)...β (Pub. L. O. II)...Boothroyd ( )...]

**β 1182.** Lalande 6759

R.A. 3<sup>h</sup> 35<sup>m</sup> 30<sup>s</sup> }  
Decl. + 48° 8' }

A and B

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1890.62 | 261.2 | 4.37 | 6.4... 14.2 | 3 <sup>n</sup> | β  |
| 1898.71 | 260.4 | 4.45 | ...         | 1 <sup>n</sup> | Hu |

A and C

|         |       |       |          |                |    |
|---------|-------|-------|----------|----------------|----|
| 1890.62 | 242.6 | 19.27 | ... 13.5 | 3 <sup>n</sup> | β  |
| 1898.71 | 242.8 | 18.76 | ...      | 1 <sup>n</sup> | Hu |

Discovered with the 36-inch. BATTERMAN (A.N. 3507) gives the proper motion of this star, 0.028 in the direction of 186°.1.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Hussey ( )...]

**β 535.** o, 38 Persei

R.A. 3<sup>h</sup> 36<sup>m</sup> 47<sup>s</sup> }  
Decl. + 31° 54' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1877.84 | 60.5 | 0.96 | ...        | 1 <sup>n</sup> | Δ   |
| 1878.25 | 56.8 | 0.83 | 4.0... 8.5 | 4 <sup>n</sup> | β   |
| 1879.69 | 53.2 | 0.67 | 4.0... 7.0 | 1 <sup>n</sup> | β   |
| 1888.42 | 51.1 | 0.97 | ...        | 5 <sup>n</sup> | HΣ  |
| 1888.71 | 59.2 | 1.09 | ... 8.7    | 3 <sup>n</sup> | β   |
| 1890.10 | 56.1 | 1.01 | ...        | 3 <sup>n</sup> | T   |
| 1890.61 | 49.7 | 0.87 | ...        | 5 <sup>n</sup> | Sp  |
| 1891.16 | 50.3 | 0.99 | ...        | 1 <sup>n</sup> | Big |
| 1894.36 | 48.2 | 0.97 | ...        | 7 <sup>n</sup> | HΣ  |

Discovered with the 18½-inch. The measures are not very accordant, but the motion, if any, is very slow. AUWERS gives the annual movement of this star, 0.023 in the direction of 243°.8, so that with the small star stationary, the distance between the components, would increase by this amount

annually, and at this time (1898) the distance should be about 1.5. It is obvious from the measures that the two stars are moving together.

[β (x)...β²...β³...β (2875)...β (Pub. L. O. II)...Tarrant (3186)...Bigourdan (Bul. Ast. xviii)...Sp (iii)...HΣ ( )...]

**β 880.** D.M. (31°) 634

R.A. 3<sup>h</sup> 37<sup>m</sup> 3<sup>s</sup> }  
Decl. + 31° 47' }

A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1880.90 | 353.7 | 0.45 | 8.7... 8.9 | 2 <sup>n</sup> | β   |
| 1891.69 | 354.7 | 0.51 | 8.4... 8.4 | 3 <sup>n</sup> | β   |
| 1898.12 | 349.2 | 0.40 | ...        | 1 <sup>n</sup> | Bow |
| 1898.76 | 354.9 | 0.55 | 8.5... 8.5 | 1 <sup>n</sup> | β   |
| 1898.97 | 346.9 | 0.42 | ...        | 1 <sup>n</sup> | L   |

AB and C (= Σ 439)

|         |      |       |            |                |   |
|---------|------|-------|------------|----------------|---|
| 1830.99 | 38.1 | 23.20 | 8.0... 9.2 | 2 <sup>n</sup> | Σ |
| 1866.85 | 38.3 | 23.39 | 7.8... 9.0 | 3 <sup>n</sup> | Δ |
| 1879.82 | 38.0 | 23.70 | 8.0... 9.1 | 2 <sup>n</sup> | β |
| 1891.69 | 38.3 | 23.42 | ... 9.2    | 3 <sup>n</sup> | β |
| 1898.82 | 38.2 | 23.46 | 8.5... 8.9 | 2 <sup>n</sup> | β |

The duplicity of the principal star of Σ 439 was discovered with the 18½-inch. It is near the last preceding pair, 38 Persei. There is no change in the distant star. A few of the measures are given.

[β (xiii)...β³...β (3114)...β (Pub. L. O. II)...Madler (Dorpat Obsns. XIII, XV) (Fixstern-Systeme I)...Δ (II)...Cin°... Lewis and Bowyer (Mon. Not. LIX, 400)...]

**β 1041.** W² III. 793, 798

R.A. 3<sup>h</sup> 37<sup>m</sup> 19<sup>s</sup> }  
Decl. + 27° 31' }

B and C

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1888.91 | 347.8 | 7.87  | ... 12.8 | 3 <sup>n</sup> | β |
| 1898.71 | 338.8 | 10.14 | ... 13.2 | 2 <sup>n</sup> | β |
| 1898.76 | 340.4 | 9.84  | ... 12.4 | 2 <sup>n</sup> | A |

A and B (= OΣ (app.) 38)

|         |      |        |            |                |    |
|---------|------|--------|------------|----------------|----|
| 1875.41 | 38.3 | 122.63 | 6.2... 6.3 | 3 <sup>n</sup> | Δ  |
| 1888.91 | 39.9 | 123.57 | 7.0... 7.0 | 3 <sup>n</sup> | β  |
| 1890.73 | 40.0 | 123.63 | 6.5... 6.6 | 4 <sup>n</sup> | Fr |
| 1898.71 | 40.9 | 124.37 | ...        | 2 <sup>n</sup> | β  |
| 1898.72 | 41.0 | 124.48 | 7.5... 8.0 | 1 <sup>n</sup> | A  |

The minute companion to the preceding star of this wide pair was discovered with the 36-inch.

The proper motion of the bright stars is given by RECHENBERG (A.N. 3482) as follows:

|   |   |   |       |    |       |
|---|---|---|-------|----|-------|
| A | - | - | 0.065 | in | 201.8 |
| B | - | - | 0.331 | in | 123.3 |

From the position of the faint star given by the measures of 1888, with the above proper motion, the place of C in 1898.7 should be  $335^{\circ}.2 : 10^{\circ}.44$ . It is evident from the latest measures that this star is fixed in space, and that the two form only an optical pair. All the measures of A and B are given here.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (Pub. L. O. II)... $\Delta$  (I)...Franz (3464) ...Aitken ( )...]

$\beta$  1183. B.A.C. 1142

R.A.  $3^h 37^m 36^s$  }  
Decl.  $+ 45^{\circ} 18'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.65 | 139.9 | 6.48 | 6.3...14.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.71 | 137.4 | 6.71 | ...        | 1 <sup>n</sup> | Hu      |

Discovered with the 36-inch. A naked-eye star in *Perseus*.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (Pub. L. O. II)...Hussey ( )...]

$\beta$  536. W<sup>2</sup> III. 846

R.A.  $3^h 39^m 8^s$  }  
Decl.  $+ 23^{\circ} 49'$  }

A and B

|         |       |      |                     |                |         |
|---------|-------|------|---------------------|----------------|---------|
| 1878.69 | 336.4 | 0.44 | 8.3... 9.3          | 3 <sup>n</sup> | $\beta$ |
| 1890.81 | 322.4 | 0.19 | 8.0... 8.5          | 3 <sup>n</sup> | $\beta$ |
| 1891.74 | 317.1 | 0.19 | 8.5... 8.9          | 3 <sup>n</sup> | $\beta$ |
| 1892.01 |       |      | Single with 36-inch |                | Bar     |
| 1893.71 |       |      | Single with 36-inch |                | Bar     |

C and D

|         |      |       |       |                |         |
|---------|------|-------|-------|----------------|---------|
| 1878.67 | 11.2 | 18.17 | ...12 | 1 <sup>n</sup> | $\beta$ |
| 1891.74 | 9.4  | 18.35 | ...13 | 3 <sup>n</sup> | $\beta$ |
| 1894.09 | 10.0 | 17.98 | ...12 | 2 <sup>n</sup> | W       |
| 1898.89 | 8.2  | 18.02 | ...13 | 1 <sup>n</sup> | A       |

AB and C (= S 437)

|         |       |       |            |                |           |
|---------|-------|-------|------------|----------------|-----------|
| 1823.99 | 299.7 | 34.57 | 9 ...10    | 2 <sup>n</sup> | S         |
| 1878.70 | 302.4 | 36.72 | 8.0...     | 2 <sup>n</sup> | $\beta$   |
| 1891.74 | 303.1 | 36.92 | ... 8.4    | 3 <sup>n</sup> | $\beta$ ] |
| 1894.05 | 303.1 | 36.84 | 8.3... 8.0 | 3 <sup>n</sup> | W         |
| 1898.89 | 303.3 | 37.47 | 8.0... 8.0 | 1 <sup>n</sup> | A         |

The wide pair, first observed by SOUTH, is in the *Pleiades*,  $1^m 15^s p$  *Alcyone*, and  $4' 52'' n$ . The close pair and the faint star D were discovered with the  $18\frac{1}{2}$ -inch. It is a physical system, and it is probable that the period will not be a long one.

There has been no change in the position of C, and this and the faint attendant form only a perspective group. C is W<sup>2</sup> III. 845. All the measures of this star are given above.

[ $\beta$  (x)... $\beta^s$ ... $\beta$  (3048,3114)... $\beta$  (Pub. L. O. II)...Barnard (A. J. 447)...Wilson ( )...Aitken ( )...]

$\beta$  537. D.M. (24°) 563

R.A.  $3^h 39^m 54^s$  }  
Decl.  $+ 24^{\circ} 28'$  }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1877.84 | 194.4 | 0.37 | 8.2...10.0 | 2 <sup>n</sup> | $\Delta$ |
| 1877.91 | 185.9 | 0.60 | 8.5...10.5 | 2 <sup>n</sup> | $\beta$  |
| 1890.88 | 184.8 | 0.48 | 8.4... 9.8 | 3 <sup>n</sup> | $\beta$  |

Discovered with the  $18\frac{1}{2}$ -inch. In the *Pleiades*. Apparently unchanged.

[ $\beta$  (x)... $\beta^s$ ... $\beta$  (3048)... $\beta$  (Pub. L. O. II)... $\Delta$  (I)...]

$\beta$  1003. O. Arg. S. 2518

R.A.  $3^h 40^m 25^s$  }  
Decl.  $- 28^{\circ} 15'$  }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1881.54 | 20.5 | 2.69 | 8.1...12.0 | 2 <sup>n</sup> | $\beta$ |
| 1892.01 | 30.4 | 2.48 | 8.2...11.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.97 | 34.4 | 2.76 | 8.0...13.2 | 2 <sup>n</sup> | Bd      |

Discovered with the 12-inch. There may be some change in the angle. BOOTHROYD suspected the principal star to be a close pair,  $15^{\circ} : 0^{\circ}.4$ .

[ $\beta$  (xiii)... $\beta^s$ ... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...Boothroyd ( )...]

$\beta$  538. Yarnall 1634

R.A.  $3^h 40^m 51^s$  }  
Decl.  $+ 23^{\circ} 44'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.73 | 138.0 | 2.27 | 10 ...11   | 1 <sup>n</sup> | $\beta$ |
| 1898.89 | 130.0 | 1.94 | 9.1...10.4 | 2 <sup>n</sup> | $\beta$ |
| 1898.92 | 128.6 | 1.59 | 10 ...11   | 1 <sup>n</sup> | A       |

A pair of faint stars in the *Pleiades*,  $30^{\circ}.4 f$  and  $20^{\circ}.5 s$  of  $\eta$  *Tauri* (ALCYONE). Not in D.M.

[ $\beta$  (x)... $\beta^s$ ...Aitken ( )...]

**β 1184.** D.M. (21°) 526

R.A. 3<sup>h</sup> 41<sup>m</sup> 14<sup>s</sup> }  
Decl. + 22° 0' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1890.83 | 272.2 | 0.62 | 8.1... 8.3 | 3 <sup>n</sup> | β   |
| 1893.07 | 269.6 | 0.75 | ...        | 1 <sup>n</sup> | Sp  |
| 1896.08 | 267.8 | 0.5± | ...        | 4 <sup>n</sup> | Sp  |
| 1897.86 | 273.8 | 0.59 | ...        | 1 <sup>n</sup> | Lew |
| 1897.88 | 266.3 | 0.73 | ...        | 3 <sup>n</sup> | A   |
| 1897.92 | 264.7 | 0.48 | ...        | 2 <sup>n</sup> | Bow |
| 1898.12 | 275.2 | 0.62 | ...        | 1 <sup>n</sup> | Bow |

Discovered with the 36-inch. Very little, if any, change.

[β (XVII)...β (3047)...β (Pub. L. O. II)...Sp (III)...Aitken (A. J. 429)...Lewis and Bowyer (Mon. Not. LIX, 400)...]

**β 1105.** D.M. (23°) 554

R.A. 3<sup>h</sup> 41<sup>m</sup> 26<sup>s</sup> }  
Decl. + 23° 49' }

|         |      |      |             |                |   |
|---------|------|------|-------------|----------------|---|
| 1889.62 | 57.7 | 0.33 | 9.3... 10.3 | 3 <sup>n</sup> | β |
|---------|------|------|-------------|----------------|---|

Difficult pair in the *Pleiades*, 1<sup>m</sup> 4<sup>s</sup> *f* and 4<sup>s</sup> 3 *n* of *η Tauri* (ALCYONE). Discovered with the 36-inch.

[β (XVI)...β (2956)...β (Pub. L. O. II)...]

**β 1106.** *Pleiades*

R.A. 3<sup>h</sup> 42<sup>m</sup> 58<sup>s</sup> }  
Decl. + 23° 51' }

|         |      |      |              |                |   |
|---------|------|------|--------------|----------------|---|
| 1889.59 | 51.7 | 0.40 | 11.5... 11.5 | 1 <sup>n</sup> | β |
|---------|------|------|--------------|----------------|---|

Another difficult pair in the *Pleiades*, discovered with the 36-inch. It is too faint for the D.M. The place is taken from the Paris map of this group. It is 55<sup>s</sup> *f* and 4<sup>s</sup> 6 *n* of 28 *Tauri* (PLEIONE).

[β (XVI)...β (2956)...β (Pub. L. O. II)...]

**β 539.** W<sup>s</sup> III. 809

R.A. 3<sup>h</sup> 43<sup>m</sup> 13<sup>s</sup> }  
Decl. — 1° 53' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1877.88 | 271.2 | 2.79 | 9 ... 11    | 2 <sup>n</sup> | β |
| 1891.86 | 271.6 | 2.69 | 8.3... 10.6 | 2 <sup>n</sup> | β |

Discovered with the 18½-inch. Near β 401. Unchanged.

[β (X)...β<sup>s</sup>...β (3114)...β (Pub. L. O. II)...]

**β 401.** Lalande 7109

R.A. 3<sup>h</sup> 44<sup>m</sup> 10<sup>s</sup> }  
Decl. — 1° 53' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1877.20 | 254.5 | 4.65 | 6.8... 10.8 | 3 <sup>n</sup> | Δ   |
| 1878.05 | 255.8 | 4.37 | 6.5... 10.0 | 1 <sup>n</sup> | Cin |
| 1879.77 | 255.8 | 4.00 | 6.0... 10.0 | 1 <sup>n</sup> | Cin |
| 1891.86 | 256.0 | 4.64 | 6.7... 11.1 | 2 <sup>n</sup> | β   |

Discovered with the 6-inch. Evidently fixed.

[β (VII)...β (2103,3114)...β (Pub. L. O. II)...Δ (I)...Cin<sup>s</sup>...Cin<sup>6</sup>...]

**β 743.** D.M. (51°) 802

R.A. 3<sup>h</sup> 46<sup>m</sup> 36<sup>s</sup> }  
Decl. + 51° 54' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.06 | 250.2 | 0.82 | 8.5... 9.0 | 1 <sup>n</sup> | β |
| 1891.77 | 246.1 | 0.74 | 8.2... 9.0 | 3 <sup>n</sup> | β |

Discovered with the 6-inch in 1879 on Mt. Hamilton.

[β (XI)...β<sup>s</sup>...β<sup>3</sup>...β (3114)...β (Pub. L. O. I, II)...]

**β 1276.** Lalande 7190

R.A. 3<sup>h</sup> 47<sup>m</sup> 4<sup>s</sup> }  
Decl. — 2° 12' }

B and C

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1898.73 | 81.1 | 0.96 | 8.7... 9.0 | 3 <sup>n</sup> | β |
|---------|------|------|------------|----------------|---|

A and BC (= Σ 468 = H 5458)

|         |      |       |            |                |     |
|---------|------|-------|------------|----------------|-----|
| 1823+   | 105± | 25±   | 8 ... 9    | 1 <sup>n</sup> | H   |
| 1831.40 | 97.7 | 20.06 | 8.7... 9.7 | 3 <sup>n</sup> | Σ   |
| 1844.13 | 98.5 | 19.37 | ...        | 1 <sup>n</sup> | Ma  |
| 1868.57 | 98.0 | 20.03 | 8.7... 9.7 | 4 <sup>n</sup> | Δ   |
| 1879.66 | 97.1 | 20.80 | 8.5... 9.5 | 1 <sup>n</sup> | Cin |
| 1892.92 | 97.7 | 19.35 | 8.1... 9.0 | 2 <sup>n</sup> | G   |
| 1898.73 | 97.7 | 20.13 | 8.2... 9.0 | 3 <sup>n</sup> | β   |

Discovered with the 40 inch. It is not a difficult pair, and should have been seen before with the present distance. The STRUVE components are evidently fixed. The foregoing are all the measures. A and B are respectively S.D. (2°) 745 and 746.

[Madler (*Fixstern-Systeme* I)...Δ (II)...Cin<sup>6</sup>...Glaspapp (II)...]

**$\beta$  540.** D.M. (31°) 669

R.A. 3<sup>h</sup> 48<sup>m</sup> 21<sup>s</sup> }  
Decl. + 31° 48' }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1878.65 | 326.0 | "    | 8.1...11.5 | 2n | $\beta$ |
| 1891.69 | 324.7 | 1.28 | 8.5...11.8 | 3n | $\beta$ |

A and C

|         |      |       |         |    |         |
|---------|------|-------|---------|----|---------|
| 1878.70 | 57.2 | 57.14 | ... 8.2 | 2n | $\beta$ |
| 1891.69 | 57.3 | 57.11 | ... 8.5 | 3n | $\beta$ |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...] **$\beta$  85.** W<sup>2</sup> III. 1031

R.A. 3<sup>h</sup> 48<sup>m</sup> 34<sup>s</sup> }  
Decl. + 17° 17' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1875.66 | 216.9 | 4.14 | 7.9...10.1 | 4n | $\Delta$ |
| 1883.53 | 220.2 | 4.48 | 7.8...10.0 | 6n | En       |
| 1891.81 | 217.2 | 4.00 | 8.2...10.3 | 3n | $\beta$  |

Discovered with the 6-inch. There is no evidence of motion.

[ $\beta$  (II)... $\beta$  (*Mon. Not. xxxiii*, 437)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (I)...Engelmann (2678)...] **$\beta$  263.** W<sup>2</sup> III. 1028

R.A. 3<sup>h</sup> 48<sup>m</sup> 50<sup>s</sup> }  
Decl. + 32° 50' }

|         |      |      |            |    |          |
|---------|------|------|------------|----|----------|
| 1875.93 | 70.6 | 0.67 | 8.2... 8.5 | 6n | $\Delta$ |
| 1882.09 | 71.9 | ...  | ...        | 1n | Big      |
| 1882.95 | 76.1 | 0.80 | 8.0... 8.3 | 5n | En       |
| 1898.76 | 75.3 | 0.87 | 8.0... 8.5 | 2n | A        |

Discovered with the 9.4-inch at the Dartmouth College Observatory.

[ $\beta$  (v)... $\beta$  (*Mon. Not. xxxv*, 31)... $\Delta$  (I)...Engelmann (2678)...Bigourdan (*Paris Obsns.*, 1883)...Aitken ( )...] **$\beta$  541.** W<sup>1</sup> III. 923

R.A. 3<sup>h</sup> 48<sup>m</sup> 53<sup>s</sup> }  
Decl. - 1° 37' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1877.95 | 259.8 | 1.34 | 8.5...10.5 | 1n | $\beta$ |
| 1879.11 | 255.2 | ...  | 8.0...10.5 | 1n | Cin     |
| 1884.83 | 261.0 | 1.41 | 9.0...11.0 | 1n | W       |
| 1898.72 | 260.2 | 1.33 | 8.2...10.5 | 2n | $\beta$ |

Discovered with the 18½-inch. Without change.

[ $\beta$  (x)... $\beta^1$ ...Cin<sup>5</sup>...Wilson (Cin<sup>20</sup>)...] **$\beta$  542.** S.D. (7°) 707

R.A. 3<sup>h</sup> 50<sup>m</sup> 21<sup>s</sup> }  
Decl. - 7° 18' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1877.86 | 198.4 | 1.65 | 9 ... 10   | 1n | $\beta$ |
| 1886.78 | 193.1 | 1.56 | 8.2... 9.0 | 2n | LM      |
| 1892.01 | 192.9 | 1.52 | 8.4... 8.9 | 3n | $\beta$ |
| 1898.88 | 192.5 | 1.50 | 8.3...10.2 | 3n | Cg      |

Discovered with the 18½-inch. Apparently fixed.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...LM...Cogshall ( )...] **$\beta$  543.** W<sup>1</sup> III. 974

R.A. 3<sup>h</sup> 51<sup>m</sup> 25<sup>s</sup> }  
Decl. - 1° 30' }

|         |      |       |            |    |         |
|---------|------|-------|------------|----|---------|
| 1877.82 | 32.0 | 11.15 | 8.5...10.5 | 1n | $\beta$ |
| 1891.75 | 28.4 | 11.19 | 8.0...10.8 | 3n | $\beta$ |
| 1896.08 | 29.9 | 11.88 | ...        | 1n | Sp      |
| 1898.70 | 28.8 | 11.02 | 8.1...10.7 | 2n | $\beta$ |
| 1898.86 | 26.8 | 11.00 | 7.7...11.0 | 3n | Cg      |

Discovered with the 18½-inch. This star has some proper motion:

|          |   |   |                |
|----------|---|---|----------------|
| Stumpe   | - | - | 0.283 in 228.3 |
| Seeliger | - | - | 0.284 in 224.1 |
| Porter   | - | - | 0.279 in 232.7 |

It will be seen from the measures that this movement belongs to both stars. If the companion was stationary, the distance at the last date would be about 5" more than at the time of discovery.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Sp (III)...Cogshall ( )...] **$\beta$  1042.** Lalande 7372

R.A. 3<sup>h</sup> 52<sup>m</sup> 36<sup>s</sup> }  
Decl. - 3° 0' }

A and BC

|         |      |       |            |    |         |
|---------|------|-------|------------|----|---------|
| 1888.92 | 93.8 | 54.93 | 7.5...     | 3n | $\beta$ |
| 1893.11 | 93.2 | 55.62 | 7.5... 9.4 | 2n | G1      |
| 1898.72 | 93.5 | 55.28 | 7.3...     | 2n | $\beta$ |
| 1898.80 | 94.1 | 55.88 | 7.0...     | 1n | A       |

B and C

|         |      |      |        |      |                  |
|---------|------|------|--------|------|------------------|
| 1888.92 | 35.1 | 1.09 | 8.7... | 9.5  | 3 <sup>n</sup> β |
| 1898.73 | 38.1 | 1.01 | 8.8... | 10.0 | 3 <sup>n</sup> β |
| 1898.80 | 35.3 | 0.97 | 9.5... | 10.5 | 1 <sup>n</sup> A |

Discovered with the 36-inch. So far there appears to be no change in the close pair.

[β (xv)...β (2929)...β (*Pub. L. O. II*)...Glasenapp (II)... Aitken ( )...]

β 544. 36 Tauri

R.A. 3<sup>h</sup> 57<sup>m</sup> 11<sup>s</sup> }  
Decl. + 23° 46' }

|         |       |       |        |      |                  |
|---------|-------|-------|--------|------|------------------|
| 1877.86 | 257.9 | 25.06 | 6.0... | 12.5 | 1 <sup>n</sup> β |
| 1892.04 | 256.6 | 26.10 | 5.5... | 13.2 | 3 <sup>n</sup> β |
| 1897.84 | 256.7 | 25.17 | ...    |      | 3 <sup>n</sup> β |

Discovered with the 18½-inch. The proper motion of this star is small, 0.012 in the direction of 214.5 (AUWERS).

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...]

β 1004. Lacaille 1326

R.A. 3<sup>h</sup> 57<sup>m</sup> 27<sup>s</sup> }  
Decl. - 34° 49' }

A and B

|         |       |      |        |     |                    |
|---------|-------|------|--------|-----|--------------------|
| 1881.85 | 154.1 | 1.79 | 7.5... | 7.9 | 3 <sup>n</sup> β   |
| 1895.08 | 144.8 | 1.54 | 7.0... | 8.5 | 3 <sup>n</sup> Sel |
| 1897.72 | 144.2 | 1.77 | 7.2... | 8.3 | 1 <sup>n</sup> See |
| 1898.84 | 143.4 | 1.97 | 7.0... | 7.7 | 2 <sup>n</sup> A   |

A and C

|         |       |       |     |      |                  |
|---------|-------|-------|-----|------|------------------|
| 1881.86 | 131.2 | 62.98 | ... | 11.2 | 2 <sup>n</sup> β |
| 1898.84 | 134.6 | 60.04 | ... | 11.7 | 2 <sup>n</sup> A |

Discovered with the 12-inch on Mt. Hamilton in 1881. There appears to be some change in the angle of AB. The change in C indicates a proper motion of 0.27 in the direction of 81.7.

[β (xiii)...β<sup>3</sup>...Sellors (3369)... See (3495)... Aitken ( )...]

β 1277. D.M. (27°) 630

R.A. 3<sup>h</sup> 58<sup>m</sup> 15<sup>s</sup> }  
Decl. + 28° 4' }

A and B

|         |       |      |        |      |                  |
|---------|-------|------|--------|------|------------------|
| 1898.84 | 259.0 | 1.34 | 8.0... | 12.2 | 2 <sup>n</sup> β |
|---------|-------|------|--------|------|------------------|

A and C

|         |      |       |     |     |                  |
|---------|------|-------|-----|-----|------------------|
| 1898.87 | 69.7 | 54.53 | ... | 9.2 | 3 <sup>n</sup> β |
|---------|------|-------|-----|-----|------------------|

Discovered with the 40-inch in looking for the next pair, β 1005.

β 1005. D.M. (28°) 618

R.A. 3<sup>h</sup> 59<sup>m</sup> 20<sup>s</sup> }  
Decl. + 28° 37' }

|         |      |      |        |      |                   |
|---------|------|------|--------|------|-------------------|
| 1881.86 | 62.7 | 3.35 | 8.5... | 11.7 | 2 <sup>n</sup> β  |
| 1891.89 | 61.7 | 2.47 | 8.4... | 12.0 | 3 <sup>n</sup> β  |
| 1898.74 | 62.1 | 2.77 | ...    |      | 3 <sup>n</sup> Hu |
| 1898.84 | 60.8 | 2.56 | ...    |      | 2 <sup>n</sup> β  |

Discovered with the 12-inch at Mt. Hamilton in 1881.

[β (xiii)...β<sup>3</sup>...β (3114)...β (*Pub. L. O. II*)...Hussey ( )...]

β 545. Lalande 7556

R.A. 3<sup>h</sup> 59<sup>m</sup> 24<sup>s</sup> }  
Decl. + 37° 42' }

|         |       |      |        |      |                  |
|---------|-------|------|--------|------|------------------|
| 1878.24 | 310.0 | 1.02 | 8.0... | 11.5 | 4 <sup>n</sup> β |
| 1890.79 | 310.1 | 1.09 | 8.0... | 10.6 | 4 <sup>n</sup> β |
| 1891.78 | 309.3 | 1.05 | 8.3... | 11.0 | 3 <sup>n</sup> β |
| 1898.82 | 303.6 | 1.04 | 8.1... | 10.0 | 2 <sup>n</sup> β |

Discovered with the 18½-inch. There seems to be no material change. This star is in the field with OΣ 531. It has been used for the determination of the parallax of OΣ 531 (= P III. 242) by BALL (*Pub. Dunsink Obsy.*, Part V). The last named star has a proper motion of 0.260 in the direction of 146.5 (PORTER). The following measures connect the two pairs:

β 545 and OΣ 531

|         |      |        |                 |      |
|---------|------|--------|-----------------|------|
| 1851.16 | 25.0 | 239.76 | 2 <sup>n</sup>  | OΣ   |
| 1854.04 | 25.6 | 239.65 | 3 <sup>n</sup>  | OΣ   |
| 1858.20 | 25.8 | 239.03 | 2 <sup>n</sup>  | OΣ   |
| 1879.60 | 27.2 | 237.32 | 30 <sup>n</sup> | Ball |
| 1890.78 | 28.1 | 235.51 | 2 <sup>n</sup>  | β    |
| 1898.82 | 28.8 | 234.95 | 2 <sup>n</sup>  | β    |

[β (x)...β<sup>2</sup>...β (3048,3114)...β (*Pub. L. O. II*)...OΣ (*Poulkova Obsns.* x, p. 61)...]

**$\beta$  309.** Lalande 7655

R.A.  $4^h 1^m 22^s$  }  
Decl.  $+ 19^\circ 25'$  }

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1875.65 | 279.1 | 5.66 | 8.0...11.3 | 3 $n$ | $\Delta$ |
| 1876.03 | 278.7 | 5.94 | 8...11     | 2 $n$ | Hl       |
| 1890.00 | 276.8 | 5.94 | ...        | 3 $n$ | Hl       |
| 1899.09 | 277.1 | 5.59 | 8.0...10.5 | 1 $n$ | $\beta$  |

Discovered with the 3-inch. Probably fixed.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (i)...Hall (i, ii)...]

 **$\beta$  1232.** W<sup>2</sup> III. 1286

R.A.  $4^h 1^m 26^s$  }  
Decl.  $+ 28^\circ 52'$  }

|         |       |            |            |       |         |
|---------|-------|------------|------------|-------|---------|
| 1891.98 | 350.4 | 0.30       | 8.4... 9.3 | 3 $n$ | $\beta$ |
| 1893.07 | 355.7 | 0.25 $\pm$ | ...        | 1 $n$ | Sp      |
| 1896.08 | 354.6 | 0.22 $\pm$ | ...        | 5 $n$ | Sp      |
| 1896.09 | 353.2 | 0.36       | ...        | 1 $n$ | L       |
| 1898.72 | 351.8 | 0.40       | ...        | 2 $n$ | Hu      |
| 1898.89 | 358.0 | 0.15       | ...        | 1 $n$ | L       |

Discovered with the 36-inch.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Sp (iii)...Lewis (*Mon. Not. LIX, 400*)...Hussey ( )...]

 **$\beta$  546.** W<sup>2</sup> III. 1323

R.A.  $4^h 3^m 12^s$  }  
Decl.  $+ 41^\circ 33'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1878.67 | 24.3  | 0.92 | 8.0... 8.0 | 1 $n$ | $\beta$ |
| 1883.66 | 26.8  | 0.77 | 8.3... 8.3 | 6 $n$ | En      |
| 1896.07 | 32.4  | 0.82 | ...        | 2 $n$ | Sp      |
| 1898.79 | 32.2  | 0.86 | ...        | 5 $n$ | Hu      |
| 1898.88 | 210.7 | 0.69 | 8.3... 8.5 | 1 $n$ | $\beta$ |

Discovered with the 18½-inch. There may be some advance in the angle.

[ $\beta$  (x)... $\beta$  (i)...Engelmann (2678)...Sp. (iii)...Hussey ( )...]

 **$\beta$  1233.** D.M. (66°) 316

R.A.  $4^h 6^m 6^s$  }  
Decl.  $+ 66^\circ 47'$  }

|         |      |      |            |       |         |
|---------|------|------|------------|-------|---------|
| 1891.85 | 37.1 | 5.17 | 8.0...13.2 | 4 $n$ | $\beta$ |
| 1898.73 | 38.4 | 5.10 | 7.7...11.9 | 2 $n$ | $\beta$ |

Discovered with the 12-inch. At first the principal star was suspected to be a close pair, but this was not verified with the large telescope. In D.M. 7.4 m; *Christiania Catalogue* 6.8 m.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...]

 **$\beta$  1278.** Lalande 7871

R.A.  $4^h 7^m 0^s$  }  
Decl.  $+ 8^\circ 35'$  }

A and B

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1898.85 | 303.4 | 7.45 | 6.5...13.7 | 3 $n$ | $\beta$ |
|---------|-------|------|------------|-------|---------|

A and C

|         |       |       |         |       |         |
|---------|-------|-------|---------|-------|---------|
| 1898.92 | 252.3 | 55.26 | ...12.5 | 1 $n$ | $\beta$ |
|---------|-------|-------|---------|-------|---------|

Discovered with the 40-inch in looking for 47 *Tauri*. The D.M. magnitude is 6.8.

 **$\beta$  547.** 47 *Tauri*

R.A.  $4^h 7^m 25^s$  }  
Decl.  $+ 8^\circ 58'$  }

A and B

|         |       |      |            |       |            |
|---------|-------|------|------------|-------|------------|
| 1877.84 | 359.4 | 0.89 | 5.5... 8.0 | 3 $n$ | $\beta$    |
| 1877.90 | 359.7 | 0.82 | 5.0... 7.5 | 3 $n$ | $\Delta$   |
| 1878.93 | 359.8 | 0.89 | 5.0... 9.0 | 3 $n$ | $\beta$    |
| 1886.20 | 363.4 | 1.18 | ...        | 2 $n$ | H $\Sigma$ |
| 1888.81 | 359.7 | 0.91 | 5.2... 8.7 | 3 $n$ | $\beta$    |
| 1889.93 | 358.6 | 0.75 | ...        | 3 $n$ | Sp         |
| 1889.02 | 359.5 | 0.94 | 5.0... 8.0 | 3 $n$ | T          |
| 1889.11 | 350.3 | ...  | 5.0... 8.0 | 1 $n$ | Lv         |
| 1896.70 | 353.4 | 0.91 | 5.5... 9.0 | 3 $n$ | A          |
| 1898.80 | 361.4 | 1.07 | 5.5... 8.0 | 2 $n$ | $\beta$    |

AB and C

|         |       |       |         |       |         |
|---------|-------|-------|---------|-------|---------|
| 1877.99 | 223.1 | 32.20 | ...12.5 | 1 $n$ | $\beta$ |
| 1898.82 | 224.5 | 31.56 | ...13.3 | 3 $n$ | $\beta$ |

Discovered with the 18½-inch. A fine pair, but the change, if any, is very slow. The proper motion of this star is small, 0.050 in the direction of 227° 5 (AUWERS), but it is sufficient to show that it is common to both stars, as otherwise there would be a decided change in both angle and distance.

The distant companion appears to be fixed in space. With the position of C from the measures of 1898, and the proper motion of A given above,

the minimum distance between A and C of 1".6 will occur in about 630 years.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2875)... $\beta$  (*Pub. L. O. II*)... $H\Sigma$  ( ) ... $\Delta$  (1)...Lv<sup>1</sup>...Tarrant (2991)...Sp (III)...Aitken (3395)...]

**$\beta$  86.** W<sup>a</sup> IV. 129

R.A. 4<sup>h</sup> 8<sup>m</sup> 39<sup>s</sup> }  
Decl. + 23° 13' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.68 | 51.1 | 4.05 | 9.0... 9.6 | 4 <sup>n</sup> | $\Delta$ |
| 1898.74 | 49.7 | 4.32 | ...        | 3 <sup>n</sup> | Hu       |
| 1898.84 | 51.0 | 4.19 | 9.0... 9.2 | 1 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Without change. There is a 13 m star, 260°.4 : 26".6.

[ $\beta$  (II)... $\beta$  (*Mon. Not. xxxiii*, 437)... $\Delta$  (1)...Hussey ( )...]

**$\beta$  548.** Lalande 8027

R.A. 4<sup>h</sup> 10<sup>m</sup> 58<sup>s</sup> }  
Decl. - 10° 23' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1877.86 | 347.0 | 6.24 | 7.0... 11.5 | 1 <sup>n</sup> | $\beta$ |
| 1879.11 | 344.4 | ...  | 7.0... 13   | 1 <sup>n</sup> | Cin     |
| 1891.86 | 345.4 | 6.10 | 7.1... 11.2 | 2 <sup>n</sup> | $\beta$ |
| 1898.83 | 345.2 | 6.14 | 7.5... 11.5 | 3 <sup>n</sup> | Cg      |

Discovered with the 18½-inch. No material change.

[ $\beta$  (x)... $\beta^2$ ...Cin<sup>5</sup>... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Cogshall ( )...]

**$\beta$  1234.** W<sup>a</sup> IV. 205

R.A. 4<sup>h</sup> 11<sup>m</sup> 56<sup>s</sup> }  
Decl. + 21° 1' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1891.82 | 205.5 | 1.77 | 8.3... 12.6 | 3 <sup>n</sup> | $\beta$ |
| 1898.80 | 203.2 | 2.04 | ...         | 4 <sup>n</sup> | Hu      |

Discovered with the 36-inch.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Hussey ( )...]

**$\beta$  310.** W<sup>a</sup> IV. 258

R.A. 4<sup>h</sup> 14<sup>m</sup> 21<sup>s</sup> }  
Decl. + 39° 39' }

|         |       |       |             |                |         |
|---------|-------|-------|-------------|----------------|---------|
| 1878.02 | 172.1 | 19.38 | 8.0... 12.0 | 2 <sup>n</sup> | H1      |
| 1890.91 | 170.7 | 19.51 | ...         | 1 <sup>n</sup> | H1      |
| 1891.89 | 171.7 | 19.11 | 7.7... 11.2 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 6-inch. Fixed.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O. II*)...Hall (1, II)...]

**$\beta$  87.** P IV. 53

R.A. 4<sup>h</sup> 15<sup>m</sup> 18<sup>s</sup> }  
Decl. + 20° 32' }

|         |       |      |             |                |            |
|---------|-------|------|-------------|----------------|------------|
| 1875.46 | 170.6 | 2.09 | 5.7... 8.8  | 5 <sup>n</sup> | $\Delta$   |
| 1877.23 | 173.4 | 1.85 | 6.5... 9.0  | 1 <sup>n</sup> | O $\Sigma$ |
| 1886.15 | 171.0 | 2.10 | ...         | 2 <sup>n</sup> | H $\Sigma$ |
| 1887.80 | 174.1 | 3.11 | 6.0... 9.7  | 2 <sup>n</sup> | T          |
| 1891.81 | 169.4 | 1.97 | 6.6... 10.5 | 3 <sup>n</sup> | $\beta$    |

Discovered with the 6-inch. A fine colored pair;  $\Delta$  gives, *golden: blue*. This is No. 74 of BIRMINGHAM'S *Catalogue of Red Stars*. A naked-eye star in *Taurus* (B.A.C. 1342). The components are evidently fixed.

[ $\beta$  (II)... $\beta$  (*Mon. Not. xxxiii*, 437)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)... $\Delta$  (2081)...Tarrant (2899)...O $\Sigma$  (*Poulkova Obsns. x*)...H $\Sigma$  ( )...]

**$\beta$  744.** *Eridani* 299

R.A. 4<sup>h</sup> 16<sup>m</sup> 32<sup>s</sup> }  
Decl. - 26° 1' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1879.75 | 290±  | 0.6± | 6.5... 6.5 | $\beta$        |         |
| 1891.78 | 306.6 | 0.79 | 7.6... 7.6 | 3 <sup>n</sup> | $\beta$ |
| 1894.10 | 301.4 | 0.59 | 7 ... 7    | 1 <sup>n</sup> | Sel     |
| 1897.73 | 312.1 | 0.52 | ...        | 1 <sup>n</sup> | See     |
| 1898.88 | 314.0 | 0.81 | 7.0... 7.5 | 1 <sup>n</sup> | A       |
| 1898.93 | 307.3 | 0.80 | 7.5... 8   | 1 <sup>n</sup> | Bd      |

A and C (= H 3644)

|         |     |       |          |                |         |
|---------|-----|-------|----------|----------------|---------|
| 1835.9  | 20± | 25±   | 6 ... 14 | H              |         |
| 1891.79 | 6.8 | 35.42 | ... 11.7 | 2 <sup>n</sup> | $\beta$ |
| 1898.93 | 7.2 | 35.80 | ... 11.0 | 1 <sup>n</sup> | Bd      |

A and D (= H 3644)

|         |      |       |         |                |         |
|---------|------|-------|---------|----------------|---------|
| 1835.9  | 37.5 | 40±   | ... 8   | 1 <sup>n</sup> | H       |
| 1891.78 | 40.4 | 44.63 | ... 8.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.93 | 40.8 | 44.88 | ... 9   | 1 <sup>n</sup> | Bd      |

The principal star of the wide triple, H 3644, was found with the 6-inch to be a close pair. The measures indicate some motion in angle.

The Cordoba magnitude of the large star (Lalande 8264) is 6¼, and of D (O. Arg. S. 3022) 7¾ m.

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. I, II*)...Sellors (3303) ...See (3495)...Aitken ( )...Boothroyd ( )...]

**$\beta$  402.** W<sup>1</sup> IV. 318

R.A. 4<sup>h</sup> 17<sup>m</sup> 3<sup>s</sup> }  
Decl. — 1° 33' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1877.95 | 74.0 | 6.94 | 8.5...10.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.86 | 73.0 | 7.48 | 8.3...11.2 | 2 <sup>n</sup> | $\beta$ |
| 1892.00 | 74.3 | 7.37 | 8.0...11.0 | 1 <sup>n</sup> | Col     |
| 1898.72 | 74.2 | 7.51 | 8.6...10.1 | 2 <sup>n</sup> | $\beta$ |
| 1898.91 | 70.9 | 7.28 | 8.2...11.5 | 3 <sup>n</sup> | Cg      |

Discovered with the 6-inch. Unchanged. COGSHALL notes a third star 13 m, 110° : 7".8, and also suspected the principal star of being a close pair in 270°.

[ $\beta$  (VII)... $\beta^1$ ... $\beta$  (2103,3114)... $\beta$  (*Pub. L. O.* II)...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Cogshall ( )...]

 **$\beta$  1235.** Lalande 8235

R.A. 4<sup>h</sup> 17<sup>m</sup> 20<sup>s</sup> }  
Decl. + 22° 28' }

|         |      |       |            |                |         |
|---------|------|-------|------------|----------------|---------|
| 1891.84 | 60.8 | 0.35  | 8.4... 8.5 | 3 <sup>n</sup> | $\beta$ |
| 1896.09 | 46.2 | 0.35  | ...        | 1 <sup>n</sup> | Lew     |
| 1896.09 | 54.5 | 0.25± | ...        | 6 <sup>n</sup> | Sp      |
| 1898.12 | 65.4 | 0.34  | ...        | 1 <sup>n</sup> | Bow     |
| 1898.79 | 65.3 | 0.37  | ...        | 2 <sup>n</sup> | Hu      |

Discovered with the 36-inch. Near  $\kappa$  *Tauri*.

[ $\beta$  (XVIII)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Hussey ( )...]

 **$\beta$  1185.** W<sup>2</sup> IV. 376

R.A. 4<sup>h</sup> 18<sup>m</sup> 52<sup>s</sup> }  
Decl. + 18° 35' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1890.70 | 25.6 | 0.16 | 7.8... 8.4 | 4 <sup>n</sup> | $\beta$ |
| 1896.09 | 18.0 | 0.2± | ...        | 4 <sup>n</sup> | Sp      |

Discovered with the 36-inch. The magnitude in D.M. is 7.5.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Sp (III)...]

 **$\beta$  745.** D.M. (53°) 772

R.A. 4<sup>h</sup> 19<sup>m</sup> 11<sup>s</sup> }  
Decl. + 53° 38' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.95 | 150±  | 0.5± | 8.5... 8.5 |                | $\beta$ |
| 1891.86 | 134.1 | 0.52 | 8.3... 8.3 | 2 <sup>n</sup> | $\beta$ |
| 1898.87 | 129.3 | 0.65 | ...        | 1 <sup>n</sup> | Hu      |

Discovered with the 6-inch on Mt. Hamilton in 1879.

[ $\beta$  (XI)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)...Hussey ( )...]

 **$\beta$  403.** W<sup>1</sup> IV. 379

R.A. 4<sup>h</sup> 19<sup>m</sup> 18<sup>s</sup> }  
Decl. — 2° 20' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1877.09 | 100.9 | 2.01 | 7.7... 9.1 | 5 <sup>n</sup> | $\Delta$ |
| 1888.08 | 101.4 | 2.08 | 8.0... 9.5 | 2 <sup>n</sup> | T        |
| 1888.39 | 98.3  | 1.95 | 7.0... 9.2 | 3 <sup>n</sup> | Lv       |
| 1893.10 | 104.2 | 1.79 | 7.5... 9.0 | 2 <sup>n</sup> | Gl       |
| 1898.85 | 98.6  | 1.96 | 7.3... 9.5 | 3 <sup>n</sup> | Cg       |

Discovered with the 6-inch. Unchanged.

[ $\beta$  (VII)... $\beta$  (2103)... $\Delta$  (I)...Lv<sup>1</sup>...Tarrant (2991)...Glase napp (II)...Cogshall ( )...]

 **$\beta$  1186.** *Tauri* 248

R.A. 4<sup>h</sup> 20<sup>m</sup> 51<sup>s</sup> }  
Decl. + 10° 56' }

|         |       |       |            |                |         |
|---------|-------|-------|------------|----------------|---------|
| 1890.92 | 182.1 | 0.59  | 6.8... 9.7 | 3 <sup>n</sup> | $\beta$ |
| 1893.61 | 185.3 | 0.55± | ...        | 2 <sup>n</sup> | Sp      |
| 1896.09 | 180.5 | 0.64  | ...        | 5 <sup>n</sup> | Sp      |
| 1898.03 | 174.4 | 0.75  | 6.2...10.0 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. A naked-eye star in *Taurus*; 6 m in ARGELANDER and HEIS. Lalande 8372. The motion, if any, is slow.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Aitken ( )...]

 **$\beta$  311.** *Eridani* 315

R.A. 4<sup>h</sup> 21<sup>m</sup> 52<sup>s</sup> }  
Decl. — 24° 21' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.92 | 148.4 | ...  | 7.5... 7.5 | 1 <sup>n</sup> | Cin |
| 1877.61 | 146.9 | 1.06 | 6.5... 7.0 | 1 <sup>n</sup> | Cin |
| 1883.91 | 162±  | ...  | ...        | 1 <sup>n</sup> | W   |
| 1891.72 | 147.5 | 0.98 | 7.3... 7.4 | 2 <sup>n</sup> | Lv  |
| 1897.67 | 333.2 | 0.70 | 6.0... 6.6 | 1 <sup>n</sup> | See |
| 1898.88 | 332.3 | 0.85 | 7.5... 7.5 | 2 <sup>n</sup> | Cg  |

Discovered with the 6-inch. Change uncertain. The Cordoba magnitude is 6.2. Lacaille 1451.

[ $\beta$  (VI)... $\beta$  (2062)...Cin<sup>3</sup>...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...Lv (*Proc. Haverford Coll. Obsy.* 1891)...See (3495)...Cogshall ( )...]

**β 184.** Lalande 8474

R.A. 4<sup>h</sup> 22<sup>m</sup> 45<sup>s</sup> }  
Decl. - 21° 46' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1877.53 | 262.5 | 1.10 | 6.2... | 7.0 | 2 <sup>n</sup> | Cin |
| 1889.01 | 261.4 | 1.12 | 6.5... | 7.1 | 3 <sup>n</sup> | Lv  |
| 1891.72 | 259.2 | 1.09 | 7.4... | 7.6 | 1 <sup>n</sup> | Lv  |
| 1895.90 | 259.8 | ...  | ...    | ... | 3 <sup>n</sup> | Do  |
| 1897.76 | 240.4 | 1.30 | 7.4... | 7.6 | 1 <sup>n</sup> | See |
| 1899.09 | 257.8 | 1.19 | ...    | ... | 1 <sup>n</sup> | β   |

Discovered with the 6-inch. No sensible change.  
In Gould 6.9 m.

[β (IV)...β (Mon. Not. xxxiv, 282)...Cin<sup>4</sup>...Lv<sup>1</sup>...Lv  
(Proc. Haverford Coll. Obsy. 1891)...Doberck (3378)...  
See (3495)...]

**β 549.** W<sup>r</sup> IV. 458

R.A. 4<sup>h</sup> 23<sup>m</sup> 2<sup>s</sup> }  
Decl. - 12° 13' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1877.97 | 189.0 | 7.85 | 8.0... | 12.5 | 2 <sup>n</sup> | β   |
| 1879.11 | 185.0 | ...  | 7.0... | 12.0 | 1 <sup>n</sup> | Cin |
| 1891.86 | 190.5 | 8.66 | 7.8... | 11.0 | 2 <sup>n</sup> | β   |
| 1898.71 | 189.2 | 8.44 | 8.3... | 10.8 | 1 <sup>n</sup> | β   |
| 1898.91 | 188.8 | 8.52 | 7.2... | 12.0 | 3 <sup>n</sup> | Cg  |

Discovered with the 18½-inch. Without change.

[β (X)...β<sup>1</sup>...β (3114)...β (Pub. L. O. 11)...Cin<sup>5</sup>...Cog-  
shall ( )...]

**β 789.** Lalande 8426

R.A. 4<sup>h</sup> 23<sup>m</sup> 30<sup>s</sup> }  
Decl. + 37° 24' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1881.69 | 322.6 | 1.30 | 8.1... | 8.8 | 3 <sup>n</sup> | β   |
| 1888.22 | 322.3 | 1.30 | 8.2... | 9.0 | 3 <sup>n</sup> | Com |

Discovered with the 15½ inch at the Washburn  
Observatory. Probably fixed.

[β (XII)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. VI)...]

**β 746.** Cord. G. C. 5107

R.A. 4<sup>h</sup> 27<sup>m</sup> 13<sup>s</sup> }  
Decl. - 36° 10' }

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1879.79 | 30±  | 1.2± | 8.0... | 9.0 |                | β   |
| 1895.10 | 11.9 | 1.05 | 7.9... | 9.0 | 3 <sup>n</sup> | Sel |

Discovered with the 6-inch at Mt. Hamilton in  
1879. Later measures are needed.

[β (XI)...β<sup>2</sup>...Sellors (3369)...]

**β 747.** Lacaille 1518

R.A. 4<sup>h</sup> 28<sup>m</sup> 50<sup>s</sup> }  
Decl. - 38° 32' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1879.79 | 240±  | 2.5± | 7.5... | 9.5 |                | β   |
| 1894.09 | 218.4 | 2.25 | 7...   | 9   | 2 <sup>n</sup> | Sel |

Discovered with the 6-inch at Mt. Hamilton in  
1879.

[β (XI)...β<sup>2</sup>...β (Pub. L. O. 1)...Sellors (3303)...]

**β 550 and β 1031.** α *Tauri* (ALDEBARAN)

R.A. 4<sup>h</sup> 29<sup>m</sup> 2<sup>s</sup> }  
Decl. + 16° 16' }

A and B (= β 550)

|         |       |       |      |      |                |    |
|---------|-------|-------|------|------|----------------|----|
| 1877.89 | 109.0 | 30.45 | 1... | 13.5 | 3 <sup>n</sup> | β  |
| 1878.00 | 110.5 | 31.26 | ...  | 15   | 3 <sup>n</sup> | Hl |
| 1880.11 | 111.2 | 31.46 | ...  | 14.0 | 2 <sup>n</sup> | β  |
| 1888.82 | 109.5 | 30.90 | ...  | ...  | 2 <sup>n</sup> | β  |
| 1890.87 | 109.0 | 31.34 | ...  | 14.2 | 3 <sup>n</sup> | β  |
| 1897.79 | 108.8 | 31.03 | ...  | ...  | 3 <sup>n</sup> | β  |
| 1898.10 | 109.7 | 31.30 | ...  | ...  | 3 <sup>n</sup> | A  |

C and D (= β 1031)

|         |       |      |         |      |                |     |
|---------|-------|------|---------|------|----------------|-----|
| 1888.81 | 281.1 | 2.34 | 9.0...  | 12.0 | 3 <sup>n</sup> | β   |
| 1890.86 | 279.1 | 1.84 | 11.0... | 13.5 | 4 <sup>n</sup> | β   |
| 1891.72 | 277.0 | 1.83 | 10.6... | 13.7 | 3 <sup>n</sup> | β   |
| 1892.82 | 277.8 | 2.11 | ...     | ...  | 3 <sup>n</sup> | Bar |
| 1897.82 | 276.9 | 1.62 | ...     | ...  | 1 <sup>n</sup> | β   |
| 1897.83 | 276.9 | 2.16 | ...     | ...  | 1 <sup>n</sup> | Bar |
| 1898.10 | 275.7 | 1.74 | 9.5...  | 13.0 | 3 <sup>n</sup> | A   |
| 1899.02 | 278.5 | 1.89 | 9.0...  | 13.0 | 1 <sup>n</sup> | β   |

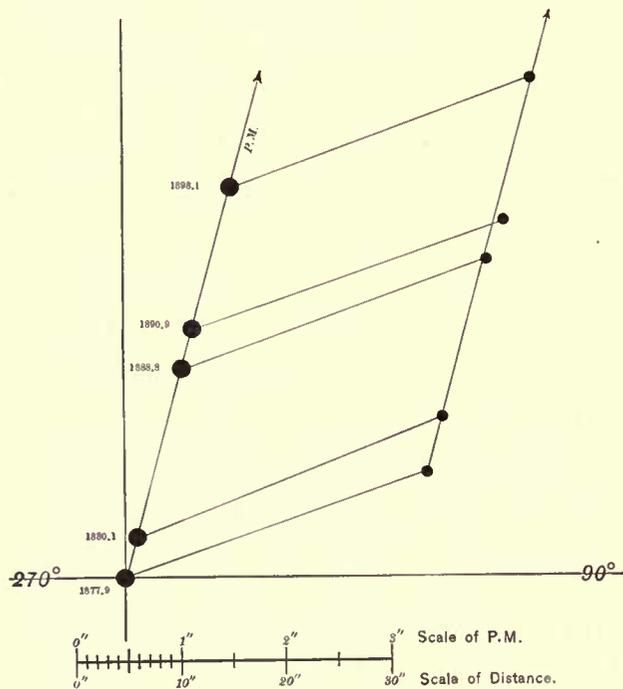
A and C (= H<sup>r</sup> VI. 66)

|         |      |        |     |      |                 |    |
|---------|------|--------|-----|------|-----------------|----|
| 1836.06 | 36.0 | 109.04 | ... | 11.2 | 2 <sup>n</sup>  | Σ  |
| 1854.66 | 35.4 | 111.76 | ... | 10.6 | 25 <sup>n</sup> | OΣ |
| 1854.24 | 34.8 | 112.79 | ... | 10.3 | 6 <sup>n</sup>  | J  |
| 1887.00 | 34.5 | 116.27 | ... | ...  | 20 <sup>n</sup> | Hl |
| 1889.98 | 34.6 | 116.97 | ... | ...  | 7 <sup>n</sup>  | β  |
| 1898.10 | 34.3 | 117.90 | ... | ...  | 4 <sup>n</sup>  | A  |
| 1899.02 | 34.6 | 117.99 | ... | ...  | 1 <sup>n</sup>  | β  |

The nearest companion to *Aldebaran* was found  
with the Chicago 18½ refractor in 1877, and this  
is now shown to have the same proper motion as  
the principal star; a result which would not be  
expected considering the distance and great differ-  
ence in magnitudes. Both distance and position

angle appear to have remained unchanged, the small difference in measure being fully accounted for by the extreme minuteness of the companion, and the difficulty of measuring it so near a first-magnitude star. It was a very difficult object to see with the Chicago telescope, and might easily be overlooked even with the 36-inch refractor.

The more distant Herschel companion has been observed for more than a hundred years, and the change shown by the measures has usually been ascribed solely to the proper motion of *Aldebaran*. The distinguished French astronomer, FLAMMARION, was the first to notice the fact that the



Proper motion of ALDEBARAN and companion.

well-known proper motion of A could not account for the relative change, and therefore came to the conclusion that B must have a proper motion of its own, and in a different direction. Of the correctness of this view there can be no doubt, and the amount and direction of the relative displacement of C should be as well known as of most stars. This motion is almost exactly half that of A, and is perhaps larger than that of any known star as faint as the eleventh magnitude, which is not connected and moving with some brighter component.

In looking at this object in 1888 with the 36-inch, I found that the Herschel companion also was

double, or had a very faint attendant a little more than 2" distant. This is too difficult for most telescopes.

That the proper motion of the faint star B is exactly the same as that of *Aldebaran* will be apparent from the foregoing diagram, showing the several positions of both stars from 1877 to 1898, as given by the measures. The annual proper motion of A is given by AUWERS as 0".190 in the direction of 164°.7. The several places of A along the line separating this movement are derived from this value of the proper motion, and the corresponding positions of B laid down from the measures. The scale of the distances AB is one-tenth that of the proper motion.

The wide pair, AC, is H<sup>1</sup> VI. 66 = S 452 = Σ 2 App. II. A few of the measures are given above. The early observations, made before the work of Σ, are not accurate in distance. The measures of AC, 1836–1898, taking into consideration the motion of A in space, give the annual proper motion of C as 0".094 in the direction of 112°.2.

The diagram on opposite page, showing to scale the several positions of the three components is reproduced from *Monthly Notices*, March 1891.

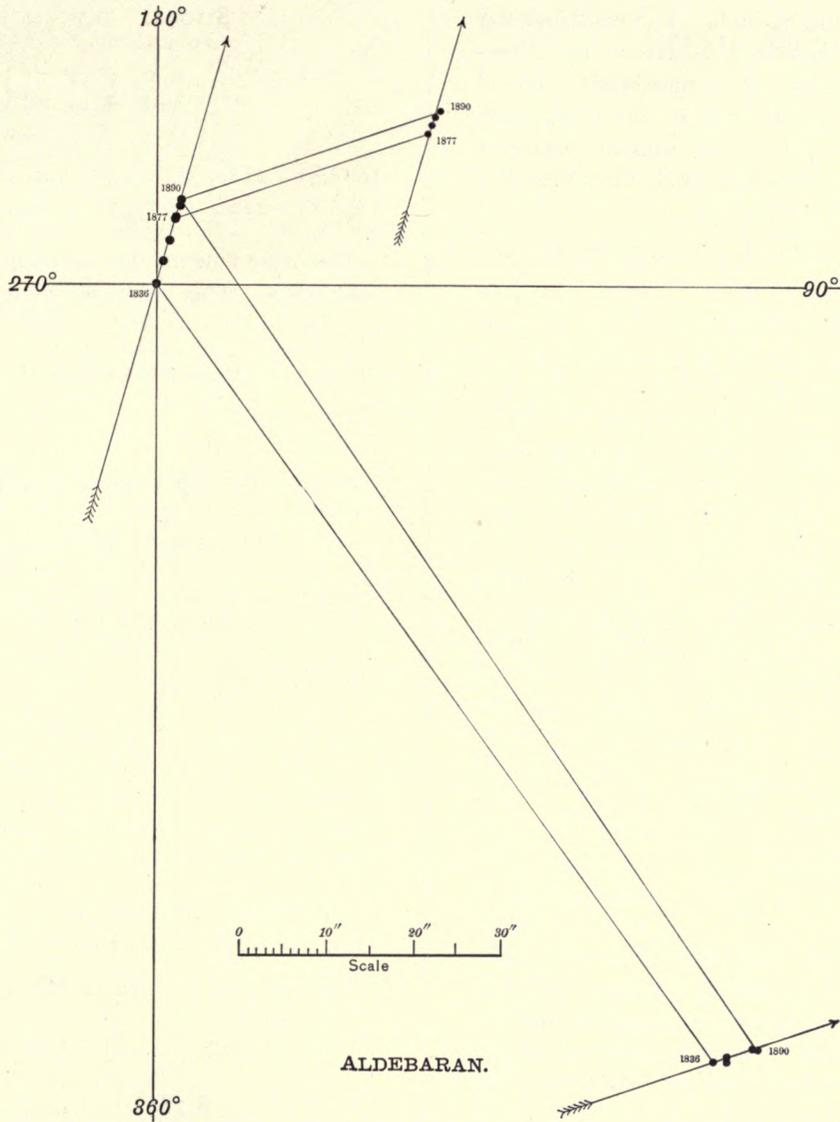
From the measures already made of C and D, it is practically certain that these two stars have a common proper motion, and therefore form a physical system. D appears to have a slow retrograde motion. Taking the relation of these stars as given by a mean of my three sets of measures at Mt. Hamilton, and applying the proper motion of C as given above, the position of D with reference to that star for 1898.10 should be 283°.0 : 2".85. The measures all concur in showing a diminishing position-angle, and no increase in the distance.

The minimum distance between these two interesting systems occurred about A. D. 1130, when the separation of A and C was only 40".

[β (x, XIV)...β<sup>1</sup>...β<sup>3</sup>...β (2189,2875,3048,3114)...β (Mon. Not. LI, 311)...β (Pub. L. O. II)...Barnard (A. J. 447)...Aitken ( )...Barnard ( )...]

Other measures, etc., of the old stars, in addition to those given above, will be found in the catalogues of HERSCHEL I, SOUTH and STRUVE, and in the following:

[Δ (II)...Δ (1475)...OΣ (Mon. Not. XLIV, 237)...OΣ (Poulkova Obsns. x, p. 64)...Flammarion (L'Astronomie, IV, 102) (Etoiles Doubles et Multiples)...Hall (I)...Hall (A. J. 156)...β<sup>2</sup>...]



**β 881. 46 Eridani**

R.A. 4<sup>h</sup> 29<sup>m</sup> 4<sup>s</sup> }  
Decl. — 7° 0' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1879.02 | 57.0 | 1.47 | 6.0...10.8 | 4 <sup>n</sup> | β   |
| 1879.10 | 55.3 | 1.35 | 5.5...10.0 | 1 <sup>n</sup> | Cin |
| 1888.99 | 53.0 | 1.60 | 6.0...10.5 | 2 <sup>n</sup> | T   |
| 1891.77 | 52.7 | 1.29 | 6.0...10.8 | 3 <sup>n</sup> | β   |
| 1891.93 | 52.6 | 1.52 | ...        | 4 <sup>n</sup> | T   |
| 1896.10 | 50.6 | 1.32 | ...        | 3 <sup>n</sup> | Sp  |
| 1898.12 | 49.0 | 1.80 | 6.2...11.5 | 2 <sup>n</sup> | A   |
| 1898.74 | 52.4 | 1.94 | 6.0...9.5  | 1 <sup>n</sup> | Cg  |

Discovered with the 18½-inch. A fine object in a large aperture. Slow angular motion, with no

material change in the distance. AUWERS gives the proper motion of the principal star, 0".008 in the direction of 212°.5.

[β (XIII)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Tarrant (2991,3186)...Cin<sup>5</sup>...Sp (III)...Aitken ( )...Cogshall ( )...]

**β 1043. 3 Camelopardali**

R.A. 4<sup>h</sup> 30<sup>m</sup> 28<sup>s</sup> }  
Decl. + 52° 50' }

|         |       |      |          |                |     |
|---------|-------|------|----------|----------------|-----|
| 1888.92 | 297.3 | 3.92 | 5...12.0 | 3 <sup>n</sup> | β   |
| 1898.80 | 294.3 | 3.95 | ...      | 3 <sup>n</sup> | Bar |

Discovered with the 36-inch. The principal star has a small proper motion of  $0.020$  in the direction of  $196^\circ$  (AUWERS). This movement 1888-98 would increase the angle  $2.8$  if the companion was fixed. It is very probable from the measures that the small star is moving with the other, but further observations are needed.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...Barnard ( )...]

**$\beta$  185.** Lalande 8745

R.A.  $4^h 31^m 24^s$  }  
Decl.  $-15^\circ 10'$  }

|         |         |        |            |            |          |
|---------|---------|--------|------------|------------|----------|
| 1875.78 | $235.4$ | $3.00$ | 8.1...11.1 | 4 <i>n</i> | $\Delta$ |
| 1877.11 | $235.9$ | $3.13$ | 8.0... 9.5 | 1 <i>n</i> | Cin      |
| 1878.10 | $231.8$ | $2.45$ | 8.0... 9.5 | 1 <i>n</i> | Cin      |
| 1888.10 | $236.7$ | $3.03$ | 8.0...11.0 | 2 <i>n</i> | T        |
| 1898.16 | $236.4$ | $3.09$ | ...        | 1 <i>n</i> | See      |

Discovered with the 6-inch. Relatively fixed.

[ $\beta$  (iv)... $\beta$  (*Mon. Not. xxxiv*, 382)... $\Delta$  (i)...Cin<sup>4</sup>...Cin<sup>5</sup>...  
Tarrant (2991)...See ( )...]

**$\beta$  88.** 51 *Eridani*

R.A.  $4^h 31^m 34^s$  }  
Decl.  $-2^\circ 43'$  }

|         |        |         |            |            |         |
|---------|--------|---------|------------|------------|---------|
| 1891.88 | $90.1$ | $32.38$ | 5.7...12.2 | 2 <i>n</i> | $\beta$ |
| 1898.72 | $89.6$ | $32.03$ | ...11.2    | 2 <i>n</i> | $\beta$ |

Distant companion noted with the 6-inch. The proper motion of 51 *Eridani* is  $0.081$  in the direction of  $151^\circ$  (AUWERS). The measures do not cover a sufficient time to show whether or not the small star has the same movement. It is probably only an optical pair.

[ $\beta$  (ii)... $\beta$  (*Mon. Not. xxxiii*, 437)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

**$\beta$  882.** S.D. ( $11^\circ$ ) 921

R.A.  $4^h 32^m 32^s$  }  
Decl.  $-11^\circ 38'$  }

|         |         |        |            |            |         |
|---------|---------|--------|------------|------------|---------|
| 1880.08 | $231.6$ | $2.04$ | 8.8...10.0 | 1 <i>n</i> | $\beta$ |
| 1891.89 | $226.4$ | $2.25$ | 8.7... 9.4 | 3 <i>n</i> | $\beta$ |
| 1898.83 | $224.5$ | $2.70$ | 8.5...10.5 | 1 <i>n</i> | Bd      |
| 1898.96 | $228.2$ | $2.28$ | 8.5... 9.7 | 1 <i>n</i> | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. The *np* of two small stars in the same field.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Boothroyd ( )...]

**$\beta$  1044.** D.M. ( $16^\circ$ ) 637

R.A.  $4^h 33^m 1^s$  }  
Decl.  $+16^\circ 17'$  }

|         |         |        |            |            |         |
|---------|---------|--------|------------|------------|---------|
| 1888.91 | $218.5$ | $1.03$ | 9.0...11.0 | 3 <i>n</i> | $\beta$ |
| 1898.11 | $220.2$ | $0.93$ | 9.0...11.0 | 2 <i>n</i> | A       |

Discovered with the 36-inch. It is  $3^m 59^s$  *f Aldebaran*. The measures so far show no sensible change.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

**$\beta$  1236.** Lalande 8833

R.A.  $4^h 34^m 27^s$  }  
Decl.  $-21^\circ 29'$  }

A and B

|         |         |        |            |            |         |
|---------|---------|--------|------------|------------|---------|
| 1891.84 | $118.3$ | $1.42$ | 7.8...10.8 | 3 <i>n</i> | $\beta$ |
|---------|---------|--------|------------|------------|---------|

A and C

|         |         |         |         |            |         |
|---------|---------|---------|---------|------------|---------|
| 1891.84 | $314.1$ | $40.24$ | ... 8.5 | 3 <i>n</i> | $\beta$ |
| 1899.09 | $313.7$ | $40.13$ | ... 8.3 | 1 <i>n</i> | $\beta$ |
| 1899.11 | $313.9$ | $40.53$ | ... 8.5 | 1 <i>n</i> | A       |

Discovered with the 36-inch. A and C are respectively, O. Arg. S. 3268 and 3266.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

**$\beta$  186.** Lalande 8986

R.A.  $4^h 40^m 10^s$  }  
Decl.  $-7^\circ 12'$  }

|         |         |        |            |            |          |
|---------|---------|--------|------------|------------|----------|
| 1875.82 | $174.1$ | $2.00$ | 8.2...11.0 | 3 <i>n</i> | $\Delta$ |
| 1877.87 | $175.4$ | $1.68$ | 7.0... 9.0 | 1 <i>n</i> | Cin      |
| 1879.11 | $176.4$ | $1.38$ | 8.0... 9.5 | 1 <i>n</i> | Cin      |
| 1886.61 | $177.5$ | $1.79$ | 8.0... 9.3 | 2 <i>n</i> | Lv       |
| 1888.10 | $178.1$ | $1.63$ | 8.3...10.5 | 2 <i>n</i> | T        |
| 1888.50 | $176.1$ | $1.76$ | 7.2... 9.2 | 2 <i>n</i> | LM       |
| 1898.71 | $176.7$ | $1.54$ | 8.3... 8.8 | 1 <i>n</i> | $\beta$  |
| 1898.92 | $181.6$ | $1.65$ | 8.0... 9.5 | 3 <i>n</i> | Bd       |

Discovered with the 6-inch. Without change.

[ $\beta$  (iv)... $\beta$  (*Mon. Not. xxxiv*, 382)... $\Delta$  (i)...Cin<sup>4</sup>...Cin<sup>5</sup>...  
Lv<sup>4</sup>...LM...Tarrant (2991)...Boothroyd ( )...]

**β 312.** Lalande 9065

R.A. 4<sup>h</sup> 42<sup>m</sup> 36<sup>s</sup> }  
Decl. - 21° 1' }

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1870.06 | 343.8 | 3.13 | 8.5...10.5 | 1 <sup>n</sup> | Hd  |
| 1876.01 | 345.1 | 3.24 | 7.7... 9.0 | 3 <sup>n</sup> | Cin |
| 1876.03 | 345.7 | 3.35 | 8.0... 9.5 | 2 <sup>n</sup> | Hl  |
| 1877.52 | 343.6 | 3.29 | 8.0... 9.0 | 2 <sup>n</sup> | Cin |
| 1888.15 | 345.8 | 3.26 | 8.0...10.0 | 3 <sup>n</sup> | Hl  |
| 1898.84 | 345.2 | 3.05 | 8.5...10.0 | 1 <sup>n</sup> | Cg  |
| 1898.88 | 344.5 | 3.43 | 7.7... 8.5 | 2 <sup>n</sup> | Bd  |

Discovered with the 6-inch. Relatively fixed. This had been previously seen at the Harvard Observatory, but not published until 1882.

[β (VI)...β (2062)...Cin<sup>3</sup>... Cin<sup>4</sup>...Hall (I, II)...*Annals Harvard Coll. Obsy.*, XIII...Boothroyd and Cogshall ( )...]

**β 551.** 96 *Tauri*

R.A. 4<sup>h</sup> 42<sup>m</sup> 52<sup>s</sup> }  
Decl. + 15° 42' }

B and C

|         | °     | "    |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1878.09 | 205.7 | 6.26 | ...         | 1 <sup>n</sup> | β |
| 1891.94 | 205.5 | 5.83 | 11.0...12.8 | 3 <sup>n</sup> | β |
| 1898.72 | 205.0 | 6.21 | 11.9...13.5 | 2 <sup>n</sup> | β |

A and B (=H 3261)

|         | °    | "     |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1831    | 55.8 | 25 ±  | 6 ... 13 | 1 <sup>n</sup> | H |
| 1878.09 | 57.2 | 30.75 | ...      | 1 <sup>n</sup> | β |
| 1891.94 | 57.0 | 29.79 | 6 ...    | 3 <sup>n</sup> | β |
| 1898.72 | 56.4 | 29.37 | 6 ...    | 2 <sup>n</sup> | β |

The faint attendant to Herschel's companion was noted with the 18½-inch. There is another faint star in the group. The above are all the measures of AB. It is probably a perspective group only.

The proper motion of the principal star is small. It is given in the *Berlin A. G. Catalogue* as 0".008 in the direction of 43°.9.

[β (x)...β<sup>r</sup>...β (3114)...(*Pub. L. O. II.*)...]

**β 883.** Lalande 9091

R.A. 4<sup>h</sup> 44<sup>m</sup> 33<sup>s</sup> }  
Decl. + 10° 52' }

A and B

|         | °                   | "      |            |                  |         |
|---------|---------------------|--------|------------|------------------|---------|
| 1879.00 | 17.5                | 0.35   | 7.0... 7.0 | 1 <sup>n</sup>   | β       |
| 1887.17 | 84.7                | 0.15   | ...        | 3 <sup>n</sup>   | Sp      |
| 1888.09 | 124.4               | 0.18   | ...        | 2 <sup>n</sup>   | Sp      |
| 1889.15 | 149.6               | 0.22   | ...        | 4 <sup>n</sup>   | Sp      |
| 1890.14 | 203.4               | 0.16   | ...        | 3 <sup>n</sup>   | Sp      |
| 1891.08 | Single              | ...    | ...        | 7 <sup>n</sup>   | Sp      |
| 1891.14 | Single with 36-inch | ...    | ...        | 2 <sup>n</sup>   | β       |
| 1891.97 | 303.1               | 0.12   | 7.8... 7.5 | 3 <sup>n</sup>   | β       |
| 1894.66 | 356.3               | 0.19   | ...        | 3 <sup>n</sup>   | Barnard |
| 1895.74 | 6.4                 | 0.39   | ...        | 2-1 <sup>n</sup> | See     |
| 1895.74 | 8.9                 | ...    | ...        | 1 <sup>n</sup>   | Moulton |
| 1896.10 | 8.9                 | 0.25 ± | ...        | 12 <sup>n</sup>  | Sp      |
| 1896.88 | 16.9                | 0.28   | ...        | 3 <sup>n</sup>   | A       |
| 1896.97 | 28.3                | 0.24   | ...        | 10 <sup>n</sup>  | See     |
| 1897.00 | 25.5                | ...    | ...        | 1 <sup>n</sup>   | Dy      |
| 1897.13 | 23.8                | 0.27 ± | ...        | 3 <sup>n</sup>   | Sp      |
| 1897.16 | 36.0                | 0.35   | ...        | 1 <sup>n</sup>   | Moulton |
| 1897.31 | 37.3                | 0.38   | ...        | 2 <sup>n</sup>   | Lew     |
| 1897.72 | 30.2                | 0.25   | ...        | 2 <sup>n</sup>   | Do      |
| 1897.76 | 32.7                | 0.21   | ...        | 3 <sup>n</sup>   | Barnard |
| 1897.78 | 37.9                | 0.31   | 7.8... 7.8 | 2 <sup>n</sup>   | See     |
| 1897.81 | 33.6                | 0.25   | ...        | 2 <sup>n</sup>   | β       |
| 1897.83 | 31.5                | 0.28   | ...        | 6 <sup>n</sup>   | A       |
| 1897.90 | 35.2                | 0.34   | ...        | 3 <sup>n</sup>   | Lew     |
| 1897.90 | 34.7                | 0.39   | ...        | 1 <sup>n</sup>   | Bow     |
| 1897.90 | 34.7                | 0.39   | ...        | 2 <sup>n</sup>   | Br      |
| 1897.95 | 34.8                | 0.27   | ...        | 3 <sup>n</sup>   | Hu      |
| 1898.08 | 41.3                | 0.23   | ...        | 1 <sup>n</sup>   | Hu      |
| 1898.09 | 37.7                | 0.26   | ...        | 6 <sup>n</sup>   | A       |
| 1898.09 | 41.5                | 0.26   | ...        | 3 <sup>n</sup>   | Lew     |
| 1898.18 | 24.8                | 0.25   | ...        | 2 <sup>n</sup>   | Sp      |
| 1898.69 | 43.9                | 0.28   | 6.5... 6.5 | 5 <sup>n</sup>   | A       |
| 1898.74 | 45.3                | 0.19   | ...        | 3 <sup>n</sup>   | Barnard |
| 1898.74 | 46.0                | 0.24   | ...        | 2 <sup>n</sup>   | β       |
| 1898.95 | 51.4                | 0.36   | ...        | 1 <sup>n</sup>   | Lew     |
| 1899.20 | 54.5                | 0.20   | ...        | 3 <sup>n</sup>   | A       |

AB and C

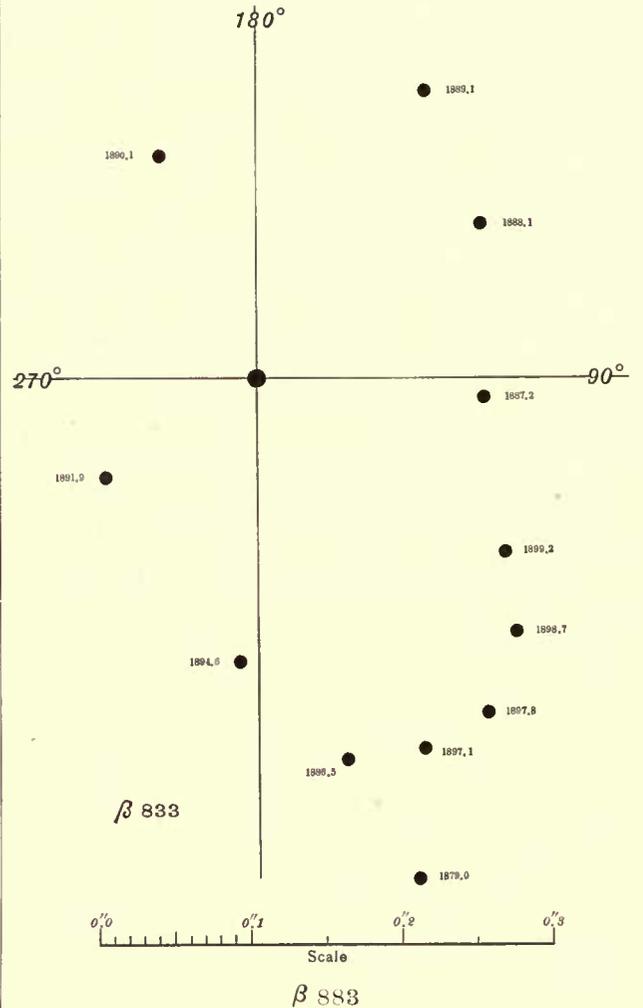
|         | °     | "     |           |                |         |
|---------|-------|-------|-----------|----------------|---------|
| 1879.00 | 148.5 | 18.35 | ... 14    | 1 <sup>n</sup> | β       |
| 1891.05 | 152.2 | 18.22 | 6.8... 13 | 1 <sup>n</sup> | β       |
| 1897.74 | 154.7 | 17.74 | ... 13    | 1 <sup>n</sup> | Barnard |
| 1897.80 | 153.1 | 18.04 | ...       | 1 <sup>n</sup> | Lew     |
| 1897.98 | 153.9 | 17.92 | ...       | 1 <sup>n</sup> | Bow     |
| 1898.17 | 154.5 | 17.55 | ...       | 1 <sup>n</sup> | A       |
| 1898.74 | 154.7 | 17.74 | ...       | 1 <sup>n</sup> | Barnard |

This very remarkable and interesting binary system was discovered with the 18½-inch. The motion has been rapid, and apparently more than one revolution has already been passed over by the companion. As the components are sensibly equal in magnitude, there is, as in all cases of this kind where the angular motion is rapid and the early measures separated by considerable intervals of time, some uncertainty as to the proper quadrant to be given to some of the measured angles. It is always a difficult pair. The maximum distance probably does not exceed 0".25.

Two orbits have been computed for this pair, the first by GLASENAPP, using the measures down to 1891.97, giving a period of 16.35 years (A.N. 3119); and the other by SEE from the measures to 1897.19, with a period of 5.5 years (*Mon. Not.* June 1897). To reach the last result, it was necessary to subject some of the measures to corrections of 180° in the angles, which seemed hardly warranted when the observations were considered as a whole. It also required the rejection of the three measures of 1891.97 with the 36-inch refractor. On the whole, from a careful consideration of all the measured positions made, it is practically certain that the period of five and one-half years is not correct, and, furthermore, that in consequence of the non-agreement of some of the measures with any apparent ellipse which can be selected, the real period, even approximately, cannot be known until the companion has moved over a larger arc, and particularly through the first quadrant. It has been well observed during the last two or three years, but even now (1899) the true form of the apparent orbit, for the reasons stated, is somewhat uncertain. It is probable that the period will not be far from that of GLASENAPP, but the other elements may differ very widely.

This star, according to PORTER, has no sensible proper motion.

[β (XIII)...β³...β (3048,3114)...β (*Pub. L. O.* II)...Sp (III)  
 ...GlaseNapp (3119)...Comstock (*Pub. Washburn Obsy.*  
 x)...See (*Mon. Not.* LVII, 577) (*Pop. Ast.* v, 245) (*A. J.*  
 359)...See (3496)...Hussey (*A. J.* 427)...Aitken (3465)  
 ...Aitken (*A. J.* 415, 429) (*Proc. A. S. P.* IX, 238)...  
 Barnard (*A. J.* 435)...Lewis and Bowyer (*Mon. Not.* LIX,  
 400)...Hussey ( )...Aitken ( )...Barnard (*A. J.*  
 435, 447)...Barnard ( )...]



β 552. *Orionis* 11. Lalande 9109

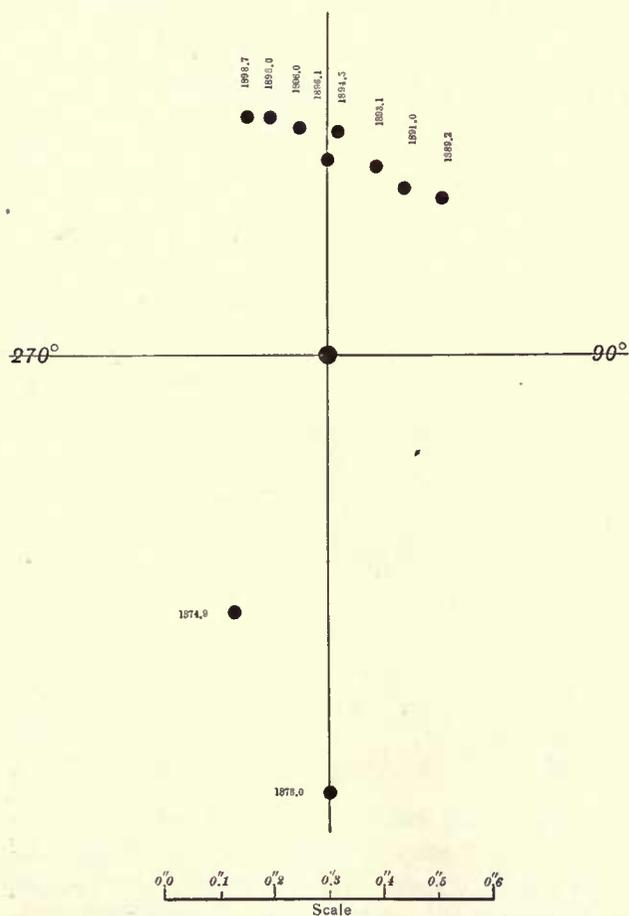
R.A. 4<sup>h</sup> 45<sup>m</sup> 4<sup>s</sup> }  
 Decl. + 13° 27' }

|         |                                |        |              |        |
|---------|--------------------------------|--------|--------------|--------|
| 1874.95 | 340±                           | 0.5±   | 7 ... 7      | β      |
| 1877.97 | 360±                           | 0.8±   | 7 ... 10     | 1n β   |
| 1886.19 | 265.0 ?                        | 0.5±   | ...          | 1n HΣ  |
| 1886.22 | ....                           | Single | ...          | 1n HΣ  |
| 1889.19 | 144.7                          | 0.35±  | ...          | 1n Sp  |
| 1890.96 | 156.7                          | 0.33   | 6.9 ... 10.2 | 3n β   |
| 1891.13 | 153.8                          | 0.3±   | ...          | 8n Sp  |
| 1892.06 | Apparently single with 36-inch |        |              | 2n β   |
| 1893.07 | 165.3                          | 0.35±  | ...          | 1n Sp  |
| 1894.15 | 178.2                          | 0.38±  | ...          | 2n Sp  |
| 1894.88 | 177.0                          | 0.40   | ...          | 2n Bar |
| 1896.11 | 179.9                          | 0.35±  | ...          | 7n Sp  |

|         |       |       |            |                |     |
|---------|-------|-------|------------|----------------|-----|
| 1896.84 | 187.7 | 0.43  | ...        | 1 <sup>n</sup> | Hu  |
| 1896.88 | 186.2 | 0.40  | ...        | 3 <sup>n</sup> | A   |
| 1897.13 | 193.5 | 0.25± | ...        | 2 <sup>n</sup> | Sp  |
| 1897.82 | 193.7 | 0.44  | ...        | 5 <sup>n</sup> | A   |
| 1897.95 | 193.4 | 0.43  | ...        | 3 <sup>n</sup> | Hu  |
| 1898.01 | 189.9 | 0.45  | 6.9...10.2 | 2 <sup>n</sup> | Lew |
| 1898.12 | 197.2 | 0.43  | ...        | 3 <sup>n</sup> | A   |
| 1898.74 | 199.1 | 0.45  | ...        | 3 <sup>n</sup> | A   |

This pair was discovered with the 18½-inch in 1877, but in looking over the old observing books used with the 6-inch, I find that on December 14, 1874, this star was noted as "possibly a close pair," and the angle and distance estimated as given above. It seems to have received no further attention with the small telescope, and was discovered independently three years later with the large refractor of the Dearborn Observatory.

There seems to be something singular about the appearance and difficulty of this pair at times with large apertures. It was not noted as difficult at the



time of the observation in 1877. In 1890 it was a hard star with the 36-inch, and on two nights in 1892, under favorable conditions, I failed to see it double at all. Since that it has been measured by several observers, and apparently the change is slow in the last five years. As the components are very unequal, there can be no uncertainty about the quadrant. The apparent orbit will probably be very eccentric.

The principal positions are shown on the accompanying diagram.

PORTER finds no evidence of proper motion in the meridian positions. To aid in determining this later I have measured a distant star in the field :

|  |       |       |       |                |   |
|--|-------|-------|-------|----------------|---|
| 1898.11  | 212.7 | 44.88 | ...13 | 3 <sup>n</sup> | β |
| [β (x)...β <sup>2</sup> ...β (3048,3141)...β (Pub. L. O. II)...Sp (III)... |       |       |       |                |   |
| Aitken (A. J. 415, 429)...Hussey (A. J. 397, 427)...Aitken                 |       |       |       |                |   |
| (3465)...Lewis (Mon. Not. LIX, 400)...Aitken ( )...                        |       |       |       |                |   |
| Barnard (A. J. 447)...]  |       |       |       |                |   |

β 1187. 5 *Camelopardali*

R.A. 4<sup>h</sup> 45<sup>m</sup> 14<sup>s</sup> }  
Decl. + 55° 4' }

|         |       |       |            |                |   |
|---------|-------|-------|------------|----------------|---|
| 1890.78 | 245.2 | 12.89 | 5.5...12.8 | 3 <sup>n</sup> | β |
| 1898.84 | 246.0 | 12.70 | 5.5...12.2 | 2 <sup>n</sup> | β |

Discovered with the 36-inch. KRUEGER gives the proper motion of this star 0".018 in the direction of 241°.1. If the small star is fixed in space its distance should decrease annually by this amount.

[β (xvii)...β (3047)...β (Pub. L. O. II)...]

β 748. S.D. (8°) 961

R.A. 4<sup>h</sup> 46<sup>m</sup> 4<sup>s</sup> }  
Decl. - 8° 3' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1879.68 | 131.4 | 1.03 | 9.0... 9.0 | 2 <sup>n</sup> | β  |
| 1891.85 | 131.1 | 1.25 | 8.6... 8.6 | 2 <sup>n</sup> | β  |
| 1898.73 | 134.7 | 1.36 | ...        | 1 <sup>n</sup> | β  |
| 1898.93 | 130.9 | 1.20 | 8.0... 8.5 | 1 <sup>n</sup> | Cg |

Discovered with the 6-inch on Mt. Hamilton in 1879. There is a small error in the place of this star in β (xi). The magnitude in S.D. is 8.6.

[β (xi)...β<sup>2</sup>...β (3114)...β (Pub. L. O. I, II)...Cogshall ( )...]

**$\beta$  1237.** Lalande 9145

R.A.  $4^h 46^m 28^s$  }  
Decl.  $+ 23^\circ 21'$  }

|         |      |      |            |            |            |         |
|---------|------|------|------------|------------|------------|---------|
| 1891.81 | 58.6 | "    | 4.32       | 8.0...10.6 | 2 <i>n</i> | $\beta$ |
| 1898.11 | 58.0 | 4.52 | 8.0...11.2 | 2 <i>n</i> | A          |         |

Discovered with the 36-inch. Evidently fixed.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 **$\beta$  316.** Lalande 9181

R.A.  $4^h 46^m 52^s$  }  
Decl.  $- 5^\circ 29'$  }

|         |       |      |            |            |            |    |
|---------|-------|------|------------|------------|------------|----|
| 1876.12 | 178.4 | "    | 0.99       | 8.0... 9.3 | 2 <i>n</i> | H1 |
| 1876.60 | 176.8 | 1.18 | 8.1... 8.2 | 4 <i>n</i> | $\Delta$   |    |
| 1877.95 | 176.8 | ...  | 8.0... 8.0 | 1 <i>n</i> | Cin        |    |
| 1879.11 | 178.0 | 1.16 | 8.0... 8.0 | 1 <i>n</i> | Cin        |    |
| 1882.11 | 178.8 | 1.22 | 9.0... 9.0 | 1 <i>n</i> | W          |    |
| 1886.94 | 179.9 | 1.31 | ...        | 1 <i>n</i> | LM         |    |
| 1887.90 | 179.4 | 1.10 | 8.0... 8.0 | 4 <i>n</i> | T          |    |
| 1888.15 | 178.6 | 1.01 | 9.0... 9.3 | 3 <i>n</i> | H1         |    |
| 1888.66 | 179.2 | 1.14 | 8.0... 8.1 | 3 <i>n</i> | Lv         |    |
| 1895.90 | 178.5 | ...  | ...        | 3 <i>n</i> | Dob        |    |

Discovered with the 6-inch. There has been no change in twenty years. In  $\beta$  (vi) the R.A. is 10"<sup>m</sup> too great. It is 10' *n* of  $\omega$  Eridani.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (1)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...LM...Lv<sup>1</sup>...Tarrant (2899)...Hall (I, II)...Doberck (3378)...]

 **$\beta$  313.** Lalande 9114

R.A.  $4^h 49^m 12^s$  }  
Decl.  $+ 68^\circ 59'$  }

|         |           |          |            |            |         |
|---------|-----------|----------|------------|------------|---------|
| 1874.98 | 250 $\pm$ | 10 $\pm$ | 6.5...11.5 | 1 <i>n</i> | $\beta$ |
|---------|-----------|----------|------------|------------|---------|

The 6-inch seemed to show a small attendant to this star, the position of which was estimated as given above, with the note, "Companion excessively faint. There is a more distant one *sf*." There are no other observations except of a negative character. I could not find any pair of this kind in or near this place with the 36-inch. It was recently examined with the 40-inch (1898), but no near companion seen. This star has two distant companions, 149 $^\circ$ 8 : 40 $^\circ$ 3, and 179 $^\circ$ 0 : 43 $^\circ$ 0. An examination of the original record throws no light

on the question. There is no apparent error in the place. The magnitude in D.M. is 7.0.

[ $\beta$  (vi)... $\beta$  (2062)...]

 **$\beta$  553.**  $\alpha^2$  Orionis

R.A.  $4^h 49^m 37^s$  }  
Decl.  $+ 13^\circ 19'$  }

|         |      |       |          |            |            |         |
|---------|------|-------|----------|------------|------------|---------|
| 1877.86 | 47.7 | "     | 28.58    | 5...12     | 2 <i>n</i> | $\beta$ |
| 1892.01 | 48.4 | 29.97 | 5.2...13 | 3 <i>n</i> | $\beta$    |         |
| 1898.75 | 49.1 | 30.57 | 5...12.5 | 2 <i>n</i> | $\beta$    |         |

Discovered with the 18 $\frac{1}{2}$ -inch. The proper motion of the principal star is 0 $^{\circ}$ .097 in the direction of 241 $^\circ$ 9 (AUWERS). This accounts for the change shown in the measures, and it is therefore only an optical pair.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  404.** D.M. (8 $^\circ$ ) 805

R.A.  $4^h 49^m 50^s$  }  
Decl.  $+ 8^\circ 58'$  }

|         |       |      |            |            |            |          |
|---------|-------|------|------------|------------|------------|----------|
| 1877.11 | 111.8 | "    | 1.56       | 9.1... 9.3 | 4 <i>n</i> | $\Delta$ |
| 1888.69 | 291.6 | 1.52 | 8.8... 8.9 | 3 <i>n</i> | Lv         |          |
| 1891.82 | 109.6 | 1.94 | 8.5... 8.5 | 2 <i>n</i> | C          |          |
| 1898.72 | 111.4 | 1.72 | ...        | 2 <i>n</i> | Hu         |          |

Discovered with the 6-inch. Without motion.

[ $\beta$  (vii)... $\beta$  (2103)... $\Delta$  (1)...Lv<sup>1</sup>...Collins (*Proc. Haverford Obsy.* 1891)...Hussey ( )...]

 **$\beta$  1045.** 99 Tauri

R.A.  $4^h 50^m 32^s$  }  
Decl.  $+ 23^\circ 46'$  }

|         |     |      |          |            |            |         |
|---------|-----|------|----------|------------|------------|---------|
| 1889.09 | 6.2 | "    | 6.30     | 6...12.3   | 3 <i>n</i> | $\beta$ |
| 1891.84 | 5.6 | 6.21 | 6...13.3 | 3 <i>n</i> | $\beta$    |         |
| 1898.96 | 6.4 | 6.19 | ...13.7  | 1 <i>n</i> | $\beta$    |         |

Discovered with the 36-inch. AUWERS gives this star a small proper motion, 0 $^{\circ}$ .021 in the direction of 238 $^\circ$ 4. Further measures are necessary to show whether or not the companion has this movement.

[ $\beta$  (xv)... $\beta$  (2929,3114)... $\beta$  (*Pub. L. O.* II)...]

**β 554. ε Aurigae**

R.A. 4<sup>h</sup> 53<sup>m</sup> 22<sup>s</sup> }  
Decl. + 43° 39' }

A and B

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1878.89 | 224.5 | 29.31 | 3.2...14 | 1n | β |
| 1891.86 | 224.8 | 29.30 | ...13.2  | 2n | β |
| 1898.79 | 223.8 | 29.93 | ...13.5  | 1n | β |

A and C

|         |       |       |         |    |   |
|---------|-------|-------|---------|----|---|
| 1878.42 | 275.4 | 42.88 | ...12   | 1n | β |
| 1878.97 | 275.3 | 42.91 | ...11.7 | 4n | β |
| 1891.86 | 275.0 | 43.03 | ...11.7 | 2n | β |
| 1898.79 | 275.0 | 43.03 | ...11.8 | 1n | β |

A and D

|         |       |       |         |    |   |
|---------|-------|-------|---------|----|---|
| 1878.80 | 317.9 | "     | ...13   | 1n | β |
| 1879.47 | 317.1 | 46.37 | ...12   | 2n | β |
| 1891.86 | 317.0 | 46.29 | ...12.6 | 2n | β |
| 1898.79 | 317.3 | 46.21 | ...13.0 | 1n | β |

These minute stars were noted with the 18½-inch. The proper motion is very small, 0.022 in the direction of 231°.1 (BONN). The same catalogue gives the principal star as variable, 3.0 to 4.5 m. BALL in his parallax measures (*Dunsink Obsns.* IV) used a star 207".6 distant in the angle of 47°3.

[β (x)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...]

**β 314. Leporis 3**

R.A. 4<sup>h</sup> 53<sup>m</sup> 39<sup>s</sup> }  
Decl. — 16° 34' }

A and B

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.69 | 149.9 | 0.43 | 6.6... 6.9 | 4n | Δ   |
| 1879.10 | 330.7 | ...  | 6.0... 7.0 | 1n | Cin |
| 1879.78 | 331.9 | 0.5± | ...        | 1n | Cin |
| 1889.13 | 326.9 | 1.05 | 6.5... 8.3 | 3n | β   |
| 1890.40 | 321.6 | 0.82 | ...        | 2n | Sp  |
| 1898.11 | 326.2 | 0.86 | 7.0...10   | 1n | Br  |
| 1898.16 | 329.2 | 0.98 | ...        | 1n | See |

AB and C

|         |      |       |         |    |     |
|---------|------|-------|---------|----|-----|
| 1889.13 | 29.0 | 54.45 | ... 8.2 | 2n | β   |
| 1898.16 | 30.6 | 54.83 | ...     | 1n | See |
| 1899.09 | 31.1 | 54.22 | ... 9.0 | 1n | β   |

Discovered with the 6-inch. In HEIS and ARGELANDER 6 m, but placed in *Eridanus*. GOULD gives it in *Lepus* 6 m. LALANDE 9420. In all but one measure Δ rates the components of equal magnitude. The change, if any, is in the distance. At the time of discovery the distance was estimated 0".5.

[β (VI)...β (2062,2929)...β (Pub. L. O. II)...Δ (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...Sp (III)...See ( )...Brown ( )...]

**β 1238. Lalande 9373**

R.A. 4<sup>h</sup> 53<sup>m</sup> 53<sup>s</sup> }  
Decl. + 26° 21' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1891.82 | 12.6 | 1.42 | 8.1...11.3 | 3n | β |
| 1899.11 | 7.0  | 1.57 | 7.0...11.0 | 1n | A |

Discovered with the 36-inch. It is 25<sup>s</sup> p and 9's of the wide pair, SOUTH 461.

[β (XVIII)...β (3113)...β (Pub. L. O. II)...Aitken ( )...]

**β 315. O. Arg. N. 5402**

R.A. 4<sup>h</sup> 53<sup>m</sup> 54<sup>s</sup> }  
Decl. + 49° 22' }

|         |       |       |            |    |   |
|---------|-------|-------|------------|----|---|
| 1877.35 | 226.0 | 10.45 | 9.0...11.0 | 2n | Δ |
| 1891.86 | 226.0 | 10.67 | 8.7... 9.4 | 2n | β |

Discovered with the 6-inch. Unchanged.

[β (VI)...β (2062,3114)...β (Pub. L. O. II)...Δ (1)...]

**β 1046. 9 Aurigae**

R.A. 4<sup>h</sup> 57<sup>m</sup> 17<sup>s</sup> }  
Decl. + 51° 26' }

A and B

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1888.92 | 93.8 | 6.29 | 5.5...12.7 | 3n | β |
| 1898.79 | 92.0 | 6.38 | ...13.0    | 1n | β |

A and C (= H<sup>1</sup> VI. 35)

|         |      |       |            |    |                |
|---------|------|-------|------------|----|----------------|
| 1783.30 | 62.2 | 79.50 | ...        | 1n | H <sup>1</sup> |
| 1888.19 | 61.0 | 90.10 | 5.1... 9.7 | 2n | Eng.           |
| 1888.92 | 60.8 | 89.92 | ... 9.0    | 2n | β              |
| 1898.79 | 60.9 | 89.85 | ... 8.7    | 1n | β              |

The faint star, B, was detected with the 36-inch. The principal star, according to AUWERS, has a proper motion of 0".169 in the direction of 190°.5.

With this movement and the positions of 1888, at the time of HERSCHEL'S measure in 1783, C should have been  $70^{\circ}8' : 79^{\circ}8'$ . All the measures of AC are given above. It is practically certain that the new star is moving with A, as otherwise the position-angle would be  $14^{\circ}$  less in 1898 than at the date of the first measures.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...Engelhardt (*Obsns. Astr.* Part 2)...]

**$\beta$  884.** Lalande 9534

R.A.  $4^{\text{h}} 57^{\text{m}} 22^{\text{s}}$  }  
Decl.  $-12^{\circ} 36'$  }

|         |        |           |                 |      |         |
|---------|--------|-----------|-----------------|------|---------|
| 1879.09 | $19.0$ | $0.54$    | $8.0 \dots 8.0$ | $2n$ | $\beta$ |
| 1891.15 | $20.7$ | $0.6 \pm$ | $\dots$         | $3n$ | Sp      |
| 1892.04 | $20.7$ | $0.54$    | $8.4 \dots 8.5$ | $3n$ | $\beta$ |
| 1896.11 | $21.1$ | $0.6 \pm$ | $\dots$         | $4n$ | Sp      |

Discovered with the  $18\frac{1}{2}$ -inch. The measures furnish no evidence of motion.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Sp (III)...]

**$\beta$  749.** D.M. ( $55^{\circ}$ ) 958

R.A.  $4^{\text{h}} 57^{\text{m}} 37^{\text{s}}$  }  
Decl.  $+55^{\circ} 22'$  }

|         |         |        |                  |      |         |
|---------|---------|--------|------------------|------|---------|
| 1879.73 | $225.9$ | $0.91$ | $7.9 \dots 10.0$ | $2n$ | $\beta$ |
| 1891.86 | $228.9$ | $1.11$ | $8.1 \dots 8.9$  | $2n$ | $\beta$ |

Discovered with the 6-inch on Mt. Hamilton in 1879. No material change.

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)...]

**$\beta$  750.**  $\gamma$  *Caeli*

R.A.  $5^{\text{h}} 0^{\text{m}} 5^{\text{s}}$  }  
Decl.  $-35^{\circ} 39'$  }

|         |         |         |                                   |      |         |
|---------|---------|---------|-----------------------------------|------|---------|
| 1853.50 | $315.7$ | $2.82$  | $5.6 \dots 9.0$                   | $5n$ | Ja      |
| 1855.13 | $318.6$ | $\dots$ | $4\frac{1}{2} \dots 9\frac{1}{2}$ | $2n$ | Pow     |
| 1882.19 | $318.4$ | $2.23$  | $\dots$                           | $1n$ | Rus     |
| 1891.08 | $311.2$ | $3.12$  | $\dots$                           | $1n$ | Sel     |
| 1892.01 | $316.0$ | $2.69$  | $4.5 \dots 8.7$                   | $3n$ | $\beta$ |
| 1894.08 | $307.7$ | $2.34$  | $4 \dots 10$                      | $1n$ | Sel     |
| 1897.09 | $313.4$ | $3.17$  | $5.7 \dots 10.5$                  | $2n$ | See     |

Discovered with the 6-inch on Mt. Hamilton in 1879, but it had been previously found by JACOB. The components are relatively fixed.

[Jacob (*Madras Obsns.* 1848-52)...Powell (*Mem. R. A. S.* (xxv)... $\beta$  (xi)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)... Russell (*Syd. Obsns.* 1871-81)... Sellors (3154.3303)... See (3495)...]

**$\beta$  751.** D.M. ( $42^{\circ}$ ) 1184

R.A.  $5^{\text{h}} 1^{\text{m}} 16^{\text{s}}$  }  
Decl.  $+42^{\circ} 31'$  }

|         |         |        |                  |      |         |
|---------|---------|--------|------------------|------|---------|
| 1891.85 | $258.0$ | $3.07$ | $8.4 \dots 10.0$ | $3n$ | $\beta$ |
| 1898.87 | $255.9$ | $3.48$ | $\dots$          | $1n$ | Hu      |
| 1898.97 | $257.0$ | $3.25$ | $8.2 \dots 10.6$ | $2n$ | $\beta$ |

Discovered with the 6-inch on Mt. Hamilton in 1879. Without change. A star  $11.7$  m,  $204^{\circ}3' : 24^{\circ}42'$  (1899.09)  $1n$ .

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)...Hussey ( )...]

**$\beta$  1047.** *Aurigae* 47

R.A.  $5^{\text{h}} 2^{\text{m}} 13^{\text{s}}$  }  
Decl.  $+27^{\circ} 53'$  }

B and C

|         |        |            |                 |      |         |
|---------|--------|------------|-----------------|------|---------|
| 1889.09 | $75.3$ | $0.44$     | $8.7 \dots 9.2$ | $3n$ | $\beta$ |
| 1890.78 | $58.2$ | $0.24 \pm$ | $\dots$         | $6n$ | Sp      |
| 1892.12 | $68.3$ | $0.26$     | $8.7 \dots 8.8$ | $3n$ | $\beta$ |
| 1896.11 | $50.3$ | $0.21$     | $\dots$         | $1n$ | L       |

A and BC (=  $\Sigma$  645)

|         |        |         |                 |      |          |
|---------|--------|---------|-----------------|------|----------|
| 1829.90 | $26.8$ | $11.71$ | $6.2 \dots 8.2$ | $3n$ | $\Sigma$ |
| 1866.14 | $27.0$ | $11.79$ | $5.8 \dots 8.0$ | $3n$ | $\Delta$ |
| 1889.09 | $26.6$ | $11.69$ | $7.2 \dots$     | $3n$ | $\beta$  |
| 1890.78 | $27.3$ | $11.82$ | $\dots$         | $6n$ | Sp       |
| 1892.11 | $27.4$ | $11.75$ | $6.5 \dots$     | $3n$ | $\beta$  |

The duplicity of the smaller component of  $\Sigma$ 645 was discovered with the 36-inch. It appears to be in rapid motion. The wide pair was first observed by HERSCHEL in 1782 (= H<sup>1</sup> III. 90). These stars are relatively fixed. A few of the measures are given above. The principal star is Lalande 9653.

[ $\beta$  (xv)... $\beta$  (2929,3141)... $\beta$  (*Pub. L. O.* II)...Sp (III)... Lewis (*Mon. Not.* LIX, 400)...]

The following references include all the measures of the wide pair:

[Herschel (*Mem. R. A. S.* xxxv, xxxviii)...Madler (*Fixstern-Systeme* 1)...Secchi (*Cat. 1321 Double Stars*)...(Radcliffe *Obsns.* xxiv)... $\Delta$  (1204)... $\Delta$  (I, II)...Glaserapp (II)...]

**β 885.** Lalande 9758

R.A. 5<sup>h</sup> 4<sup>m</sup> 53<sup>s</sup> }  
Decl. — 1° 55'

|         |       |      |        |     |                |    |
|---------|-------|------|--------|-----|----------------|----|
| 1880.80 | 196.1 | 0.71 | 8.3... | 8.4 | 3 <sup>n</sup> | β  |
| 1888.92 | 190.7 | 0.65 | 8.0... | 8.6 | 2 <sup>n</sup> | Lv |
| 1892.13 | 186.5 | 0.72 | 8.0... | 9.0 | 1 <sup>n</sup> | C  |
| 1898.11 | 194.8 | 0.69 | ...    |     | 1 <sup>n</sup> | Br |

Discovered with the 18½-inch. Probably unchanged.

[β (XIII)...β³...Lv¹...Collins (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Brown ( )...]

**β 1006.** S.D. (2°) 1169

R.A. 5<sup>h</sup> 6<sup>m</sup> 17<sup>s</sup> }  
Decl. — 2° 21'

A and B

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1882.00 | 201.7 | 0.78 | 9.6... | 11.0 | 2 <sup>n</sup> | β |
| 1891.93 | 203.5 | 0.66 | 8.5... | 9.0  | 2 <sup>n</sup> | β |

A and C

|         |       |       |     |     |                |   |
|---------|-------|-------|-----|-----|----------------|---|
| 1882.00 | 177.8 | 52.29 | ... | 9.7 | 2 <sup>n</sup> | β |
| 1891.93 | 178.2 | 52.40 | ... | 8.7 | 2 <sup>n</sup> | β |
| 1899.09 | 177.8 | 52.37 | ... | 8.9 | 2 <sup>n</sup> | β |

Discovered with the 12-inch on Mt. Hamilton in 1881.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...]

**β 555.** β Orionis

R.A. 5<sup>h</sup> 8<sup>m</sup> 47<sup>s</sup> }  
Decl. — 8° 20'

B and C

|         |                                     |       |  |                        |
|---------|-------------------------------------|-------|--|------------------------|
| 1871.90 | B elongated n direction of A (200°) |       |  | β                      |
| 1876.20 | B elongated in 170°-180°            |       |  | Sadler                 |
| 1878.14 | 172.8                               | 0.35  |  | 2 <sup>n</sup> β       |
| 1878.80 | 55.±                                | 0.25± |  | 2 <sup>n</sup> Russell |
| 1879.68 | 125.9                               | ...   |  | 5 <sup>n</sup> β       |
| 1879.76 | 158.7                               | 0.4±  |  | 1 <sup>n</sup> Cin     |
| 1880.82 | Doubtful with 18½-inch              |       |  | β                      |
| 1880.17 | Single                              |       |  | 2 <sup>n</sup> Sp      |
| 1882.21 | Single                              |       |  | 2 <sup>n</sup> Sp      |

|         |                                 |       |  |                |         |
|---------|---------------------------------|-------|--|----------------|---------|
| 1884.14 | 178.0                           | ...   |  | 3 <sup>n</sup> | Henry   |
| 1887    | Always single                   |       |  |                | Tarrant |
| 1889.09 | Round with 36-inch              |       |  |                | β       |
| 1890.83 | Single with 2600, 36-inch       |       |  | 3 <sup>n</sup> | β       |
| 1891.73 | Single with all powers, 36-inch |       |  |                | β       |
| 1892.88 | Single 36-inch                  |       |  |                | Barnard |
| 1898.87 | 178.0                           | 0.16  |  | 3 <sup>n</sup> | Aitken  |
| 1898.88 | 178.4                           | 0.12± |  | 1 <sup>n</sup> | Hussey  |
| 1899.17 | 196.2                           | 0.12  |  | 1 <sup>n</sup> | Aitken  |

A and B (= Σ 668)

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1831.53 | 199.8 | 9.14 | 1.0... | 8.0 | 3 <sup>n</sup> | Σ   |
| 1845.94 | 199.1 | 9.39 | ...    |     | 4 <sup>n</sup> | Ma  |
| 1852.20 | 199.4 | 9.69 | ...    |     | 4 <sup>n</sup> | Ma  |
| 1865.33 | 201.1 | 9.47 | ...    | 7.8 | 5 <sup>n</sup> | J   |
| 1876.91 | 201.3 | 9.32 | ...    |     | 6 <sup>n</sup> | Sp  |
| 1881.05 | 202.0 | 9.31 | ...    |     | 4 <sup>n</sup> | Jed |
| 1888.13 | 202.1 | 9.74 | ...    |     | 4 <sup>n</sup> | HI  |
| 1898.89 | 201.7 | 9.62 | ...    |     | 2 <sup>n</sup> | A   |
| 1898.92 | 201.4 | 9.55 | ...    |     | 2 <sup>n</sup> | β   |

A and D

|         |     |       |     |      |                |   |
|---------|-----|-------|-----|------|----------------|---|
| 1878.82 | 1.5 | 44.48 | ... | 12.5 | 2 <sup>n</sup> | β |
| 1892.07 | 1.4 | 44.44 | ... | 13.5 | 2 <sup>n</sup> | β |
| 1898.83 | 1.3 | 44.10 | ... | 13.5 | 3 <sup>n</sup> | β |

In 1871, while examining Rigel with the 6-inch, I suspected an elongation of the companion, and called the attention of observers with larger instruments to this star. In 1878 I examined it very carefully with the 18½-inch, and saw and measured what I felt certain was a real and measurable elongation of the small star. The measured distances were noted at the time as being too large. When on Mt. Hamilton with the 6-inch, in 1879, I again measured the position angle, and regarded the elongation as not due to atmospheric causes. This star was scrutinized with the 18½-inch at Chicago a number of times from 1880 to 1882, but at all times it appeared either round or very doubtful. In 1889 and 1890 it was certainly single with the 36-inch with the highest powers under the very best conditions. If the distance had been as much as 0.05, it would have been noticed on some of these occasions with the large refractor. There are some other observations which tend to confirm the theory of duplicity. RUSSELL speaks of it as being divided at times with the SYDNEY refractor of 11

inches, although the distance was estimated as a quarter of a second. This would seem to be impossible for any ordinary telescope of that aperture, although with such a distance it should be plainly elongated. It is evident that one or the other of the measures of 1878 must be erroneous. STONE noted it as "pear-shaped" with the Cincinnati 11-inch refractor in 1879. The Paris measures by HENRY with the 15 inch I get at secondhand, as I have not seen the original observations in print. The angle agrees well enough with the previous measures. One of two conclusions seems obvious: Either this star is not double at all, the elongation supposed to be seen on the different occasions mentioned being due to atmospheric or other causes; or, if double, it must be moving with great rapidity. The negative results can be explained in no other way. I dislike to believe that I have been deceived by any spurious elongation of the small star, as this would be the first time such a mistake has happened in my experience in double-star observations; but certainly my subsequent failures to see this star double would tend to that conclusion. It should be carefully examined each year, because if it is really double, it cannot remain apparently single very long. On no occasion has the bright star presented an unusual appearance; and when B was seen double, other small stars in the vicinity were examined, and they were all apparently round.

There has been no change in the position of B with reference to A. It has been frequently measured by most of the double-star observers. Enough measures are given above to show relative fixity.

The faint star C was first mentioned by MITCHELL in 1846. The foregoing measures are all that have ever been made of this star.

[Since the foregoing was written I have received the recent measures of AITKEN and HUSSEY made with the great refractor at Mt. Hamilton. There is no longer any doubt of the duplicity of this star. It is equally certain that the period will be very short—perhaps shorter than that of any known system.]

AUWERS gives the proper motion of Rigel  $0.018$  in the direction of  $293^{\circ}2$ . This movement would not affect the distance of the Herschel companion, but would decrease the angle  $7^{\circ}6$  between the measures of  $\Sigma$  and those of 1898. It is therefore practically certain that A and BC form a physical system.

The following references relate to the duplicity of B:

$\beta$  (x)... $\beta$  (*Eng. Mech.* Feb. 9, 1872) (*Mon. Not.* xxxviii, 476)... $\beta^1$ ... $\beta^2$ ... $\beta^3$ ... $\beta$  (2929,3048,3114)... Sadler (*Eng. Mech.* Feb. 4, 1887)... Russell (*Pub. Sydney Obsy.* 1871-81) (*Observatory* II, 374)... Cin<sup>6</sup>... Tarrant (2898)... Sp (II)... Aitken and Hussey ( )...

There are many measures of the old pair (= H<sup>1</sup> II. 33 = Sh 53 =  $\Sigma$  668) in addition to those given above. They will be found in the references given for BC in the original catalogues of H<sup>1</sup>, Sh, and  $\Sigma$ , and in the following:

[Herschel II (*Mem. R. A. S.* v, VIII)... Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* XI, XII, XIII, XV)... Dawes (*Mem. R. A. S.* VIII)... Secchi (*Cat. di 1321 Stelle Doppie*) (*Third Series of Measures*, 1855)... Lassell (858)... Wrottesley (*Mem. R. A. S.* XXIX)... Fletcher (*Mem. R. A. S.* XXII)... Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII)... Gledhill (*Mem. R. A. S.* XLII)... Knott (*Mem. R. A. S.* XLIII)... Radcliffe *Obsns.* XXII...  $\Delta$  (1185,1735)...  $\Delta$  (I, II)... Doberck (2196,2899) (*Trans. R. I. Acad.* XXIX, Part 13)... Lassell (*Mon. Not.* XIII, 183)... Winnecke (*Ast. Beob. Sternwarte zu Berlin*, v)... Mitchell (*Sid. Mess.* May 1847)... Cin<sup>4</sup>... Cin<sup>5</sup>... Cin<sup>6</sup>... Sp (II)... Jedrzejewicz (2449)... Maw (*Mem. R. A. S.* L, 75)... Hall (II)... Glasenapp II)...

### $\beta$ 317. Lalande 9852

R.A.  $5^h 8^m 54^s$  }  
Decl.  $-23^{\circ} 8'$  }

|         | $^{\circ}$ | "    |        |      |            |         |
|---------|------------|------|--------|------|------------|---------|
| 1876.05 | 12.4       | 9.16 | 7.5... | 11.0 | 1 <i>n</i> | Cin     |
| 1877.11 | 11.6       | 8.06 | 7.5... | 10.0 | 1 <i>n</i> | Cin     |
| 1891.87 | 11.8       | 8.53 | 7.4... | 10.1 | 3 <i>n</i> | $\beta$ |
| 1898.14 | 11.3       | 8.95 | ...    |      | 1 <i>n</i> | See     |

Discovered with the 6-inch. Evidently fixed. SEE measures a distant star  $46^{\circ}5 : 18^m 75$  (1898.14) 1*n*.

[ $\beta$  (VI)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* II)... Cin<sup>3</sup>... Cin<sup>4</sup>... See ( )...]

### $\beta$ 885 $\frac{1}{2}$ . Lalande 9823

R.A.  $5^h 10^m 0^s$  }  
Decl.  $+37^{\circ} 30'$  }

|         | $^{\circ}$ | "    |        |      |            |         |
|---------|------------|------|--------|------|------------|---------|
| 1880.21 | 69.3       | 2.31 | 7.5... | 9.5  | 6 <i>n</i> | $\beta$ |
| 1898.87 | 69.3       | 2.30 | ...    |      | 1 <i>n</i> | Hu      |
| 1899.05 | 67.2       | 2.50 | 8.2... | 10.5 | 1 <i>n</i> | $\beta$ |

Discovered with the 18 $\frac{1}{2}$ -inch.

[ $\beta$  (XIII)... $\beta^3$ ... Hussey ( )...]

**β 318.** Lalande 9873

R.A.  $5^h 10^m 15^s$  }  
Decl.  $- 3^\circ 37'$  }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1876.23 | 227.2 | 0.66 | 8.3... | 8.7 | 3 <sup>n</sup> | Δ   |
| 1878.61 | 226.6 | ...  | 8.2... | 8.5 | 2 <sup>n</sup> | Cin |
| 1883.13 | 226.2 | 0.55 | 8.5... | 8.7 | 1 <sup>n</sup> | Sp  |
| 1886.11 | 227.3 | 0.48 | 8.0... | 8.0 | 1 <sup>n</sup> | LM  |
| 1898.11 | 238.5 | 0.57 | ...    |     | 1 <sup>n</sup> | Br  |
| 1898.78 | 234.2 | 0.64 | 8.0... | 8.0 | 3 <sup>n</sup> | A   |
| 1898.93 | 229.9 | 0.78 | 8.5... | 8.5 | 2 <sup>n</sup> | Cg  |

Discovered with the 6-inch. There seems to be no sensible change.

[β (v1)... (2062)... Δ (1)... Cin<sup>5</sup>... LM... Sp (11)... Brown ( )... Aitken ( )... Cogshall ( )...]

**β 188.** τ *Orionis*

R.A.  $5^h 11^m 47^s$  }  
Decl.  $- 6^\circ 58'$  }

B and C

|         |      |      |    |     |      |                |    |
|---------|------|------|----|-----|------|----------------|----|
| 1876.22 | 49.1 | 3.77 | 11 | ... | 12   | 2 <sup>n</sup> | H1 |
| 1878.26 | 50.8 | 4.10 | 11 | ... | 13   | 4 <sup>n</sup> | β  |
| 1891.94 | 51.4 | 3.79 | 11 | ... | 11.6 | 3 <sup>n</sup> | β  |

A and B (= H<sup>1</sup> V. 25)

|         |       |       |     |     |    |                |                |
|---------|-------|-------|-----|-----|----|----------------|----------------|
| 1830    | 250.4 | 18±   | 4   | ... | 14 | 1 <sup>n</sup> | H <sup>2</sup> |
| 1868.08 | 248.3 | 31.28 | ... |     |    | 1 <sup>n</sup> | Hd             |
| 1876.22 | 250.1 | 36.01 | ... |     | 11 | 2 <sup>n</sup> | H1             |
| 1877.95 | 249.1 | 36.20 | ... |     |    | 1 <sup>n</sup> | β              |
| 1891.94 | 249.2 | 35.27 | ... |     |    | 3 <sup>n</sup> | β              |
| 1899.02 | 250.3 | 35.01 | ... |     |    | 1 <sup>n</sup> | β              |

A and D (= H 2259)

|         |      |       |     |  |      |                |                |
|---------|------|-------|-----|--|------|----------------|----------------|
| 1830    | 63.8 | 18±   | ... |  | 12   | 1 <sup>n</sup> | H <sup>2</sup> |
| 1868.08 | 60.8 | 36.03 | ... |  | 12   | 1 <sup>n</sup> | Hd             |
| 1876.22 | 59.8 | 35.99 | ... |  | 12   | 2 <sup>n</sup> | H1             |
| 1877.95 | 60.0 | 36.09 | ... |  | 12   | 1 <sup>n</sup> | β              |
| 1891.94 | 60.0 | 35.97 | ... |  | 10.7 | 3 <sup>n</sup> | β              |
| 1899.02 | 60.0 | 36.02 | ... |  |      | 1 <sup>n</sup> | β              |

The attendant to the H<sup>1</sup> companion was discovered with the 18½-inch. H<sup>1</sup> failed to see D, which was added by H<sup>2</sup> (*Fifth Catalogue*). The above are all the measures of these stars.

AUWERS gives the proper motion of the principal star 0.035 in the direction of 290°.1.

[β (iv)... β (*Mon. Not.* xxxiv, 382)... β<sup>1</sup>... β<sup>3</sup>... β (3114)... β (*Pub. L. O.* 11)... *Annals Harvard Coll. Obsy.* xiii... Herschel (*Mem. R. A. S.* vi)... Hall (1)...]

**β 886.** D.M. (33°) 1020

R.A.  $5^h 14^m 24^s$  }  
Decl.  $+ 33^\circ 41'$  }

C and D

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1882.22 | 246.9 | 0.90 | 8.5... | 10.0 | 1 <sup>n</sup> | β   |
| 1892.07 | 253.8 | 0.77 | 9.1... | 9.6  | 3 <sup>n</sup> | β   |
| 1898.19 | 258.2 | 0.82 | ...    |      | 2 <sup>n</sup> | Lew |

A and B (= Σ 687)

|         |      |       |        |     |                |     |
|---------|------|-------|--------|-----|----------------|-----|
| 1829.24 | 67.6 | 17.17 | 8.2... | 9.0 | 2 <sup>n</sup> | Σ   |
| 1844.26 | 68.6 | 16.61 | ...    |     | 1 <sup>n</sup> | Ma  |
| 1867.22 | 68.7 | 17.20 | 8.0... | 9.0 | 3 <sup>n</sup> | Δ   |
| 1882.23 | 68.5 | 17.51 | 8.5... | 8.6 | 3 <sup>n</sup> | β   |
| 1892.06 | 67.9 | 17.30 | 8.1... | 8.6 | 2 <sup>n</sup> | β   |
| 1898.19 | 68.9 | 17.57 | ...    |     | 2 <sup>n</sup> | Lew |

A and C (= Σ 687)

|         |       |       |     |     |                |   |
|---------|-------|-------|-----|-----|----------------|---|
| 1829.24 | 153.5 | 48.73 | ... | 9.2 | 2 <sup>n</sup> | Σ |
| 1867.22 | 153.6 | 48.78 | ... | 8.9 | 3 <sup>n</sup> | Δ |
| 1882.24 | 153.2 | 48.48 | ... | 8.8 | 2 <sup>n</sup> | β |
| 1892.06 | 153.9 | 48.53 | ... |     | 2 <sup>n</sup> | β |

The duplicity of the distant Σ companion was discovered with the 18½-inch. There is no change in the wide triple. The above are all the measures of AB and AC. The measures indicate some change in CD.

[β (xiii)... β<sup>3</sup>... β (3141)... β (*Pub. L. O.* 11)... Lewis (*Mon. Not.* LIX, 400)... Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* xiii)... Δ (11)...]

**β 887.** D.M. (33°) 1026

R.A.  $5^h 14^m 33^s$  }  
Decl.  $+ 33^\circ 18'$  }

A and B

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1882.22 | 194.3 | 1.00 | 9.0... | 10.5 | 2 <sup>n</sup> | β   |
| 1891.90 | 192.0 | 0.96 | 8.9... | 9.7  | 3 <sup>n</sup> | β   |
| 1898.25 | 198.0 | 0.91 | ...    |      | 1 <sup>n</sup> | L   |
| 1898.84 | 189.4 | 0.87 | 9.0... | 10.5 | 1 <sup>n</sup> | β   |
| 1898.89 | 193.6 | 1.10 | ...    |      | 1 <sup>n</sup> | Bar |

| A and C |       |   |      |         |      |
|---------|-------|---|------|---------|------|
| 1898.84 | 112.8 | " | 9.54 | ...13.5 | 1n β |

| A and D |       |   |       |         |      |
|---------|-------|---|-------|---------|------|
| 1882.24 | 332.8 | " | 10.56 | ...12   | 3n β |
| 1891.90 | 332.1 | " | 10.66 | ...11.8 | 3n β |
| 1898.24 | 335.2 | " | 10.55 | ...     | 1n L |
| 1898.84 | 332.0 | " | 10.47 | ...13.2 | 1n β |

| A and E |       |   |       |         |      |
|---------|-------|---|-------|---------|------|
| 1898.84 | 201.6 | " | 14.80 | ...13.5 | 1n β |

Discovered with the 18½-inch. The two faint stars were added with the 36-inch.

[β (XIII)...β<sup>3</sup>...β (3113)...β (Pub. L. O. II)...Lewis (Mon. Not. LIX, 400)...Barnard ( )...]

### β 189. Orionis 81

R.A. 5<sup>h</sup> 14<sup>m</sup> 33<sup>s</sup> }  
Decl. — 5° 28' }

|         |       |   |      |            |       |
|---------|-------|---|------|------------|-------|
| 1875.86 | 283.6 | " | 4.27 | 6.8...11.5 | 3n Δ  |
| 1891.92 | 286.5 | " | 4.09 | 6.9...10.2 | 3n β  |
| 1898.92 | 286.8 | " | 4.40 | 7.2...11.0 | 3n Bd |

Discovered with the 6-inch. The change, if any, is small. Lalande 10023.

[β (IV)...β (Mon. Not. xxxiv, 382)...β (3114)...β (Pub. L. O. II)...Δ (1)...Boothroyd ( )...]

### β 190. Orionis 82

R.A. 5<sup>h</sup> 14<sup>m</sup> 38<sup>s</sup> }  
Decl. — 8° 9' }

| A and B |       |   |      |            |        |
|---------|-------|---|------|------------|--------|
| 1876.15 | 355.3 | " | 0.71 | 7.9... 8.7 | 4n Δ   |
| 1877.97 | 360.7 | " | ...  | 8.0... 8.5 | 1n Cin |
| 1879.88 | 363.8 | " | 0.53 | 8.0... 8.0 | 4n β   |
| 1887.98 | 363.7 | " | 0.60 | 7.9... 8.7 | 3n T   |
| 1890.98 | 358.5 | " | 0.54 | 8.0... 8.1 | 3n β   |
| 1898.86 | 356.4 | " | 0.64 | 8.0... 8.5 | 2n A   |

### AB and C (= Σ 692)

|         |     |   |       |            |       |
|---------|-----|---|-------|------------|-------|
| 1783.73 | 7.7 | " | 29.30 | ...        | 1n H' |
| 1825.05 | 6.8 | " | 35.68 | 8 ... 10   | 2n S  |
| 1831.48 | 4.2 | " | 34.86 | 7.8... 8.8 | 3n Σ  |
| 1863.10 | 3.9 | " | 35.62 | ...        | 4n En |

|         |     |   |       |            |          |
|---------|-----|---|-------|------------|----------|
| 1867.64 | 3.9 | " | 34.84 | 7.3... 8.0 | 3n Δ     |
| 1890.99 | 3.9 | " | 34.90 | ...        | 8.7 2n β |
| 1898.86 | 3.7 | " | 34.98 | ...        | 8.0 2n A |

The close pair was discovered with the 6-inch. Evidently there is no change in the wide pair (= H' IV. 87 = S 475 = Σ 692). All the measures are given above. The principal star is Lalande 10029.

[β (IV)...β (Mon. Not. xxxiv, 382)...β<sup>2</sup>...β<sup>3</sup>...β (3048)...β (Pub. L. O. II)...Δ (II, p. 121)...Cin<sup>4</sup>...Tarrant (2899)...Aitken ( )...Engelmann (Mess. Neunzig Doppelsternen, 1865)...]

### β 888. σ Aurigae

R.A. 5<sup>h</sup> 16<sup>m</sup> 30<sup>s</sup> }  
Decl. + 37° 16' }

#### A and B

|         |       |   |      |            |      |
|---------|-------|---|------|------------|------|
| 1880.14 | 171.0 | " | 7.91 | 6.0...12.0 | 4n β |
| 1890.97 | 167.1 | " | 8.60 | 6.0...13.2 | 3n β |
| 1898.82 | 166.3 | " | 8.65 | ...12.5    | 4n β |

#### A and C

|         |       |   |       |         |      |
|---------|-------|---|-------|---------|------|
| 1898.87 | 330.5 | " | 27.24 | ...14.2 | 2n β |
|---------|-------|---|-------|---------|------|

#### C and D

|         |       |   |     |           |      |
|---------|-------|---|-----|-----------|------|
| 1898.96 | 348.1 | " | 4.4 | 15 ... 16 | 1n β |
|---------|-------|---|-----|-----------|------|

Discovered with the 18½-inch. The proper motion of this star is 0".027 in the direction of 272°.1 (AUWERS). The interval covered by the measures is too short to tell with certainty whether the companion is moving with it. The faint stars, C and D, were noted with the 40-inch.

[β (XIII)...β<sup>3</sup>...β (Observatory, III, 451)...β (Pub. L. O. II)...β (3048)...]

### β 191. D.M. (34°) 1033

R.A. 5<sup>h</sup> 17<sup>m</sup> 19<sup>s</sup> }  
Decl. + 34° 27' }

|         |      |   |      |             |      |
|---------|------|---|------|-------------|------|
| 1875.94 | 24.8 | " | 3.24 | 10.1...10.4 | 4n Δ |
| 1891.85 | 24.5 | " | 3.40 | 9.1... 9.1  | 2n β |

Discovered with the 18½-inch. Unchanged. In D.M. 8.9 m. The 36-inch shows a 13 m star, 144°.4 : 16°.7.

[β (IV)...β (Mon. Not. xxxiv, 382)...β (3114)...β (Pub. L. O. II)...Δ (1)...]

**β 556.** Lalande 10159

R.A. 5<sup>h</sup> 18<sup>m</sup> 39<sup>s</sup> }  
Decl. — 2° 36' }

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1878.17 | 242.2 | 0.76 | 7 ... 12    | 2n | β |
| 1891.85 | 239.2 | 0.89 | 7.0... 11.3 | 3n | β |
| 1898.76 | 238.0 | 1.18 | 7.0... 10.0 | 1n | β |

Discovered with the 18½-inch. It is a bright star near η Orionis, and wanting in many of the star catalogues. In Lalande and S.D. 8 m.

[β (x)...β¹...β³...β (3114)...β (Pub. L. O. II)...]

**β 889.** W² V. 518

R.A. 5<sup>h</sup> 20<sup>m</sup> 10<sup>s</sup> }  
Decl. + 34° 19' }

A and B

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1878.91 | 223.5 | 1.11 | 8.5... 10.0 | 1n | β   |
| 1891.95 | 223.7 | 0.80 | 8.4... 8.8  | 3n | β   |
| 1898.86 | 229.1 | 0.85 | 8.3... 9.0  | 1n | β   |
| 1898.87 | 227.4 | 1.04 | ...         | 2n | Bar |

A and C

|         |       |      |          |    |     |
|---------|-------|------|----------|----|-----|
| 1891.95 | 102.6 | 3.76 | ... 14.1 | 3n | β   |
| 1898.85 | 108.0 | 4.09 | ...      | 1n | Bar |

A and D

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1891.95 | 108.0 | 12.04 | ... 13.8 | 3n | β |
| 1898.86 | 105.3 | 11.65 | ... 13.5 | 1n | β |

A and E (= Σ 707)

|         |       |       |             |    |    |
|---------|-------|-------|-------------|----|----|
| 1830.75 | 131.6 | 18.29 | 8.0... 10.2 | 2n | Σ  |
| 1844.26 | 134.7 | 17.61 | ...         | 1n | Ma |
| 1873.17 | 131.0 | 18.02 | 8.5... 10.0 | 2n | Δ  |
| 1878.91 | 131.4 | 18.04 | ... 10.0    | 1n | β  |
| 1891.95 | 133.3 | 18.22 | ... 9.4     | 3n | β  |
| 1898.86 | 132.0 | 18.26 | ... 10.0    | 1n | β  |

A and F

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1878.91 | 200.7 | 27.77 | ... 11.5 | 1n | β |
| 1891.90 | 200.2 | 27.85 | ... 10.1 | 2n | β |
| 1898.86 | 200.3 | 27.84 | ... 11.0 | 1n | β |

The duplicity of the principal star of Σ 707 was discovered with the 18½-inch, and the very faint companions, C and D, added with the 36-inch. The Σ components are fixed. The above are all the measures.

[β (XIII)...β³...β (Mon. Not. xxxiv, 392)...β (3114)...β (Pub. L. O. II)...Barnard ( )...Δ (1979)...Δ (II)... Madler (Fixstern-Systeme 1) (Dorpat Obsns. XI)...]

**β 890.** Lalande 10175

R.A. 5<sup>h</sup> 20<sup>m</sup> 49<sup>s</sup> }  
Decl. + 37° 41' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1880.14 | 286.6 | 1.17 | 8.4... 8.8 | 3n | β |
| 1891.89 | 285.3 | 1.08 | 8.6... 8.7 | 2n | β |

Discovered with the 18½-inch. Thus far there is no evidence of motion.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...]

**β 319.** O. Arg. S. 3957

R.A. 5<sup>h</sup> 21<sup>m</sup> 15<sup>s</sup> }  
Decl. — 20° 49' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1876.09 | 231.3 | 3.98 | 8.0... 11   | 3n | Hl  |
| 1877.11 | 228.1 | 3.80 | 7.7... 10.0 | 2n | Cin |
| 1879.13 | 226.6 | 3.72 | 7.8... 11.5 | 1n | β   |
| 1891.06 | 229.7 | 4.29 | ...         | 2n | Hl  |
| 1898.14 | 227.7 | 4.26 | ...         | 1n | See |

Discovered with the 6-inch. It is near β Leporis. The change, if any, is small.

[β (VI)...β (2062)...β³...Cin⁴...Hall (I, II)...See ( )...]

**β 891.** W² V. 615

R.A. 5<sup>h</sup> 22<sup>m</sup> 48<sup>s</sup> }  
Decl. + 18° 19' }

A and B

|         |       |       |             |    |   |
|---------|-------|-------|-------------|----|---|
| 1879.10 | 121.6 | 9.89  | 7.0... 13   | 1n | β |
| 1891.98 | 126.7 | 10.66 | 8.0... 12.5 | 3n | β |
| 1898.85 | 122.2 | 10.66 | 7.5... 12.7 | 2n | β |

A and C (= H 3275)

|         |      |       |            |    |    |
|---------|------|-------|------------|----|----|
| 1875.31 | 20.6 | 52.86 | 7.2... 7.7 | 3n | Δ  |
| 1879.63 | 22.0 | 52.82 | 7.5... 7.5 | 2n | β  |
| 1891.98 | 21.0 | 53.10 | 8.0... 8.1 | 3n | β  |
| 1892.56 | 21.0 | 53.27 | 7.4... 7.8 | 4n | Fr |
| 1898.45 | 20.7 | 53.54 | ... 7.6    | 2n | β  |

The small star was detected with the 18½-inch. H has no measure of AC. The wide pair is also OΣ (App) 64. The foregoing are all the measures. C is W² V. 617. The distance between A and C is slowly increasing. The meridian positions for 1825 make the distance 51.0 at that time.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...Δ (I, p. 246) ... Franz (3464)...]

$\beta$  320.  $\beta$  Leporis

R.A.  $5^h 23^m 6^s$  }  
Decl.  $-20^\circ 51'$  }

## A and B

|         | $^\circ$ | "    |   |          |    |          |
|---------|----------|------|---|----------|----|----------|
| 1875.09 | 267.7    | 2.89 | 3 | ... 11.0 | 1n | $\Delta$ |
| 1876.07 | 280.0    | 2.78 |   | ... 10.0 | 2n | $\Delta$ |
| 1876.96 | 290.7    | 2.98 |   | ... 11.0 | 4n | $\Delta$ |
| 1877.33 | 283.1    | 2.80 |   | ... 8.6  | 4n | Cin      |
| 1877.46 | 282.5    | 3.12 |   | ... 11.0 | 7n | Hl       |
| 1877.76 | 294.4    | 3.01 |   | ... 10.8 | 3n | $\Delta$ |
| 1878.10 | 283.6    | 2.63 |   | ...      | 5n | Rus      |
| 1878.35 | 293.1    | 3.07 |   | ... 10.8 | 3n | $\Delta$ |
| 1879.10 | 286.3    | 2.74 |   | ... 9.0  | 1n | Cin      |
| 1879.18 | 285.0    | 2.88 |   | ...      | 8n | Sp       |
| 1879.47 | 284.6    | 2.54 |   | ... 10.9 | 7n | $\beta$  |
| 1879.77 | 286.3    | 2.57 |   | ... 7.8  | 1n | Cin      |
| 1879.98 | 281.3    | 3.05 |   | ...      | 2n | Hl       |
| 1880.10 | 282.8    | 2.85 |   | ...      | 2n | Hl       |
| 1880.56 | 287.8    | 2.72 |   | ...      | 2n | Pt       |
| 1882.10 | 282.4    | 2.70 |   | ...      | 3n | Hl       |
| 1882.68 | 287.0    | 3.03 |   | ...      | 8n | Sp       |
| 1889.02 | 292.5    | 2.79 |   | ... 10.0 | 3n | T        |
| 1889.06 | 293.0    | 2.83 |   | ... 9.0  | 1n | Lv       |
| 1891.12 | 282.1    | 2.89 |   | ...      | 2n | Hl       |
| 1897.78 | 288.5    | 3.05 |   | ...      | 2n | See      |
| 1898.12 | 295.7    | 2.72 |   | ... 10.5 | 3n | A        |

## A and C (= H 3761)

|         | $^\circ$ | "        |  |          |            |
|---------|----------|----------|--|----------|------------|
| 1835.90 | 145.9    | $70 \pm$ |  | ... 13   | 1n H       |
| 1898.94 | 146.3    | 65.58    |  | ... 11.5 | 2n $\beta$ |

The close star was discovered with the 6-inch. The measures are not wanting, but are not as accordant, especially in the angles, as might be expected in an easy pair of this class. The apparent change in the position-angle shown by the earlier measures made the companion appear to have rapid direct motion, but the subsequent measures show that the change, if any, is very slow.

AUWERS gives the proper motion of  $\beta$  Leporis  $0.0817$  in the direction of  $194^\circ.9$ . The interval covered by the measures is sufficient to establish the common proper motion of the two components. Assuming  $285^\circ:2.88$  for the position of the companion in 1876.5, its place, if fixed in space, should

be  $317^\circ:3.4$  for 1898.5. It is certain that no such relative change has taken place.

Two distant stars are:

|         | $^\circ$ | "      |  |        |            |
|---------|----------|--------|--|--------|------------|
| 1879.88 | 75.0     | 206.36 |  | ... 10 | 1n $\beta$ |
| 1879.88 | 57.6     | 241.53 |  | ... 10 | 1n $\beta$ |

[ $\beta$  (VI)... $\beta$  (2020,2062)... $\beta^2$ ... $\beta^3$ ... $\Delta$  (I)... $\Delta$  (2195)...Hall (2295,2430) (I, II) (*Wash. Obsns.* 1880, 1882)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Pritchett (*Pub. Morrison Obsy.* No. 1)...Russell (*Sidney Obsns.* 1871-81)...Lv<sup>1</sup>...Tarrant (2991)...Sp (II)...Sp (2133)...See (3495)...Aitkin ( )...]

 $\beta$  557. Lalande 10311

R.A.  $5^h 23^m 16^s$  }  
Decl.  $+3^\circ 3'$  }

## B and C

|         | $^\circ$ | "         |            |    |         |
|---------|----------|-----------|------------|----|---------|
| 1878.16 | 142.4    | 0.46      | 9.5... 9.5 | 2n | $\beta$ |
| 1890.80 | 153.2    | $0.3 \pm$ | ...        | 6n | Sp      |
| 1890.90 | 147.3    | 0.36      | 9.0... 9.0 | 3n | $\beta$ |
| 1895.46 | 152.2    | $0.4 \pm$ | ...        | 3n | Sp      |
| 1898.98 | 151.8    | 0.42      | 9.0... 9.0 | 1n | A       |

A and BC (=  $\Sigma$  721)

|         | $^\circ$ | "     |            |    |                |
|---------|----------|-------|------------|----|----------------|
| 1783.72 | 152.4    | 20.05 | ...        | 1n | H <sup>1</sup> |
| 1823.14 | 152.7    | 24.73 | 7 ... 9    | 1n | Sh             |
| 1830.18 | 150.9    | 24.21 | 7.0... 9.0 | 2n | $\Sigma$       |
| 1847.07 | 150.7    | ...   | ...        | 1n | Ma             |
| 1863.14 | 151.2    | 23.99 | 7.0... 9.0 | 5n | En             |
| 1868.65 | 149.7    | 24.57 | 7.0... 8.9 | 4n | $\Delta$       |
| 1878.15 | 149.8    | 24.32 | ...        | 1n | $\beta$        |
| 1890.88 | 149.4    | 24.72 | ...        | 3n | Sp             |
| 1890.91 | 149.8    | 24.61 | 7.6... 8.7 | 2n | $\beta$        |
| 1893.12 | 148.8    | 24.49 | 6.8... 8.7 | 2n | Gl             |
| 1898.93 | 149.3    | 24.68 | 7.0... 8.7 | 2n | A              |

The close pair was discovered with the  $18\frac{1}{2}$ -inch. All the measures of the wide pair (= H<sup>1</sup> IV. 45 = Sh 57 =  $\Sigma$  721) are given. It is evidently unchanged.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Aitken ( )...Madler (*Fixstern-Systeme*, II)...Engelmann (*Mess. Neunzig Doppelsternen*, 1865)...Glaserapp (II)...]

**β 1239.** D.M. (34°) 1074

R.A. 5<sup>h</sup> 23<sup>m</sup> 28<sup>s</sup> }  
Decl. + 34° 11' }

B and D

|         |       |      |          |    |   |
|---------|-------|------|----------|----|---|
| 1891.77 | 324.6 | 2.31 | ... 15.2 | 2n | β |
|---------|-------|------|----------|----|---|

A and B (= H 367)

|         |       |      |             |    |       |
|---------|-------|------|-------------|----|-------|
| 1873.77 | 239.2 | 7.1  | ...         | 1n | Rosse |
| 1891.77 | 233.8 | 8.00 | 9.5... 9.9  | 3n | β     |
| 1899.11 | 232.3 | 8.18 | 9.5... 10.5 | 1n | A     |

A and C (= H 367)

|         |       |       |          |    |       |
|---------|-------|-------|----------|----|-------|
| 1873.77 | 310.5 | 9.7   | ...      | 1n | Rosse |
| 1891.77 | 310.1 | 10.53 | ... 11.2 | 3n | β     |
| 1899.11 | 308.5 | 9.88  | ... 11.0 | 1n | A     |

HERSCHEL's description of the wide triple is: "One of the most curious objects in the heavens. It is a triple star forming an equilateral triangle, and placed exactly in the center of a small circular nebula, which extends a little beyond the stars on all sides, surrounding them like an atmosphere." The second star of this triangle, in order of magnitude, was found to be double with the 36-inch. The small star is extremely faint. The only previous measures of the HERSCHEL stars which I have been able to find were made with one of the reflectors of Lord Rosse's Observatory. They are evidently only approximate, and no change can be inferred from the differences in distance. The 36-inch shows another faint star 14 m, 13".6 from A in the direction of 18°.7. AITKEN, 16°.8 : 14".76 (1899.11) 1n.

[β (xviii)...β (*Mon. Not.* LII, 454)...β (3141)...β (*Pub. L. O.* II, pp. 178, 224)...]

**β 558.** δ Orionis

R.A. 5<sup>h</sup> 25<sup>m</sup> 52<sup>s</sup> }  
Decl. — 0° 23' }

A and B

|         |       |       |             |    |   |
|---------|-------|-------|-------------|----|---|
| 1878.46 | 226.9 | 33.27 | 2.0... 13.5 | 4n | β |
| 1892.06 | 226.8 | 32.40 | ... 14      | 3n | β |
| 1898.84 | 226.5 | 32.35 | ... 13.7    | 2n | β |

A and C (= H<sup>1</sup> V. 10)

|         |       |       |         |    |                |
|---------|-------|-------|---------|----|----------------|
| 1781.90 | 358.2 | 52.97 | ...     | 1n | H <sup>1</sup> |
| 1835.75 | 359.2 | 52.74 | ... 6.8 | 5n | Σ              |
| 1863.05 | 359.2 | 52.48 | ...     | 5n | En             |
| 1870.05 | 359.3 | 52.49 | ... 6.7 | 5n | Δ              |
| 1879.08 | 360.3 | 52.62 | ...     | 2n | β              |
| 1898.84 | 359.3 | 52.56 | ...     | 2n | β              |

The faint companion was detected with the 18½-inch. The proper motion of δ Orionis is 0".022 in the direction of 288°.4 (AUWERS). With this value, and the position of C from the measures of Σ, that companion, if fixed in space, should be in 1898.8, 360°.6 : 52".3. As a wide pair this is H<sup>1</sup> V. 10 = Sh 60 = Σ 14 App I.

[β (x)...β<sup>2</sup>...β<sup>3</sup>...β (3141)...β (*Pub. L. O.* II)...Δ (II)... (*Radcliffe Obsns.* Vols. 23, 31, 38, 39)...Secchi (*Cat. di 1321 Stelle Doppie*) (*First Series of Measures, Obsy. Coll. Rome*, 1855)...Engelmann (*Mess. Neunzig Doppelsternen*, 1865)...Jedrzejewicz (2329)...Glasenapp (11)...]

**β 1048.** Lalande 10437

R.A. 5<sup>h</sup> 26<sup>m</sup> 37<sup>s</sup> }  
Decl. — 1° 41' }

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1889.13 | 358.2 | 2.20 | 6.2... 10.7 | 3n | β |
| 1898.20 | 354.6 | 2.22 | 6.0... 10.8 | 3n | A |

Discovered with the 36-inch. A naked-eye star in Orion; 6 m in D.M. and HEIS; GOULD, 6½. No proper motion in *Greenwich 10-Year Catalogue*.

[β (xv)...β (2929)...β (*Pub. L. O.* II)...Aitken ( )...]

**β 1049.** W<sup>1</sup> V. 631

R.A. 5<sup>h</sup> 27<sup>m</sup> 3<sup>s</sup> }  
Decl. — 1° 48' }

C and D

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1888.91 | 296.1 | 0.76 | 8.7... 9.7 | 4n | β  |
| 1890.20 | 297.7 | 0.73 | ...        | 2n | T  |
| 1891.16 | 297.2 | 0.5± | ...        | 1n | Sp |
| 1895.11 | 291.8 | 0.6± | ...        | 4n | Sp |
| 1898.88 | 294.2 | 0.58 | 9.0... 9.5 | 1n | β  |

A and B (=  $\Sigma$  734)

|         | $^{\circ}$ | "    |        |     |                |          |
|---------|------------|------|--------|-----|----------------|----------|
| 1832.93 | 356.4      | 1.78 | 7.0... | 8.6 | 3 <sup>n</sup> | $\Sigma$ |
| 1845.20 | 357.9      | 1.91 | ...    |     | 1 <sup>n</sup> | Ma       |
| 1867.76 | 353.8      | 1.65 | 7.0... | 8.5 | 3 <sup>n</sup> | $\Delta$ |
| 1872.02 | 355.3      | 1.45 | 8.5... | 9   | 1 <sup>n</sup> | Hd       |
| 1878.99 | 354.9      | 1.75 | 8.0... | 9.5 | 1 <sup>n</sup> | $\beta$  |
| 1886.13 | 355.6      | 1.82 | 7.0... | 8.5 | 1 <sup>n</sup> | W        |
| 1886.94 | 352.6      | 1.83 | 6.5... | 8.0 | 1 <sup>n</sup> | LM       |
| 1888.72 | 355.8      | 1.95 | 7.1... | 9.2 | 2 <sup>n</sup> | Lv       |
| 1888.91 | 355.2      | 1.61 | 7.0... | 8.0 | 4 <sup>n</sup> | $\beta$  |
| 1890.20 | 358.6      | 1.62 | ...    |     | 2 <sup>n</sup> | T        |
| 1890.80 | 355.6      | 1.60 | ...    |     | 5 <sup>n</sup> | Sp       |
| 1892.92 | 354.2      | 1.64 | 7.2... | 8.5 | 2 <sup>n</sup> | J        |
| 1895.11 | 354.3      | 1.59 | ...    |     | 4 <sup>n</sup> | Sp       |

A and C (= H<sup>1</sup> V. 119)

|         | $^{\circ}$ | "     |     |     |                |                |
|---------|------------|-------|-----|-----|----------------|----------------|
| 1783.76 | 248.4      | 30.20 | ... |     | 1 <sup>n</sup> | H <sup>1</sup> |
| 1832.43 | 243.1      | 29.29 | ... | 8.6 | 6 <sup>n</sup> | $\Sigma$       |
| 1845.19 | 243.9      | 27.13 | ... |     | 1 <sup>n</sup> | Ma             |
| 1867.76 | 242.9      | 29.36 | ... | 8.6 | 3 <sup>n</sup> | $\Delta$       |
| 1872.02 | 245.0      | 30.11 | ... |     | 1 <sup>n</sup> | Hd             |
| 1879.02 | 242.8      | 29.47 | ... | 8.7 | 2 <sup>n</sup> | $\beta$        |
| 1881.91 | 242.8      | 29.42 | ... |     | 3 <sup>n</sup> | $\beta$        |
| 1891.13 | 243.5      | 29.24 | ... |     | 2 <sup>n</sup> | Sp             |
| 1894.16 | 243.2      | 29.25 | ... |     | 2 <sup>n</sup> | Sp             |

The duplicity of C was discovered with the 36-inch. The change is not very pronounced. In appearance it is an interesting quadruple, but there has been no change of the Herschel and Struve companions with respect to A. All the measures of these stars are given above.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta^3$ ... $\beta$  (*Pub. L. O.* II)...Sp (III)...Tarrant (3185,3186)...Madler (*Fixstern-Systeme* I)... $\Delta$  (II)...LM...Lv...Wilson (*Cin*<sup>10</sup>)...*Annals Harvard Coll. Obsy.* XIII...Jones (*Proc. Haverford Coll. Obsy.* 1892)...]

 $\beta$  1267. Lalande 10423

R.A. 5<sup>h</sup> 27<sup>m</sup> 22<sup>s</sup> }  
Decl. + 30° 51' }

|         | $^{\circ}$ | "    |        |     |                |         |
|---------|------------|------|--------|-----|----------------|---------|
| 1892.13 | 217.9      | 0.84 | 8.5... | 8.5 | 3 <sup>n</sup> | $\beta$ |
| 1894.16 | 216.9      | 0.82 | ...    |     | 2 <sup>n</sup> | Sp      |
| 1896.11 | 215.2      | 0.86 | ...    |     | 4 <sup>n</sup> | Sp      |

Discovered with the 36-inch in the course of measures of *Nova Aurigae*. The measures appear to indicate some retrograde motion. The magnitude in D.M. is 8.0.

[ $\beta$  (xix)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...Sp (III)...]

 $\beta$  13. W<sup>1</sup> V. 676

R.A. 5<sup>h</sup> 28<sup>m</sup> 36<sup>s</sup> }  
Decl. — 4° 34' }

|         | $^{\circ}$ | "    |        |      |                |          |
|---------|------------|------|--------|------|----------------|----------|
| 1876.08 | 128.8      | 1.38 | 8.0... | 10.0 | 2 <sup>n</sup> | $\Delta$ |
| 1879.10 | 131.7      | 1.01 | 8.0... | 10.0 | 1 <sup>n</sup> | Cin      |
| 1892.00 | 131.6      | 1.10 | 8.3... | 8.9  | 3 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. In a low-power field with  $\Sigma$  743. No sensible change.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Cin<sup>5</sup>...]

 $\beta$  1050. Bond 974

R.A. 5<sup>h</sup> 30<sup>m</sup> 55<sup>s</sup> }  
Decl. — 5° 33' }

|         | $^{\circ}$ | "    |         |      |                |         |
|---------|------------|------|---------|------|----------------|---------|
| 1889.03 | 283.6      | 0.67 | 10.5... | 11.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.94 | 283.6      | 0.65 | 10      | ...  | 1 <sup>n</sup> | A       |

A difficult pair of small stars in the nebula of *Orion*, 1<sup>m</sup> 32<sup>s</sup> f of  $\theta'$  *Orionis*, and 5' s. Discovered with the 36-inch. It is No. 974 of BOND'S catalogue of stars in the great nebula.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 $\beta$  1240. 26 *Aurigae*

R.A. 5<sup>h</sup> 30<sup>m</sup> 56<sup>s</sup> }  
Decl. + 30° 25' }

## A and B

|         | $^{\circ}$ | "          |        |     |                |         |
|---------|------------|------------|--------|-----|----------------|---------|
| 1892.00 | 344.4      | 0.15       | 5.6... | 6.0 | 3 <sup>n</sup> | $\beta$ |
| 1892.84 | 354.2      | 0.22       | ...    |     | 3 <sup>n</sup> | Bar     |
| 1893.22 | 342.9      | 0.15 $\pm$ | ...    |     | 1 <sup>n</sup> | Sp      |
| 1893.94 | 342.5      | 0.16       | ...    |     | 1 <sup>n</sup> | Bar     |
| 1894.17 | 347.2      | 0.20 $\pm$ | ...    |     | 4 <sup>n</sup> | Sp      |
| 1896.13 | 338.8      | 0.20 $\pm$ | ...    |     | 9 <sup>n</sup> | Sp      |

AB and C (=  $\Sigma$  753)

|         |       |       |            |                 |          |
|---------|-------|-------|------------|-----------------|----------|
| 1828.61 | 268.0 | 12.34 | 5.8... 8.0 | 3 <sup>n</sup>  | $\Sigma$ |
| 1865.52 | 268.0 | 12.39 | 5.7... 7.8 | 3 <sup>n</sup>  | $\Delta$ |
| 1880.95 | 268.3 | 12.17 | ...        | 3 <sup>n</sup>  | Sp       |
| 1891.95 | 268.3 | 12.25 | ... 8.7    | 4 <sup>n</sup>  | $\beta$  |
| 1895.54 | 268.4 | 12.41 | ...        | 10 <sup>n</sup> | Sp       |

AB and D (=  $\beta$  90)

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1877.87 | 113.2 | 31.47 | ... 11.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.97 | 112.7 | 32.33 | ... 11.0 | 3 <sup>n</sup> | $\beta$ |
| 1898.96 | 112.4 | 32.97 | ... 11.5 | 2 <sup>n</sup> | $\beta$ |

The close pair was discovered with the 36-inch. As the components are nearly equal in magnitude, it is a comparatively easy object with that aperture. Rapid motion would be expected in a pair of this class. It is certainly a binary system.

As a wide pair this has been known for more than a century (H<sup>r</sup> III. 64 = S 492 =  $\Sigma$  753). There has been no change whatever in the position of this companion with reference to the primary since it was first measured. A few only of the measures are given above.

The fourth star, D, was noted by me with a 6-inch in 1872, but it had been previously seen by MORTON at LORD WROTTESELEY'S Observatory, though apparently overlooked by HERSCHEL and STRUVE. It was first measured in 1877. The distance in that observation, by a clerical error, was printed 25".86 in  $\beta^1$ . It should have been as given above. All the measures of this star are given.

The annual proper motion of 26 *Aurigae* is 0".044 in the direction of 276°.5 (AUWERS). This movement, though small, is sufficient to show that the  $\Sigma$  companion is moving in space with exactly the same proper motion. Otherwise, with this motion of A, and  $\Sigma$ 's position of C, the latter star for 1898.7 should be 265°.2 : 9'.27. The change in D corresponds to the proper motion of AB, and this star, therefore, is not a member of the system.

[ $\beta$  (II, XVIII)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^1$ ... $\beta$  (3113)... $\beta$  (*A. J.* 256)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Barnard (*A. J.* 447)...]

There is an unnecessary number of measures of the H- $\Sigma$  companion, since it has been known for nearly half a century that it had no sensible motion

with respect to the large star. These observations will be found as follows:

[Ma (*Fixstern-Systeme* I) (*Dorpat Obsns.* IX, X, XI, XIII, XV)...Dawes (*Obsns. at Bishop's Obsy.*) (*Mem. R. A. S.* xxxv)... (*Obsns. at Barclay's Obsy.* I, II)...Jacob (*Mem. R. A. S.* xvii)...Worster and Jacob (*Madras Obsns.* Second Series)...Radcliffe *Obsns.* xxiii, xxx)...Wrottesley (*Mem. R. A. S.* xxix)...Secchi (*Cat. di 1321 Stelle Doppie*)...Gledhill (*Mem. R. A. S.* xlii)...O $\Sigma$  (*Poulkova Obsns.* IX)... $\Delta$  (I, II)... $\Delta$  (1036)...Duner (*Mesures Microm.* 1876)...Sp (II)...]

$\beta$  89. Lalande 10608

R.A. 5<sup>h</sup> 31<sup>m</sup> 29<sup>s</sup> }  
Decl. — 1° 30' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.68 | 344.2 | 0.55 | 7.9... 8.5  | 3 <sup>n</sup> | $\Delta$ |
| 1878.40 | 356.1 | 0.81 | 7.5... 9.0  | 2 <sup>n</sup> | Cin      |
| 1879.59 | 361.6 | 0.73 | 8.0... 9.2  | 4 <sup>n</sup> | $\beta$  |
| 1888.52 | 360.1 | 0.88 | 8.0... 9.3  | 2 <sup>n</sup> | Lv       |
| 1889.15 | 362.1 | 0.77 | ...         | 4 <sup>n</sup> | Sp       |
| 1891.15 | 360.9 | 0.72 | ...         | 3 <sup>n</sup> | Sp       |
| 1898.88 | 357.2 | 0.75 | 8.1... 9.1  | 4 <sup>n</sup> | A        |
| 1898.88 | 361.6 | 0.74 | 8.0... 10.0 | 1 <sup>n</sup> | $\beta$  |
| 1898.91 | 361.7 | 0.95 | 8.0... 10.2 | 2 <sup>n</sup> | Cg       |

Discovered with the 6-inch. It is 1<sup>m</sup> 23<sup>s</sup> *f*  $\epsilon$  *Orionis*, and 12' 57" *s*. A difficult pair with that aperture. It has no appreciable proper motion (PORTER).

[ $\beta$  (II)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^3$ ... $\Delta$  (1)...Cin<sup>5</sup>...Lv<sup>2</sup>...Lv (*Sid. Mess.* VIII, 77)...Sp (III)...Cogshall ( )...Aitken ( )...]

$\beta$  1051. Bond 1096

R.A. 5<sup>h</sup> 32<sup>m</sup> 1<sup>s</sup> }  
Decl. — 4° 57' }

|         |      |      |              |                |         |
|---------|------|------|--------------|----------------|---------|
| 1889.09 | 24.7 | 0.75 | 10.1... 10.7 | 3 <sup>n</sup> | $\beta$ |
|---------|------|------|--------------|----------------|---------|

A difficult pair in the nebula of *Orion*; discovered with the 36-inch. It is 2<sup>m</sup> 38<sup>s</sup> *f*  $\theta^1$  *Orionis*, and 31' *n*. A 7½" *m* star 22<sup>s</sup>.4 *p* and 2' 34" *n* of the new pair.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  1032.  $\sigma$  Orionis

R.A.  $5^h 32^m 43^s$  }  
Decl.  $- 2^\circ 40'$  }

## A and B

|         |       |            |         |                |         |
|---------|-------|------------|---------|----------------|---------|
| 1888.81 | 357.0 | 0.26       | 4 ... 6 | 4 <sup>n</sup> | $\beta$ |
| 1890.20 | 353.7 | 0.3 $\pm$  | ...     | 2 <sup>n</sup> | Sp      |
| 1890.81 | 351.6 | 0.29       | 4 ... 5 | 3 <sup>n</sup> | $\beta$ |
| 1891.16 | 360.5 | 0.25 $\pm$ | ...     | 1 <sup>n</sup> | Sp      |
| 1891.88 | 349.7 | 0.23       | ...     | 3 <sup>n</sup> | $\beta$ |
| 1892.22 | 348.7 | 0.25 $\pm$ | ...     | 2 <sup>n</sup> | Sp      |
| 1893.22 | 349.3 | 0.25 $\pm$ | ...     | 3 <sup>n</sup> | Sp      |
| 1906.21 | 346.4 | 0.25 $\pm$ | ...     | 1 <sup>n</sup> | Sp      |
| 1898.87 | 332.9 | 0.27       | ...     | 4 <sup>n</sup> | A       |

AB and C (=  $\Sigma$  762)

|         |       |       |            |                |          |
|---------|-------|-------|------------|----------------|----------|
| 1831.42 | 236.5 | 11.00 | 4.1...10.3 | 4 <sup>n</sup> | $\Sigma$ |
| 1869.97 | 235.4 | 11.07 | 3.9... 9.5 | 4 <sup>n</sup> | $\Delta$ |
| 1888.17 | 237.0 | 11.46 | ...        | 2 <sup>n</sup> | Hl       |
| 1888.84 | 237.1 | 11.23 | ...        | 3 <sup>n</sup> | $\beta$  |
| 1899.12 | 237.4 | 11.28 | ...        | 3 <sup>n</sup> | $\beta$  |

AB and D (=  $\Sigma$  762)

|         |      |       |         |                |          |
|---------|------|-------|---------|----------------|----------|
| 1831.20 | 84.5 | 12.86 | ... 7.5 | 3 <sup>n</sup> | $\Sigma$ |
| 1869.97 | 85.1 | 12.76 | ... 6.8 | 4 <sup>n</sup> | $\Delta$ |
| 1888.84 | 83.3 | 12.84 | ...     | 3 <sup>n</sup> | $\beta$  |
| 1893.62 | 83.7 | 12.96 | ...     | 5 <sup>n</sup> | Sp       |
| 1899.12 | 82.8 | 12.77 | ...     | 3 <sup>n</sup> | $\beta$  |

## AB and E

|         |      |       |         |                |          |
|---------|------|-------|---------|----------------|----------|
| 1869.97 | 60.9 | 41.64 | ... 6.3 | 4 <sup>n</sup> | $\Delta$ |
| 1899.12 | 60.9 | 41.42 | ...     | 3 <sup>n</sup> | $\beta$  |

## E and D

|         |       |       |            |                |          |
|---------|-------|-------|------------|----------------|----------|
| 1831.20 | 230.8 | 30.03 | 7.0... 7.5 | 3 <sup>n</sup> | $\Sigma$ |
| 1871.34 | 230.9 | 30.10 | ...        | 3 <sup>n</sup> | $\Delta$ |

The close pair was discovered with the 12-inch. It is certain to be a binary, and the measures already made indicate retrograde motion. The maximum distance probably does not exceed 0".25; otherwise I would have found it before. AUWERS gives the principal star a proper motion of 0".024 in the direction of 297°.7. It is evident that both stars have the same movement.

There is no relative change in the distant stars (= H<sup>+</sup> II. 10 = Sh 63 =  $\Sigma$  762), and they must therefore have the same proper motion as  $\sigma$ . An annual movement of even 0".02 in the time covered by the measures would be apparent if either of these companions was fixed in space. With this proper motion, and the positions of  $\Sigma$  for the distant companions, at this time (1899.1) they should be:

|    |   |   |   |       |       |
|----|---|---|---|-------|-------|
| AC | - | - | - | 228.7 | 10.33 |
| AD | - | - | - | 88.0  | 14.24 |

[ $\beta$  (xiv)... $\beta$  (2875,3048,3114)... $\beta$  (*Pub. L. O.* II)...Sp (III)  
...Aitken ( )...]

The following relate to the old companions:

[Madler (*Fixstern-Systeme* I) (*Dorpat Obsns.* XI, XIII, XV)  
...Herschel (*Cape Obsns.*)...Dawes (*Mem. R. A. S.* VIII  
(*Obsns. at Bishop's Obsy.*)...*Radcliffe Obsns.* XXIII, XLVI...  
Jacob (*Mem. R. A. S.* XVI)...*An. Königsberg Sternwarte*,  
München XVII...*Annals Harvard Obsy.* XIII...Engelmann  
(*Mess. Neunzig Dopplesternen*)...Wilson and Seabroke (*Mem.*  
*R. A. S.* XLIII)...Nobile (*Rend. Accad. Sci. Napoli*, Jan. 1875)  
...Webb (*Mon. Not.* XX, 253)...Dawes (*Mon. Not.* XX, 285)  
... $\Delta$  (II)...Cin<sup>5</sup>...Gaudibert (*Soc. Ast. France Bul.* 1890)...  
Hall (II)...Hahn (*Mikrom. Ver. des Sternhaufens  $\Sigma$  762*,  
Leipzig, 1891)...Glasenapp (II)...Sol<sup>4</sup> (3529)...]

 $\beta$  321. *Leporis* 45

R.A.  $5^h 33^m 59^s$  }  
Decl.  $- 17^\circ 55'$  }

## A and B

|         |       |           |            |                |          |
|---------|-------|-----------|------------|----------------|----------|
| 1877.11 | 142.4 | 1.06      | 7.0... 8.0 | 1 <sup>n</sup> | Cin      |
| 1877.33 | 144.5 | 0.68      | 6.8... 8.3 | 3 <sup>n</sup> | $\Delta$ |
| 1879.48 | 139.2 | 0.99      | 6.9... 7.3 | 3 <sup>n</sup> | $\beta$  |
| 1888.92 | 141.2 | 0.76      | 7.1... 8.4 | 2 <sup>n</sup> | Lv       |
| 1891.15 | 145.4 | 0.6 $\pm$ | ...        | 2 <sup>n</sup> | Sp       |
| 1896.20 | 153.0 | 0.55      | ...        | 1 <sup>n</sup> | Sp       |
| 1898.16 | 143.1 | 0.81      | ...        | 1 <sup>n</sup> | See      |

## C and D

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1877.11 | 358.0 | 1.56 | 8.0... 8.5 | 1 <sup>n</sup> | Cin      |
| 1877.34 | 357.5 | 1.26 | 9.3... 9.7 | 3 <sup>n</sup> | $\Delta$ |
| 1879.48 | 359.4 | 1.49 | 9.0... 9.8 | 3 <sup>n</sup> | $\beta$  |
| 1888.94 | 358.8 | 1.40 | 8.5... 9.0 | 2 <sup>n</sup> | Lv       |
| 1898.16 | 358.7 | 1.44 | ...        | 1 <sup>n</sup> | See      |

AB and C

|         |       |       |        |     |    |     |
|---------|-------|-------|--------|-----|----|-----|
| 1876.59 | 136.0 | 89.46 | ...    | 9.0 | 2n | Δ   |
| 1879.18 | 136.0 | 88.41 | ...    |     | 3n | β   |
| 1893.16 | 135.8 | 89.30 | 6.6... | 8.4 | 3n | Gl  |
| 1898.16 | 136.6 | 89.29 | ...    |     | 1n | See |

AB and E

|         |     |       |        |     |    |    |
|---------|-----|-------|--------|-----|----|----|
| 1876.59 | 6.2 | 76.20 | 7.0... | 8.0 | 2n | Δ  |
| 1893.16 | 6.3 | 76.23 | 6.6... | 7.5 | 2n | Gl |

AB and F

|         |       |        |     |     |    |   |
|---------|-------|--------|-----|-----|----|---|
| 1876.59 | 298.5 | 126.46 | ... | 8.5 | 2n | Δ |
|---------|-------|--------|-----|-----|----|---|

AB and G

|         |      |      |     |    |    |   |
|---------|------|------|-----|----|----|---|
| 1878.17 | 48.7 | 60.3 | ... | 10 | 1n | β |
|---------|------|------|-----|----|----|---|

AB and H

|         |       |       |     |    |    |     |
|---------|-------|-------|-----|----|----|-----|
| 1878.17 | 310.4 | 41.79 | ... | 13 | 1n | β   |
| 1898.16 | 306.2 | 40.96 | ... |    | 1n | See |

The five principal stars of this group were observed by HERSCHEL (*Cape Observations*), and entered as H 3780, with the description "Quintuple, 6th and 7th classes, magnitudes 7, 7, 8, 8, 8." With the 6-inch I found that two of these stars were close doubles, and noted two more faint stars in the group. The four bright stars, A, E, C, and F, are, respectively, 10726, 10727, 10728, and 10725 of LALANDE. The group is just visible to the naked eye as a 6 m star.

The measures give no certain evidence of motion in the close pairs.

[β (v1)...β (2062)...β<sup>1</sup>...β<sup>3</sup>...Δ (II)...Cin<sup>4</sup>...Lv<sup>1</sup>...Knott (*Observatory* IV, 184,212)...Sp (III)...Glaseapp (II)... See ( )...]

β 1007. 126 *Tauri*

R.A. 5<sup>h</sup> 34<sup>m</sup> 22<sup>s</sup> }  
Decl. + 16° 28' }

|         |                              |       |        |     |    |    |
|---------|------------------------------|-------|--------|-----|----|----|
| 1881.86 | 266.2                        | 0.27  | 6.0... | 6.2 | 2n | β  |
| 1887.16 | 249.5                        | 0.3 ± | ...    |     | 3n | Sp |
| 1888.07 | 241.7                        | 0.2 ± | ...    |     | 2n | Sp |
| 1889.10 | 239.3                        | 0.3 ± | ...    |     | 5n | Sp |
| 1890.78 | Single with 1000, 36-inch    |       |        |     | 1n | β  |
| 1891.79 | Elongation doubtful, 36-inch |       |        |     | 1n | β  |
| 1892.06 | Perhaps elongation in 330°   |       |        |     | 1n | β  |

|         |       |        |     |  |    |    |
|---------|-------|--------|-----|--|----|----|
| 1894.16 | 243.6 | 0.22 ± | ... |  | 2n | Sp |
| 1896.15 | 230.8 | 0.20 ± | ... |  | 3n | Sp |
| 1897.13 | 226.9 | 0.20 ± | ... |  | 2n | Sp |
| 1897.81 | 245.1 | 0.36   | ... |  | 1n | β  |
| 1898.20 | 227.2 | 0.20   | ... |  | 1n | Sp |
| 1899.17 | 244.3 | 0.18   | ... |  | 1n | A  |

Discovered with the 12-inch on Mt. Hamilton in 1881. It was single or too close for the 36-inch 1890-92. The measures since then show but little change in the angle, but a whole revolution may be covered by the observations. The components are nearly equal, and therefore some of the measures may require a correction of 180°. In my measure with the 40-inch in 1897 it was noted: "The distance is less than 0".3; the smaller star is *p*." In the first set of measures in 1881 with the 12-inch it was stated: "The measured distances are decidedly too large." The distance is probably always less than 0".25. There is little doubt of its being a binary of short period.

The proper motion is small, 0".013 in the direction of 173°.7 (AUWERS).

[β (XIII)...β<sup>3</sup>...β (3048,3114)...β (*Pub. L. O. II*)...Sp (III)...Aitken ( )...]

β 322. O. Arg. S. 4178

R.A. 5<sup>h</sup> 34<sup>m</sup> 40<sup>s</sup> }  
Decl. - 25° 13' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1877.11 | 104.2 | 2.23 | 8.0... | 9.5 | 1n | Cin |
| 1898.14 | 103.4 | 2.76 | ...    |     | 1n | See |
| 1898.83 | 103.0 | 2.87 | 8.0... | 9.0 | 1n | Bd  |

Discovered with the 6-inch.

[β (v1)...β (2062)...Cin<sup>4</sup>...See ( )...Boothroyd ( )...]

β 14. Lalande 10696

R.A. 5<sup>h</sup> 34<sup>m</sup> 48<sup>s</sup> }  
Decl. + 29° 47' }

|         |       |      |        |      |    |    |
|---------|-------|------|--------|------|----|----|
| 1874.17 | 194.8 | 5.78 | ...    |      | 1n | OΣ |
| 1875.43 | 194.7 | 5.71 | 7.4... | 10.5 | 4n | Δ  |
| 1891.90 | 194.5 | 5.79 | 7.9... | 10.2 | 2n | β  |

Discovered with the 6-inch. Unchanged.

[β (i)...β (*Mon. Not. XXXIII*, 351)...β (3114)...β (*Pub. L. O. II*)...OΣ (*Poulkowa Obsns. x*)...Δ (i)...]

**β 1052.** Lalande 10776

R.A. 5<sup>h</sup> 35<sup>m</sup> 39<sup>s</sup> }  
Decl. — 2° 57' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1889.14 | 189.1 | 0.66 | 7.2... 8.2 | 3 <sup>n</sup> | β  |
| 1890.13 | 191.1 | 0.47 | ...        | 3 <sup>n</sup> | Sp |
| 1892.00 | 192.6 | 0.48 | ...        | 6 <sup>n</sup> | Sp |
| 1898.19 | 188.6 | 0.70 | 7.2... 8.5 | 2 <sup>n</sup> | A  |

Discovered with the 36-inch. Probably without change. In GOULD 6.7 m; in S.D. 7.5.

[β (xv)...β (2929)...β (Pub. L. O. II)...Sp (III)...Aitken ( )...]

**β 752.** D.M. (47°) 1193

R.A. 5<sup>h</sup> 37<sup>m</sup> 19<sup>s</sup> }  
Decl. + 47° 51' }

This 7½ m star was suspected to be a very close pair, 120°: 0".5, with the 6-inch on Mt. Hamilton in 1879. It was examined (1890.66) with the 36-inch, and it was certainly single then with the highest powers. There are no other observations of it, negative or otherwise. It is possible that the apparent elongation was an illusion, but it should be examined further.

[β (xi)...β²...β (3048)...β (Pub. L. O. I, II)...]

**β 91.** Lalande 10913

R.A. 5<sup>h</sup> 40<sup>m</sup> 29<sup>s</sup> }  
Decl. + 20° 54' }

|         |      |      |             |                |   |
|---------|------|------|-------------|----------------|---|
| 1875.34 | 82.0 | 1.57 | 7.5... 10.0 | 3 <sup>n</sup> | Δ |
| 1891.93 | 80.9 | 1.75 | 8.1... 10.0 | 3 <sup>n</sup> | β |

Discovered with the 6-inch. Probably without change.

[β (II)...β (Mon. Not. xxxiii, 437)...β (3113)...β (Pub. L. O. II)...Δ (I)...]

**β 559.** D.M. (0°) 1177

R.A. 5<sup>h</sup> 40<sup>m</sup> 36<sup>s</sup> }  
Decl. + 0° 2' }

A and B

|         |      |      |             |                |   |
|---------|------|------|-------------|----------------|---|
| 1878.12 | 85.3 | 1.74 | 9.0... 11.5 | 4 <sup>n</sup> | β |
| 1891.93 | 84.2 | 1.96 | 9.3... 11.4 | 2 <sup>n</sup> | β |
| 1898.73 | 86.4 | 2.10 | 9.7... 12.0 | 1 <sup>n</sup> | β |

A and C

|         |       |       |     |     |                |   |
|---------|-------|-------|-----|-----|----------------|---|
| 1879.13 | 201.8 | 50.72 | ... | 9.5 | 4 <sup>n</sup> | β |
| 1891.92 | 201.9 | 50.34 | ... | 9.2 | 3 <sup>n</sup> | β |
| 1898.73 | 201.4 | 50.35 | ... | 9.8 | 1 <sup>n</sup> | β |

This is in the nebula, MESSIER 78. The wide stars had been remarked by H. The close pair was discovered with the 18½-inch. There is no evidence of motion. All the measures of AC are given.

[β (x)...β¹...β³...β (3114)...β (Pub. L. O. II)...]

**β 892.** D.M. (17°) 1006

R.A. 5<sup>h</sup> 40<sup>m</sup> 40<sup>s</sup> }  
Decl. + 17° 41' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1879.09 | 272.8 | 1.19 | 8.8... 13   | 2 <sup>n</sup> | β |
| 1891.89 | 276.2 | 1.15 | 9.0... 10.4 | 2 <sup>n</sup> | β |

Discovered with the 18½-inch. It is 12<sup>s</sup> f 130 *Tauri*.

[β (xiii)...β³...β (3114)...β (Pub. L. O. II)...]

**β 192.** τ *Aurigae*

R.A. 5<sup>h</sup> 40<sup>m</sup> 52<sup>s</sup> }  
Decl. + 39° 8' }

A and B

|         |       |       |     |      |                |                |   |
|---------|-------|-------|-----|------|----------------|----------------|---|
| 1877.82 | 350.0 | 38.93 | 5   | ...  | 12             | 1 <sup>n</sup> | β |
| 1892.03 | 352.0 | 39.29 | ... | 11.9 | 2 <sup>n</sup> | β              |   |
| 1898.75 | 352.0 | 39.28 | ... | 12.2 | 2 <sup>n</sup> | β              |   |

A and C (= H<sup>1</sup> V. 21)

|         |      |       |     |      |                |   |
|---------|------|-------|-----|------|----------------|---|
| 1877.82 | 32.9 | 47.85 | ... | 12.0 | 1 <sup>n</sup> | β |
| 1892.03 | 33.3 | 47.96 | ... | 11.1 | 2 <sup>n</sup> | β |
| 1898.75 | 34.0 | 48.52 | ... | 11.5 | 2 <sup>n</sup> | β |

The nearest companion to τ *Aurigae* was noted with the 6-inch. A more distant star was recorded by H<sup>1</sup>. All the measures of this star are given above. The principal star has a proper motion of 0".043 in the direction of 239°.4 (AUWERS). The interval covered by the measures is too short to say whether or not this small movement affects the positions of the companion stars.

[β (IV)...β (Mon. Not. xxxiv, 382)...β (3141)...β (Pub. L. O. II)...]

**β 92.** W<sup>2</sup> V. 1309

R.A. 5<sup>h</sup> 40<sup>m</sup> 57<sup>s</sup> }  
Decl. + 21° 4' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1875.45 | 170.2 | 8.87 | 9.3...11.0 | 2n | Δ |
| 1890.15 | 171.7 | 8.59 | ...        | 3n | T |
| 1892.03 | 169.9 | 9.24 | 8.6... 9.6 | 2n | β |
| 1892.16 | 170.3 | 9.12 | ...        | 2n | T |

Discovered with the 6-inch. Relatively fixed.

[β (11)...β (Mon. Not. xxxiii, 437)...β (3141)...β (Pub. L. O. II)...Δ (1)...Tarrant (3186)...]

**β 561.** Lalande 10969

R.A. 5<sup>h</sup> 41<sup>m</sup> 18<sup>s</sup> }  
Decl. + 12° 22' }

|         |     |       |            |    |   |
|---------|-----|-------|------------|----|---|
| 1878.09 | 4.0 | 19.70 | 7 ... 13   | 1n | β |
| 1892.00 | 3.4 | 19.47 | 7 ... 12.2 | 3n | β |

Noted with the 18½-inch in looking for H 5465.

[β (x)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...]

**β 560.** Lalande 10958

R.A. 5<sup>h</sup> 41<sup>m</sup> 37<sup>s</sup> }  
Decl. + 29° 41' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1877.88 | 208.2 | 0.94 | 8.0... 8.0 | 1n | β   |
| 1889.66 | 178.2 | 0.6± | ...        | 2n | Sp  |
| 1891.15 | 174.0 | 0.58 | ...        | 4n | Sp  |
| 1892.10 | 172.4 | 0.60 | 8.0... 8.5 | 4n | β   |
| 1895.06 | 155.3 | 0.52 | ...        | 1n | Lew |
| 1898.12 | 167.5 | ...  | ...        | 1n | Bow |
| 1898.59 | 163.3 | 0.69 | ...        | 2n | Lew |
| 1898.88 | 165.8 | 0.75 | ...        | 2n | Hu  |
| 1899.00 | 166.6 | 1.02 | 8.0... 8.6 | 1n | β   |

Discovered with the 18½-inch. A binary in rapid motion. It should be carefully measured each year, as it is likely to have a short period.

[β (x)...β<sup>2</sup>...β (3141)...β (Pub. L. O. II)...Sp (III)...Lewis (Mon. Not. lvi, 359) (Greenwich Obsns. 1895)...Lewis and Bowyer ( )...Hussey ( )...]

**β 93.** W<sup>2</sup> V. 1332

R.A. 5<sup>h</sup> 41<sup>m</sup> 44<sup>s</sup> }  
Decl. + 20° 59' }

A and B

|         |       |       |        |    |   |
|---------|-------|-------|--------|----|---|
| 1891.85 | 121.7 | 60.03 | 8.3... | 2n | β |
| 1898.85 | 121.7 | 60.07 | 8.2... | 2n | β |

B and C

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1891.85 | 167.0 | 5.71 | 9.1... 9.2  | 2n | β |
| 1898.92 | 162.3 | 5.46 | 9.5... 11.0 | 1n | β |

B and D

|         |       |      |          |    |   |
|---------|-------|------|----------|----|---|
| 1891.85 | 323.6 | 9.43 | ... 11.2 | 2n | β |
| 1898.92 | 326.2 | 9.74 | ... 11.3 | 1n | β |

The distant triple companion was noted with the 6-inch. It is not likely to have any special interest.

[β (11)...β (Mon. Not. xxxiii, 437)...β (3114)...β (Pub. L. O. II)...]

**β 15.** Lalande 11005

R.A. 5<sup>h</sup> 41<sup>m</sup> 45<sup>s</sup> }  
Decl. — 2° 20' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1875.60 | 174.3 | 2.07 | 7.8... 12.0 | 2n | Δ   |
| 1878.12 | 177.9 | 1.67 | 8.0... 10.5 | 1n | Cin |
| 1886.89 | 179.8 | 2.08 | 8.1... 10.2 | 2n | LM  |
| 1898.84 | 178.7 | 2.05 | 7.5... 11.0 | 1n | Cg  |

Discovered with the 6-inch. Apparently without change.

[β (1)...β (Mon. Not. xxxiii, 351)...Δ (1)...Cin<sup>5</sup>...LM ...Cogshall ( )...]

**β 405.** W<sup>2</sup> V. 1045

R.A. 5<sup>h</sup> 42<sup>m</sup> 22<sup>s</sup> }  
Decl. — 13° 34' }

|         |       |       |             |    |   |
|---------|-------|-------|-------------|----|---|
| 1877.95 | 125.1 | 14.50 | 8.5... 11.0 | 1n | β |
| 1892.04 | 126.8 | 14.45 | 8.3... 11.6 | 2n | β |
| 1899.11 | 126.7 | 14.13 | 8.5... 11.5 | 2n | β |

Noted with the 6-inch. Without change.

[β (VII)...β (2103,3141)...β<sup>2</sup>...β (Pub. L. O. II)...]

**$\beta$  406.** W<sup>1</sup> V. 1068

R.A. 5<sup>h</sup> 43<sup>m</sup> 1<sup>s</sup> }  
Decl. — 13° 28' }

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1877.95 | 243.1 | 12.01 | 9.0...12.0 | 1n | $\beta$ |
| 1892.00 | 242.3 | 11.39 | 8.7...11.3 | 3n | $\beta$ |
| 1899.11 | 244.4 | 11.33 | 8.7...12.0 | 2n | $\beta$ |

Discovered with the 6 inch. In the field with  $\Sigma$  801 *rej.*

[ $\beta$  (VII)... $\beta^1$ ... $\beta$  (2103,3141)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  94.** *Leporis* 61

R.A. 5<sup>h</sup> 44<sup>m</sup> 9<sup>s</sup> }  
Decl. — 14° 31' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1876.16 | 179.4 | 2.73 | 6.0... 9.4 | 4n | $\Delta$ |
| 1878.10 | 180.3 | 2.39 | 6.0... 8.5 | 1n | Cin      |
| 1881.14 | 182.5 | 2.72 | 7.0... 9.0 | 1n | $\beta$  |
| 1888.08 | 178.8 | 2.82 | 6.0... 8.4 | 3n | Lv       |
| 1888.49 | 179.7 | 2.61 | 6.0... 9.5 | 2n | T        |
| 1892.99 | 178.6 | 2.48 | 6.0... 8.4 | 2n | J        |
| 1898.84 | 180.1 | 2.56 | 6.5... 9.0 | 1n | Cg       |

Discovered with the 6-inch. Evidently without change. This star is Lalande 11086.

In 1846 JACOB found a pair, the rough place of which reduced would give for 1880, R.A. 6<sup>h</sup> 5<sup>m</sup>: Decl. — 14° 35' (*Mem. R. A. S.* xvii). He states that he subsequently looked for it several times, and could not find it. From a careful search I am certain there is no such pair in or near his place. There is no doubt now of its identity with  $\beta$  94, JACOB having made an error of about 20<sup>m</sup> in his R.A. This is confirmed by his description of the pair, 184°0 : 1<sup>h</sup>8<sup>±</sup> : 6½...9.

[ $\beta$  (II)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^3$ ... $\Delta$  (1)...Cin<sup>5</sup>...Lv<sup>1</sup>...Tarrant (2991)...Jones (*Proc. Haverford Coll. Obsy.* 1892)...Cogshall ( )...]

 **$\beta$  1188.** Lalande 11084

R.A. 5<sup>h</sup> 44<sup>m</sup> 33<sup>s</sup> }  
Decl. — 1° 28' }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1890.84 | 106.0 | 1.23 | 7.9...10.3 | 3n | $\beta$ |
| 1893.22 | 105.5 | 1.05 | ...        | 1n | Sp      |

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1898.77 | 104.5 | 1.02 | 7.7...11.2 | 2n | $\beta$ |
| 1898.88 | 103.1 | 1.43 | 8.0...10.0 | 1n | A       |

A and C (=  $\Sigma$  809)

|         |       |       |            |    |          |
|---------|-------|-------|------------|----|----------|
| 1831.16 | 101.2 | 25.70 | 7.7... 8.8 | 3n | $\Sigma$ |
| 1847.23 | 99.6  | 25.49 | ...        | 1n | Ma       |
| 1863.18 | 98.9  | 24.90 | ...        | 2n | En       |
| 1868.56 | 99.6  | 25.25 | 7.9... 9.0 | 4n | $\Delta$ |
| 1879.02 | 98.3  | 25.22 | 7.7... 8.3 | 2n | $\beta$  |
| 1890.85 | 98.3  | 25.32 | ... 8.7    | 3n | $\beta$  |
| 1898.77 | 97.8  | 24.98 | ... 8.4    | 2n | $\beta$  |
| 1898.88 | 98.2  | 25.00 | ... 9.0    | 1n | A        |

The principal star of  $\Sigma$  809 was found to be double with the 36-inch.

There is no material change in the  $\Sigma$  companion. All the measures of this are given.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)... $\beta^3$ ...Sp (III)...Aitken ( )...Madler (*Fixstern-Systeme* II)...Engelmann (*Mess. Neunzig Doppelsternen*)... $\Delta$  (II)...]

 **$\beta$  1053.** *Aurigae* 146

R.A. 5<sup>h</sup> 45<sup>m</sup> 18<sup>s</sup> }  
Decl. + 37° 19' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1889.92 | 233.2 | 0.43 | 7.5... 9.5 | 1n | $\beta$ |
|---------|-------|------|------------|----|---------|

Discovered with the 36-inch. Lalande 11066. In Lalande 6½ m, and 6.8 in D.M.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  1054.** 136 *Tauri*

R.A. 5<sup>h</sup> 45<sup>m</sup> 47<sup>s</sup> }  
Decl. + 27° 35' }

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1889.08 | 232.2 | 15.00 | 6 ... 12   | 3n | $\beta$ |
| 1898.94 | 232.7 | 15.01 | 6 ... 13.1 | 2n | $\beta$ |

Discovered with the 36-inch. The proper motion of this star is 0.021 in the direction of 172°8 (AUWERS).

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...]

**β 95.** Lalande 11128

R.A. 5<sup>h</sup> 46<sup>m</sup> 9<sup>s</sup> }  
Decl. — 7° 20' }

|         |       |       |            |    |   |
|---------|-------|-------|------------|----|---|
| 1878.16 | 298.2 | 13.67 | 8.0...12.0 | 1n | β |
| 1892.00 | 296.1 | 13.89 | 8.2...11.0 | 2n | β |

Discovered with the 18½-inch; *nf* 55 *Orionis*.  
Probably fixed.

[β (II)...β (*Mon. Not.* XXXIII, 437)...β (3114)...β (*Pub. L. O. II*)...]

**β 563.** Lalande 11156

R.A. 5<sup>h</sup> 47<sup>m</sup> 44<sup>s</sup> }  
Decl. + 15° 29' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1878.06 | 183.9 | 7.42 | 7.8...11.0 | 1n | β  |
| 1886.18 | 184.5 | 6.50 | ...        | 1n | HΣ |
| 1892.00 | 185.2 | 6.52 | 8.1...10.8 | 3n | β  |
| 1898.77 | 183.3 | 6.81 | 8.0...11.0 | 3n | β  |

Discovered with the 18½-inch. Probably fixed.

[β (x)...β...β (3114)...β (*Pub. L. O. II*)...HΣ ( )...]

**β 1190.** W<sup>r</sup> V. 1269

R.A. 5<sup>h</sup> 51<sup>m</sup> 17<sup>s</sup> }  
Decl. + 0° 1' }

A and B

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1890.85 | 340.1 | 1.41 | 7.4...10.8 | 3n | β |
| 1898.86 | 337.7 | 1.60 | 7.5...10.2 | 2n | A |
| 1898.88 | 341.4 | 1.40 | 7.2...10.7 | 2n | β |

A and C

|         |      |      |         |    |   |
|---------|------|------|---------|----|---|
| 1890.85 | 95.5 | 6.65 | ...12.5 | 3n | β |
| 1898.86 | 95.8 | 6.20 | ...12.5 | 2n | A |
| 1898.88 | 94.7 | 6.36 | ...11.7 | 2n | β |

Discovered with the 36-inch. The distant star C is noted in the Harvard Zones, where it is called 17 m, and distance estimated 8".

[β (xvii)...β (3047)...β (*Pub. L. O. II*)...Aitken ( )...]

**β 1189.** Schj. 1985

R.A. 5<sup>h</sup> 51<sup>m</sup> 18<sup>s</sup> }  
Decl. + 0° 23' }

A and B

|         |        |       |             |    |    |
|---------|--------|-------|-------------|----|----|
| 1890.90 | 269.5  | 0.20  | 8.1... 9.1  | 3n | β  |
| 1897.12 | 133.1? | 0.2 ± | "uncertain" | 1n | Sp |

AB and C

|         |       |       |            |    |   |
|---------|-------|-------|------------|----|---|
| 1890.85 | 194.5 | 58.11 | ... 8      | 2n | β |
| 1898.88 | 194.5 | 58.02 | 8.2... 8.4 | 1n | β |

Discovered with the 36-inch. The magnitudes of A and C in D.M. are 9.0 and 9.2. D.M. (0°) 1230, 1229.

[β (xvii)...β (3047)...β (*Pub. L. O. II*)...Sp (III)...]

**β 1055.** Aurigae 161

R.A. 5<sup>h</sup> 51<sup>m</sup> 32<sup>s</sup> }  
Decl. + 44° 35' }

A and B

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1888.92 | 332.9 | 1.61 | 6.7...11.5 | 3n | β |
|---------|-------|------|------------|----|---|

A and C (= H<sup>r</sup> V. 91)

|         |       |       |         |    |                |
|---------|-------|-------|---------|----|----------------|
| 1783.49 | 315.1 | 30.05 | ...     | 1n | H <sup>r</sup> |
| 1888.92 | 329.7 | 33.35 | ... 9.2 | 3n | β              |

The close companion was discovered with the 36-inch. The Herschel companion has been wholly neglected for more than a century. The above are all the measures. This star is B.A.C. 1899. The proper motion is given by KUSTNER as 0".057 in the direction of 238°.6. It is pretty certain that A and B are moving together. With this proper motion and the position of C for 1888, if the small star was fixed its position at the time of HERSCHEL'S measure should have been 320°:33".8.

[β (xv)...β (2929)...β (*Pub. L. O. II*)...]

**$\beta$  564.** D.M. ( $-1^\circ$ ) 1088

R.A.  $5^h 54^m 59^s$  }  
Decl.  $- 1^\circ 34'$  }

|         |                |               |            |            |
|---------|----------------|---------------|------------|------------|
| 1877.95 | $90^\circ \pm$ | $1^\circ \pm$ | 9.0...11.0 | $\beta$    |
| 1892.04 | 70.9           | 1.29          | 9.0...10.5 | $2n \beta$ |
| 1899.02 | 73.0           | 1.47          | 8.7...10.3 | $1n \beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. Further measures are needed.

[ $\beta$  (x)... $\beta^2$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)...]

 **$\beta$  1056.**  $\mu$  Orionis

R.A.  $5^h 55^m 47^s$  }  
Decl.  $+ 9^\circ 39'$  }

|         |               |           |          |            |
|---------|---------------|-----------|----------|------------|
| 1889.11 | $272.0^\circ$ | $16.80''$ | 4 ... 14 | $3n \beta$ |
| 1890.86 | 272.7         | 17.11     | ... 14.2 | $3n \beta$ |
| 1898.08 | 273.8         | 17.25     | ... 14   | $1n A$     |

Discovered with the 36-inch. The large star has a proper motion of  $0''.031$  in the direction of  $49^\circ 8$  (AUWERS). It is probably only an optical pair.

[ $\beta$  (xv)... $\beta$  (2929,3048)... $\beta$  (*Pub. L. O.* 11)... Aitken ( )...]

 **$\beta$  16.** 3 *Monocerotis*

R.A.  $5^h 56^m 12^s$  }  
Decl.  $- 10^\circ 36'$  }

|         |               |          |                       |                  |
|---------|---------------|----------|-----------------------|------------------|
| 1872.14 | $356.0^\circ$ | $1.80''$ | $5\frac{1}{2}$ ... 10 | $1n K$           |
| 1875.59 | 354.8         | 1.62     | 6.0... 9.7            | $2n \Delta$      |
| 1877.97 | 352.2         | 2.12     | 5.5... 8.5            | $1n \text{ Cin}$ |
| 1878.17 | 354.0         | 1.66     | 5.3... 8.3            | $2n \text{ Cin}$ |
| 1888.99 | 354.0         | 1.69     | 6.0... 9.5            | $2n T$           |
| 1889.02 | 353.9         | 1.88     | 5.2... 9.2            | $4n \text{ Lv}$  |
| 1898.83 | 351.5         | 1.82     | 6.0... 10.0           | $1n \text{ Cg}$  |
| 1898.88 | 356.1         | 1.68     | 6.0... 10.0           | $1n \beta$       |

Discovered with the 6-inch. The measures show no relative motion. This star is involved in a large, faint nebula (DREYER 2142). The proper motion, according to AUWERS, is  $0''.036$  in the direction of  $313^\circ 3$ . Taking this value, and the position of the companion in 1875 from the measures of  $\Delta$ , the small star, if fixed in space, should be  $23^\circ 9 : 1'.14$  (1898.8) It is evident from the

measures that no such relative change has occurred, and that the components, having the same proper motion, probably form a physical system.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... Knott (*Mem. R. A. S.* XLIII)...  $\Delta$  (1)...  $\text{Cin}^4$ ...  $\text{Cin}^5$ ... Tarrant (2991)...  $\text{Lv}^1$ ... Cogshall ( )...]

 **$\beta$  893.** B.A.C. 1935

R.A.  $5^h 56^m 49^s$  }  
Decl.  $+ 37^\circ 58'$  }

|         |               |           |             |            |
|---------|---------------|-----------|-------------|------------|
| 1878.90 | $128.0^\circ$ | $17.60''$ | 6.2... 12.5 | $2n \beta$ |
| 1892.07 | 130.5         | 17.95     | 6.2... 12.5 | $2n \beta$ |
| 1898.79 | 127.4         | 17.75     | 6.5... 11.5 | $1n \beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. This is a naked-eye star near  $40$  *Aurigae*.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)...]

 **$\beta$  1241.** 3 *Geminorum*

R.A.  $6^h 2^m 27^s$  }  
Decl.  $+ 23^\circ 8'$  }

A and B

|         |               |            |             |                 |
|---------|---------------|------------|-------------|-----------------|
| 1891.84 | $344.7^\circ$ | $0.53''$   | 5.9... 10.0 | $3n \beta$      |
| 1894.53 | 331.2         | $0.48 \pm$ | ...         | $3n \text{ Sp}$ |

A and C

|         |              |           |          |            |
|---------|--------------|-----------|----------|------------|
| 1891.85 | $63.3^\circ$ | $18.36''$ | ... 14.5 | $1n \beta$ |
| 1899.05 | 60.5         | 18.60     | ... 14.0 | $1n \beta$ |

Discovered with the 36-inch. It is a difficult pair of the 85 *Pegasi* class. The proper motion from the *Berlin A. G. Catalogue* is very small,  $0''.0024$  in the direction of  $145^\circ 4$ .

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11)...  $\text{Sp}$  (iii)...]

 **$\beta$  17.** 4 *Monocerotis*

R.A.  $6^h 2^m 48^s$  }  
Decl.  $- 11^\circ 8'$  }

A and B

|         |               |          |             |                 |
|---------|---------------|----------|-------------|-----------------|
| 1872.14 | $178.6^\circ$ | $3.38''$ | 6.5... 10.5 | $1n \text{ Kn}$ |
| 1875.90 | 178.0         | 3.16     | 6.8... 10.5 | $3n \Delta$     |

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1878.10 | 180.6 | 2.69 | 6.5...10.0 | 1n | Cin     |
| 1888.98 | 178.1 | 3.37 | ...        | 2n | T       |
| 1892.02 | 180.4 | 3.21 | 6.0...10.4 | 3n | $\beta$ |
| 1898.17 | 181.4 | 3.01 | 6.0...10.2 | 2n | A       |

A and C

|         |       |          |         |    |          |
|---------|-------|----------|---------|----|----------|
| 1872.14 | 244.1 | 10 $\pm$ | ...11.5 | 1n | Kn       |
| 1876.78 | 244.5 | 8.95     | ...11.5 | 1n | $\Delta$ |
| 1892.02 | 246.8 | 8.77     | ...10.8 | 3n | $\beta$  |
| 1898.17 | 249.1 | 9.32     | ...11.5 | 2n | A        |

The nearest companion was discovered with the 6-inch, and in measuring that KNOTT detected the third star C. AUWERS gives the proper motion of the principal star 0".029 in the direction of 84°.2. With this value, and the relation of AB from the measures of  $\Delta$  in 1875, the smaller component, if fixed, should be, for 1898.17, 189°.4 : 3".27. The measures show no such change in the angle, and point to a common proper motion, so far as A and B are concerned. The observations are not sufficient to decide as to C.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Knott (*Mem. R. A. S.* XLIII)...Cin<sup>5</sup>...Tarrant (2991)...Aitken ( )...]

$\beta$  1058. 4 *Geminorum*

R.A. 6<sup>h</sup> 3<sup>m</sup> 13<sup>s</sup> }  
Decl. + 23° 1' }

|         |       |            |            |    |         |
|---------|-------|------------|------------|----|---------|
| 1889.13 | 284.3 | 0.41       | 7.2... 7.5 | 2n | $\beta$ |
| 1890.88 | 284.0 | 0.25 $\pm$ | ...        | 8n | Sp      |
| 1891.01 | 281.3 | 0.28       | 6.3... 6.4 | 3n | $\beta$ |
| 1891.84 | 283.1 | 0.30       | 6.5... 6.6 | 3n | $\beta$ |

Discovered with the 36-inch. There is an error of 180° in the angle as originally printed. The proper motion of 4 *Geminorum* in AUWERS is 0".014 in the direction of 270°. It is certain that this pair will prove to be a binary system. Late measures are wanting.

[ $\beta$  (xv)... $\beta$  (2929,3048,3114)... $\beta$  (*Pub. L. O.* 11)...Sp (111)...]

$\beta$  565. Lalande 11741

R.A. 6<sup>h</sup> 3<sup>m</sup> 41<sup>s</sup> }  
Decl. — 14° 3' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1878.21 | 100.4 | 1.02 | 8 ... 12   | 1n | $\beta$ |
| 1892.07 | 99.9  | 1.13 | 8.1... 9.1 | 3n | $\beta$ |

Discovered with the 18½-inch. Apparently unchanged. In L and W' 7½ m; D.M. 8.2.

[ $\beta$  (x)... $\beta$ '... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)...]

$\beta$  1242. S.D. (6°) 1431

R.A. 6<sup>h</sup> 3<sup>m</sup> 42<sup>s</sup> }  
Decl. — 6° 18' }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1891.87 | 124.5 | 0.48 | 8.6... 8.8 | 3n | $\beta$ |
|---------|-------|------|------------|----|---------|

AB and C (= H 2298)

|         |          |          |          |    |         |
|---------|----------|----------|----------|----|---------|
| 1830    | 90 $\pm$ | 35 $\pm$ | 8.9...10 | 1n | H       |
| 1891.87 | 92.9     | 43.87    | ...10.7  | 3n | $\beta$ |

The close pair was discovered with the 36-inch while examining the nebula No. 2182 of *Dreyer's Catalogue*. The wide pair, H 2298, is found in *Herschel's Fifth Catalogue of Double Stars*, in which he says: "The larger star has a strong nebulous burr. It is my father's IV. 38." In the 36-inch this is a large faint nebula, with the double centrally placed in it. All the measures of C are given above.

[ $\beta$  (xviii)... $\beta$  (*Mon. Not.* LII, 455)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11, pp. 178, 225)...]

$\beta$  1017. S.D. (2°) 1510

R.A. 6<sup>h</sup> 6<sup>m</sup> 28<sup>s</sup> }  
Decl. — 2° 56' }

|         |           |           |            |    |         |
|---------|-----------|-----------|------------|----|---------|
| 1882    | 180 $\pm$ | 0.8 $\pm$ | 8.7... 8.8 |    | $\beta$ |
| 1892.05 | 161.1     | 0.65      | 8.5... 8.8 | 3n | $\beta$ |
| 1898.16 | 159.2     | 0.67      | ...        | 4n | D       |

Discovered with the 18½-inch.

[ $\beta$  (xiii)... $\beta$ <sup>3</sup> (app.)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  1008.  $\eta$  Geminorum

R.A.  $6^h 7^m 38^s$  }  
Decl.  $+ 22^\circ 32'$  }

|         |       |      |           |       |         |
|---------|-------|------|-----------|-------|---------|
| 1882.05 | 301.4 | 0.96 | 3 ... 8.8 | 5 $n$ | $\beta$ |
| 1883.28 | 300.2 | 0.83 | ... 10    | 4 $n$ | Hl      |
| 1886.34 | 289.3 | 0.89 | ... 9     | 3 $n$ | Ho      |
| 1887.17 | 291.3 | 1.05 | ...       | 5 $n$ | Sp      |
| 1888.15 | 291.7 | 0.97 | ...       | 5 $n$ | Sp      |
| 1889.07 | 289.7 | 1.01 | ...       | 4 $n$ | Sp      |
| 1889.14 | 294.8 | 1.04 | ... 10.5  | 3 $n$ | $\beta$ |
| 1890.93 | 296.1 | 1.08 | ... 10.7  | 3 $n$ | $\beta$ |
| 1893.22 | 291.9 | 0.99 | ...       | 5 $n$ | Sp      |
| 1894.22 | 289.7 | 0.99 | ...       | 2 $n$ | Sp      |
| 1896.22 | 289.6 | 1.05 | ...       | 2 $n$ | Sp      |
| 1897.17 | 291.5 | 1.24 | ...       | 1 $n$ | Sp      |

Discovered with the 12-inch on Mt. Hamilton in 1881. The measures show slow retrograde motion. AUWERS gives the proper motion of this star  $0''.069$  in the direction of  $267^\circ.5$ , and obviously this is common to both components.

In 1852 GILLISS observed a double or peculiar occultation of this star (A.N. 813), which he explains as the temporary eclipse of the star by a projecting lunar mountain. TATLOCK (*Sid. Mess.*, IV, 18) has shown that on another occasion the same observer saw this star occulted.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (2930,3048)...Hough (2978)...Hall (II)...Sp (III)...]

 $\beta$  566. *Monocerotis* 21

R.A.  $6^h 8^m 41^s$  }  
Decl.  $- 4^\circ 32'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1878.03 | 219.7 | 1.43 | 8.5...12.5 | 1 $n$ | $\beta$ |
| 1892.07 | 209.9 | 1.87 | 6.5...12.5 | 3 $n$ | $\beta$ |

Discovered with the 18½-inch. This star is 6 m in L and S.D. Lalande 11916.

[ $\beta$  (X)... $\beta^3$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...]

 $\beta$  323. Lalande 11915

R.A.  $6^h 8^m 44^s$  }  
Decl.  $- 1^\circ 41'$  }

|         |      |      |             |       |    |
|---------|------|------|-------------|-------|----|
| 1876.17 | 93.1 | 2.17 | 8.0... 9.0  | 2 $n$ | Hl |
| 1876.28 | 96.3 | 2.39 | 8.5... 10.2 | 2 $n$ | J  |

|         |      |      |            |       |     |
|---------|------|------|------------|-------|-----|
| 1878.05 | 93.5 | 2.16 | 7.4... 9.0 | 2 $n$ | Cin |
| 1888.18 | 96.3 | 2.13 | ...        | 2 $n$ | Hl  |
| 1889.07 | 96.9 | 2.26 | 8.0... 9.6 | 3 $n$ | Lv  |

Discovered with the 6-inch. Without change.

[ $\beta$  (VI)... $\beta$  (2062)... $\Delta$  (I)...Cin<sup>5</sup>...Lv<sup>1</sup>...Hl (I, II)...]

 $\beta$  193. W<sup>1</sup> VI. 208

R.A.  $6^h 9^m 9^s$  }  
Decl.  $+ 4^\circ 0'$  }

A and B

|         |      |       |             |       |         |
|---------|------|-------|-------------|-------|---------|
| 1892.04 | 90.2 | 17.88 | 8.0... 11.0 | 2 $n$ | $\beta$ |
| 1898.84 | 91.3 | 17.83 | 8.0... 12.0 | 1 $n$ | $\beta$ |

A and C

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1898.84 | 231.1 | 58.55 | ... 10.3 | 1 $n$ | $\beta$ |
|---------|-------|-------|----------|-------|---------|

Discovered with the 6-inch.

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* xxxiv, 382)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...]

 $\beta$  894. D.M. (19°) 1285

R.A.  $6^h 9^m 27^s$  }  
Decl.  $+ 19^\circ 3'$  }

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1881.14 | 138.0 | 5.14 | 8.2... 12.5 | 2 $n$ | $\beta$ |
| 1898.15 | 133.8 | 5.24 | 8 ... 12    | 4 $n$ | D       |

Discovered with the 18½-inch. This star from the *Berlin A. G. Catalogue* has a proper motion of  $0''.089$  in the direction of  $37^\circ.2$ . At the date of the last measure, in 1898, the companion if fixed should have been  $152^\circ.9 : 5''.79$ . It is therefore certain that the two stars are moving together.

[ $\beta$  (XIII)... $\beta^3$ ...Doolittle (*Pub. Flower Obsy.* 1)...]

 $\beta$  567. *Monocerotis* 23

R.A.  $6^h 9^m 34^s$  }  
Decl.  $- 4^\circ 53'$  }

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1879.08 | 249.5 | 3.83 | 6.8... 11.0 | 4 $n$ | $\beta$ |
| 1892.00 | 246.8 | 3.97 | 7.1... 10.9 | 3 $n$ | $\beta$ |

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1898.10 | 242.4 | 4.26 | 6.0...11.0 | 2n | D |
| 1898.86 | 245.2 | 4.21 | 6.7...10.2 | 2n | β |

Discovered with the 18½-inch. Probably unchanged. In LALANDE, HEIS, and ARGELANDER 6 m. Lalande 11949.

[β (x)...β¹...β (3114)...β (Pub. L. O. II)...Doolittle (Pub. Flower Obsy. 1)...]

**β 1018.** Lalande 11965

R.A. 6<sup>h</sup> 10<sup>m</sup> 7<sup>s</sup> }  
Decl. — 2° 50' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1882    | 60.0± | 5±   | 8.5...12.0 |    | β |
| 1892.06 | 54.7  | 6.02 | 8.5...11.7 | 3n | β |
| 1899.02 | 53.6  | 5.92 | 9.0...11.5 | 1n | β |

Discovered with the 18½-inch. Probably fixed.

[β (XIII)...β³ (app)...β (3114)...β (Pub. L. O. II)...]

**β 96.** 75 Orionis

R.A. 6<sup>h</sup> 10<sup>m</sup> 29<sup>s</sup> }  
Decl. + 9° 59' }

C and D

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1877.93 | 226.5 | 4.74 | 9.0...11.5 | 1n | β |
| 1892.12 | 227.0 | 5.10 | 9.0...10.7 | 2n | β |
| 1898.92 | 224.3 | 4.79 | 9.8...12.0 | 1n | β |

A and C

|         |       |        |       |    |   |
|---------|-------|--------|-------|----|---|
| 1892.12 | 159.5 | 119.90 | 6 ... | 2n | β |
| 1898.79 | 159.2 | 119.32 | ...   | 1n | β |

A and B

|         |       |       |         |    |   |
|---------|-------|-------|---------|----|---|
| 1892.12 | 255.5 | 62.88 | ...10.2 | 2n | β |
| 1898.79 | 256.0 | 62.83 | ...     | 1n | β |

The faint double companion was noted with the 6-inch. AUWERS gives the proper motion of A 0".060 in 191.3.

[β (II)...β (Mon. Not. xxxiii, 437)...β¹...β (3141)...β (Pub. L. O. II)...]

**β 18.** Lalande 12006

R.A. 6<sup>h</sup> 11<sup>m</sup> 7<sup>s</sup> }  
Decl. — 12° 0' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.00 | 271.9 | 1.79 | 7.3... 9.0 | 3n | Δ   |
| 1877.97 | 273.5 | 1.54 | 7.5... 9.0 | 1n | Cin |
| 1885.14 | 276.9 | 1.77 | 7.0... 9.5 | 1n | W   |
| 1886.52 | 275.9 | 1.68 | 8.0... 9.0 | 1n | LM  |
| 1892.93 | 273.5 | 1.21 | 8.0... 9.0 | 1n | J   |

Discovered with the 6-inch. Apparently fixed.

[β (1)...β (Mon. Not. xxxiii, 351)...Δ (1)...Cin⁴...Wilson (Cin<sup>10</sup>)...Jones (Proc. Haverford Coll. Obsy. 1892)...]

**β 1019.** S.D. (3°) 1373

R.A. 6<sup>h</sup> 11<sup>m</sup> 26<sup>s</sup> }  
Decl. — 3° 0' }

|         |        |      |            |    |   |
|---------|--------|------|------------|----|---|
| 1882    | 280.0± | 1±   | 8.0... 9.5 |    | β |
| 1892.06 | 274.2  | 0.81 | 8.0... 9.6 | 3n | β |
| 1898.88 | 277.6  | 0.80 | 8.3... 9.7 | 1n | β |

Discovered with the 18½-inch.

[β (XIII)...β³ (app)...β (3141)...β (Pub. L. O. II)...]

**β 895.** W² VI. 287

R.A. 6<sup>h</sup> 12<sup>m</sup> 23<sup>s</sup> }  
Decl. + 28° 29' }

A and B

|         |  |       |            |    |    |
|---------|--|-------|------------|----|----|
| 1873.9  | Elongation suspected in 250° with 6-inch |       |            |    | β  |
| 1875.9  | Appeared round with 18½-inch             |       |            |    | β  |
| 1879.00 | Elongated in 120°, 18½-inch              |       |            |    | β  |
| 1879.22 | 133.3                                    | 0.27  | 7.5... 7.5 | 1n | β  |
| 1887.17 | 143.5                                    | 0.25± | ...        | 3n | Sp |
| 1888.94 | 150.9                                    | 0.2 ± | ...        | 5n | Sp |
| 1891.18 | 144.6                                    | 0.22  | 8.2... 8.3 | 3n | β  |
| 1891.78 | 146.0                                    | 0.21  | 8.1... 8.3 | 3n | β  |
| 1898.24 | 185.8                                    | 0.35  | ...        | 1n | L  |

AB and C (= Σ 888)

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1831.22 | 246.2 | 2.70 | 7.5... 9.2 | 3n | Σ  |
| 1844.26 | 247.9 | 2.45 | ...        | 1n | Ma |
| 1857.16 | 250.8 | 2.77 | ...        | 1n | Se |
| 1869.83 | 249.8 | 2.95 | 7.2... 9.0 | 4n | Δ  |
| 1879.22 | 250.3 | 2.83 | ... 9.5    | 1n | β  |
| 1888.94 | 252.9 | 2.69 | ...        | 2n | Sp |
| 1891.22 | 250.2 | 2.87 | ...        | 2n | β  |

|         |       |   |      |     |                |   |
|---------|-------|---|------|-----|----------------|---|
| 1898.28 | 250.0 | " | 2.97 | ... | 3 <sup>n</sup> | D |
| 1898.59 | 251.8 | " | 2.73 | ... | 2 <sup>n</sup> | L |

The duplicity of the principal star of  $\Sigma$  888 was suspected with the 6-inch, and verified five years later with the 18½-inch. Rapid motion would be expected in a pair of this class, and it may prove to be a binary of short period. The measures since 1888 do not show very rapid change in the angle, but the distance at this time is probably about maximum, and one half or a whole revolution may have been described between 1879 and 1887. Only the largest apertures will show any difference of magnitude in the components. In 1828 HERSCHEL (*Seventh Catalogue, Mem. R.A.S., xxxviii*) noted, "the large star suspected to be a close double." This remark seems to have attracted no attention; at all events, the close pair was missed by  $\Sigma$  and other observers who measured C. All the measures of this star are given above. There is evidently no change.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Sp (iii)... Lewis (*Mon. Not. LIX, 400*)...Madler (*Fixstern-Systeme I*)...Secchi (*Cat. 1321 Stelle Doppie, 1859*)...Doolittle (*Pub. Flower Obsy. I*)...]

### $\beta$ 1059. $\mu$ *Geminorum*

R.A. 6<sup>h</sup> 15<sup>m</sup> 42<sup>s</sup>.  
Decl. + 22° 34'

B and C

|         |       |   |      |             |                |         |
|---------|-------|---|------|-------------|----------------|---------|
| 1889.10 | 266.7 | " | 0.80 | 9.8...10.7  | 3 <sup>n</sup> | $\beta$ |
| 1899.12 | 270.8 | " | 0.68 | 10.0...11.0 | 1 <sup>n</sup> | A       |

A and BC

|         |       |   |        |       |                |         |
|---------|-------|---|--------|-------|----------------|---------|
| 1889.10 | 141.0 | " | 122.49 | 3 ... | 3 <sup>n</sup> | $\beta$ |
| 1899.08 | 141.3 | " | 121.71 | ...   | 2 <sup>n</sup> | $\beta$ |

The duplicity of this distant companion to  $\mu$  *Geminorum* was discovered with the 36-inch. There are many faint stars less distant from A, one of which was measured by me, 76° 6' : 72° 66' (1880.01) 2<sup>n</sup>. AUWERS gives the proper motion of the large star as 0".116 in the direction of 153° 8' (*Fundamental Catalogue*). With this movement the minimum distance of the double companion of 26".7 will be reached in a little more than one thousand years.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)... $\beta^3$ ... Aitken ( )...]

### $\beta$ 1020. W<sup>2</sup> VI. 387

R.A. 6<sup>h</sup> 15<sup>m</sup> 46<sup>s</sup>.  
Decl. + 28° 49'

|         |       |   |      |            |                |         |
|---------|-------|---|------|------------|----------------|---------|
| 1891.22 | 158.5 | " | 1.27 | 8.2...10.0 | 2 <sup>n</sup> | $\beta$ |
| 1898.12 | 159.5 | " | 1.28 | 8.0...10.7 | 2 <sup>n</sup> | A       |

Discovered with the 18½-inch.

[ $\beta$  (xiii)... $\beta^3$  (app.)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

### $\beta$ 97. Lalande 12260

R.A. 6<sup>h</sup> 18<sup>m</sup> 29<sup>s</sup>.  
Decl. — 1° 21'

|         |       |   |      |            |                |          |
|---------|-------|---|------|------------|----------------|----------|
| 1876.00 | 257.8 | " | 1.15 | 7.2... 9.2 | 3 <sup>n</sup> | $\Delta$ |
| 1877.97 | 260.6 | " | 1.18 | 6.5... 8.5 | 1 <sup>n</sup> | Cin      |
| 1878.16 | 81.1  | " | 1.09 | 7.5... 8.5 | 1 <sup>n</sup> | Cin      |
| 1889.14 | 260.9 | " | 0.93 | 7.2... 8.9 | 2 <sup>n</sup> | Lv       |
| 1898.19 | 260.7 | " | 1.20 | 7.0... 8.0 | 3 <sup>n</sup> | D        |

Discovered with the 6-inch. Without change.

[ $\beta$  (ii)... $\beta$  (*Mon. Not. xxxiii, 437*)... $\Delta$  (i)...Cin<sup>4</sup>...Cin<sup>5</sup>...Lv<sup>1</sup>...Doolittle (*Pub. Flower Obsy. I*)...]

### $\beta$ 568. *Canis Majoris* 33

R.A. 6<sup>h</sup> 18<sup>m</sup> 36<sup>s</sup>.  
Decl. — 19° 43'

|         |       |   |      |            |                |         |
|---------|-------|---|------|------------|----------------|---------|
| 1878.16 | 157.8 | " | 0.67 | 7.0... 9.0 | 1 <sup>n</sup> | Cin     |
| 1878.21 | 155.1 | " | 0.78 | 7.0... 7.3 | 1 <sup>n</sup> | $\beta$ |
| 1889.07 | 148.3 | " | 0.63 | 7.0... 7.8 | 3 <sup>n</sup> | Lv      |
| 1891.88 | 154.2 | " | 0.86 | 7 ... 8    | 1 <sup>n</sup> | Col     |
| 1892.93 | 156.1 | " | 1.07 | 7.0... 8.0 | 1 <sup>n</sup> | J       |
| 1898.24 | 158.8 | " | 0.58 | ...        | 1 <sup>n</sup> | See     |

Discovered with the 18½-inch. Probably unchanged. The distance in the second measure, by an error in reducing, was printed 1".35. It should be as given above. Lalande 12288.

[ $\beta$  (x)... $\beta^3$ ...Cin<sup>5</sup>...Lv<sup>1</sup>...Collins and Jones (*Proc. Harvard Coll. Obsy., 1891, 1892*)...See ( )...]

**β 1191.** Lalande 12262

R.A. 6<sup>h</sup> 19<sup>m</sup> 8<sup>s</sup> }  
Decl. + 18° 50' }

1890.93 161.5 1.33 7.0...13.8 3<sup>n</sup> β

Discovered with the 36-inch. The *Berlin A G. Catalogue* gives the proper motion of this star 0".205 in the direction of 222°.2. If this is substantially correct, another measure will show whether the components are moving together. If the companion is fixed in space, its position for 1898.9 would be 91°.8 : 1".51.

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...]

**β 569.** Lalande 12315

R.A. 6<sup>h</sup> 19<sup>m</sup> 37<sup>s</sup> }  
Decl. - 10° 52' }

1877.99 120.7 1.84 8.2...10.5 1<sup>n</sup> β  
1878.62 118.8 1.54 8.0...10.2 2<sup>n</sup> Cin  
1886.89 115.2 1.99 8.0... 9.7 2<sup>n</sup> LM  
1898.10 115.5 2.07 8.0...10.0 3<sup>n</sup> D

Discovered with the 18½-inch. Change uncertain.

[β (x)...β<sup>s</sup>...Cin<sup>5</sup>...LM...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 1192.** *v* *Geminorum*

R.A. 6<sup>h</sup> 21<sup>m</sup> 50<sup>s</sup> }  
Decl. + 20° 17' }

B and C

1890.88 346.2 0.15 8.7... 8.8 3<sup>n</sup> β  
1899.12 346.4 0.20 9.0... 9.5 1<sup>n</sup> A

A and BC (= OΣ (app.) 77)

1876.02 329.1 112.54 4.2... 8.0 3<sup>n</sup> J  
1890.86 329.3 112.69 ... 3<sup>n</sup> β  
1895.53 329.5 112.87 4.5...7.4 3<sup>n</sup> F  
1899.08 329.6 112.71 ... 2<sup>n</sup> β

The duplicity of the distant companion was discovered with the 36-inch. This star is Lalande

12358. The principal star has a proper motion of 0".0315 in the direction of 259°.0 (AUWERS). All the measures of OΣ (app.) 77 are given above.

The following positions are derived from meridian observations:

|      |       |        |          |
|------|-------|--------|----------|
| 1800 | 329.7 | 111.20 | Lalande  |
| 1875 | 329.4 | 112.64 | A. G. C. |

The large telescope shows a number of faint stars nearer the primary than BC. The nearest is the only one seen with any difficulty.

|    |         |       |       |         |                  |
|----|---------|-------|-------|---------|------------------|
| Aa | 1890.88 | 358.0 | 22.65 | ...15   | 3 <sup>n</sup> β |
| Ab | 1890.87 | 13.3  | 53.90 | ...13.8 | 2 <sup>n</sup> β |
| Ac | 1890.87 | 254.6 | 56.76 | ...12.5 | 2 <sup>n</sup> β |
| Ad | 1890.87 | 11.6  | 92.13 | ...13   | 2 <sup>n</sup> β |

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...Δ (1)...Franz (3464)...Aitken ( )...]

**β 570.** 11 *Monocerotis*

R.A. 6<sup>h</sup> 23<sup>m</sup> 0<sup>s</sup> }  
Decl. - 6° 57' }

A and D

|         |      |       |   |         |                  |
|---------|------|-------|---|---------|------------------|
| 1878.02 | 56.1 | 25.79 | 5 | ...12.5 | 3 <sup>n</sup> β |
| 1898.90 | 55.2 | 25.63 |   | ...13.0 | 2 <sup>n</sup> β |

A and B (= Σ 919)

|         |       |      |            |                   |
|---------|-------|------|------------|-------------------|
| 1831.23 | 130.0 | 7.25 | 5.0... 5.5 | 3 <sup>n</sup> Σ  |
| 1854.20 | 131.2 | 7.33 | ...        | 5 <sup>n</sup> J  |
| 1878.38 | 131.2 | 7.23 | 5.7... 5.7 | 5 <sup>n</sup> Sp |
| 1898.96 | 133.4 | 7.44 | ...        | 1 <sup>n</sup> β  |

B and C

|         |       |      |     |     |                   |
|---------|-------|------|-----|-----|-------------------|
| 1831.23 | 101.7 | 2.46 | ... | 6.0 | 3 <sup>n</sup> Σ  |
| 1854.20 | 101.6 | 2.53 | ... |     | 5 <sup>n</sup> J  |
| 1878.38 | 104.9 | 2.76 | ... | 6.1 | 5 <sup>n</sup> Sp |
| 1898.96 | 108.4 | 2.95 | ... |     | 1 <sup>n</sup> β  |

The distant companion was noted with the 18½-inch. The principal star, according to AUWERS, has a proper motion of 0".076 in the direction of 296°.4, and obviously the two Σ companions are moving with it, as there has been no relative change

in the last half century. A few only of the measures are given. The triple is  $H^1 I. 10 = H^2 II. 17 = Sh 71 = \Sigma 919$ .

[ $\beta$  (x)... $\beta^2$ ... Madler (*Fixstern-Systeme 1*) (*Dorpat Obsns.* x, xi, xiii, xv)... Worster and Jacob (*Madras Obsns.* first series)... Jacob (*Mem. R. A. S.* xvii)... Secchi (*Catalogo di 1321 Stelle Doppie*) (*Atti dell' Accad. Pontif. de Nouvi Lincei*, Anno vii)... *Obsns. at Barclay's Obsy.* 1... Wrottesley (*Mem. R. A. S.* xxix)... *Radcliffe Obsns.* xxiii... Powell (*Mem. R. A. S.* xxv)... Herschel (*5th Catalogue Mem. R. A. S.* vi)...  $\Delta$  (1015, 1256)...  $\Delta$  (I, II)...  $\Delta$  (*Accad. Sci. Mem.*)... Gledhill (*Mem. R. A. S.* xlii)... Duner (*Mesures Microm Lund*, 1876)... Nobile (*Rend. della Accad. Sci.*, Napoli, Nov. 1875)... Plummer (*Oxford Obsns.* No. 1)... Cin<sup>5</sup>... Je (2346)... *Harvard Obsns.* xiii... Hall (I, II)... Seabroke (*Mem. R. A. S.* L)... LM... Tarrant (2991)... Hayn (3051)... Knorre (3300, 3518)... Glasenapp (III)... Bryant (*Mon. Not.* LIX, 400)... Solá (3563)...]

### $\beta$ 753. $\lambda$ Canis Majoris

R.A.  $6^h 23^m 43^s$  }  
Decl.  $-32^\circ 30'$  }

|         |                |           |            |            |
|---------|----------------|-----------|------------|------------|
| 1879.79 | $40^\circ \pm$ | $1.2 \pm$ | 5 ... 8    | $\beta$    |
| 1892.14 | 47.2           | 1.29      | 5.8... 7.7 | 3n $\beta$ |
| 1893.14 | 37.3           | 1.16      | 6 ... 8    | 2n Sel     |
| 1897.12 | 38.2           | 1.36      | ...        | 3n A       |
| 1898.19 | 43.1           | 1.14      | ...        | 1n See     |

Discovered with the 6-inch at Mt. Hamilton in 1879. The *Second Washington Catalogue* gives the proper motion,  $0.088$  in the direction of  $270^\circ$ . The components are evidently moving together.

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* I, II)... Sellors (3240)... Aitken (3465)... See ( )...]

### $\beta$ 896. Lalande 12414

R.A.  $6^h 23^m 48^s$  }  
Decl.  $+32^\circ 15'$  }

A and B

|         |               |        |             |            |
|---------|---------------|--------|-------------|------------|
| 1879.00 | $199^\circ 3$ | $0.89$ | 7.0... 10.0 | 1n $\beta$ |
|---------|---------------|--------|-------------|------------|

A and C

|         |               |         |          |            |
|---------|---------------|---------|----------|------------|
| 1879.56 | $210^\circ 8$ | $18.44$ | ... 13.0 | 2n $\beta$ |
| 1899.05 | $210^\circ 0$ | $18.18$ | ... 13.0 | 1n $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. In looking over my old observing books with the 6-inch recently

I find that the close pair was suspected with that instrument three years before its independent discovery with the  $18\frac{1}{2}$ -inch.

[ $\beta$  (xiii)... $\beta^3$ ...]

### $\beta$ 1021. W<sup>2</sup> VI. 648

R.A.  $6^h 24^m 8^s$  }  
Decl.  $+28^\circ 28'$  }

|         |                 |           |            |         |
|---------|-----------------|-----------|------------|---------|
| 1882    | $120^\circ \pm$ | $0.8 \pm$ | 8.0... 9.0 | $\beta$ |
| 1892.16 | 86.0            | 0.68      | 8.1... 9.4 | 2n Lv   |
| 1898.24 | 77.0            | 0.66      | ...        | 1n L    |

Discovered with the  $18\frac{1}{2}$ -inch. There may be some angular motion.

[ $\beta$  (xiii)... $\beta^3$  (app.)... Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)... Lewis (*Mon. Not.* LIX, 400)...]

### $\beta$ 98. Lalande 12564

R.A.  $6^h 26^m 46^s$  }  
Decl.  $-5^\circ 15'$  }

|         |               |        |            |             |
|---------|---------------|--------|------------|-------------|
| 1876.09 | $140^\circ 8$ | $1.05$ | 8.3... 8.3 | 3n $\Delta$ |
| 1877.97 | 135.9         | ...    | 8.0... 8.3 | 2n Cin      |
| 1878.12 | 135.5         | ...    | 8.0... 8.5 | 1n Cin      |
| 1898.14 | 142.6         | 0.88   | 8 ... 8+   | 3n D        |

Discovered with the 6-inch. Without change.

[ $\beta$  (ii)... $\beta$  (*Mon. Not.* xxxiii, 437)...  $\Delta$  (I)... Cin<sup>4</sup>... Cin<sup>5</sup>... Doolittle (*Pub. Flower Obsy.* I)...]

### $\beta$ 194. D.M. ( $38^\circ$ ) 1537

R.A.  $6^h 28^m 4^s$  }  
Decl.  $+38^\circ 5'$  }

|         |               |           |            |             |
|---------|---------------|-----------|------------|-------------|
| 1874.25 | $283^\circ 5$ | $1 \pm$   | 8.0... 8.5 | 1n $\beta$  |
| 1875.43 | 285.0         | 0.91      | 8.0... 8.5 | 4n $\Delta$ |
| 1880.55 | 283.6         | $0.9 \pm$ | 8.0... 8.5 | 3n Sp       |
| 1883.90 | 285.7         | 1.17      | 8.2... 8.6 | 7n En       |

Discovered with the 6-inch. No indication of change.

[ $\beta$  (iv)... $\beta$  (*Mon. Not.* xxxiv, 382)...  $\Delta$  (I)... Sp (II)... Engelmann (2678)...]

**β 754.** Lacaille 2350

R.A. 6<sup>h</sup> 30<sup>m</sup> 22<sup>s</sup> }  
Decl. - 33° 55' }

|         |                   |      |        |     |        |
|---------|-------------------|------|--------|-----|--------|
| 1879.79 | 20 <sup>o</sup> ± | 0.5± | 6.5... | 7.0 | β      |
| 1892.14 | 22.8              | ...  | ...    | ... | 1n Lv  |
| 1892.18 | 36.5              | 0.78 | 8.0... | 8.2 | 2n β   |
| 1897.77 | 16.2              | 0.92 | 6.2... | 7.5 | 1n See |

Discovered with the 6-inch on Mt. Hamilton in 1879. Further measures are necessary to show whether or not there is any motion. There is a star 11 m, 40° : 25". The principal star in Lac. 5½ m, Gould 7.0.

[β (x1)...β²...β (3141)...β (Pub. L. O. 1, II)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...See (3495)...]

**β 755.** Argus 34

R.A. 6<sup>h</sup> 31<sup>m</sup> 14<sup>s</sup> }  
Decl. - 36° 41' }

A and B

|         |                    |      |        |     |        |
|---------|--------------------|------|--------|-----|--------|
| 1879.79 | 250 <sup>o</sup> ± | 1±   | 6.0... | 7.5 | β      |
| 1887.24 | 253.1              | 0.77 | 6 ...  | 7   | 2n Pol |
| 1891.11 | 252.7              | 0.91 | 6 ...  | 7   | 1n Sel |
| 1897.17 | 260.6              | 1.09 | 6.2... | 9.8 | 1n See |

AB and C (= H 3875)

|         |                    |       |       |      |        |
|---------|--------------------|-------|-------|------|--------|
| 1837.9  | 295 <sup>o</sup> ± | 20±   | 6 ... | 13   | 2n H²  |
| 1887.25 | 301.0              | 21.22 | ...   | 11   | 1n Pol |
| 1891.11 | 300.4              | 20.87 | ...   | ...  | 1n Sel |
| 1897.17 | 301.8              | 21.83 | ...   | 12.9 | 1n See |

The duplicity of the principal star of H 3875 was discovered with the 6-inch at Mt. Hamilton in 1879. Further observations will be necessary to show the nature of the relation. All the measures of the Herschel companion are given above. A naked-eye star in *Argo*. Lacaille 2359.

[β (x1)...β²...Herschel (*Cape Obsns.*)...Russell (*Mon. Not. XLVII, 473*)...Pollock (*Mem. R. A. S. L*) (*Pub. Sydney Obsy. 1891*)...Sellors (3154)...See (3495)...]

**β 571.** W<sup>v</sup> VI. 956

R.A. 6<sup>h</sup> 33<sup>m</sup> 2<sup>s</sup> }  
Decl. + 13° 5' }

|         |       |      |        |      |       |
|---------|-------|------|--------|------|-------|
| 1877.95 | 316.2 | 2.73 | 6.0... | 12.0 | 1n β  |
| 1886.22 | 307.7 | 2.88 | ...    | ...  | 1n HΣ |

|         |       |      |        |      |      |
|---------|-------|------|--------|------|------|
| 1892.10 | 317.9 | 3.00 | 6.9... | 11.2 | 3n β |
| 1899.08 | 322.4 | 2.49 | 7.0... | 13.0 | 2n β |

Discovered with the 18½-inch. In Heis 6-7 m; D.M. 7.0. It is wanting in many of the star catalogues where a star of this brightness should be found.

[β (x)...β²...β (3141)...β (Pub. L. O. II)...HΣ ( )...]

**β 19.** Lalande 12936

R.A. 6<sup>h</sup> 36<sup>m</sup> 36<sup>s</sup> }  
Decl. - 15° 53' }

|         |       |      |        |     |        |
|---------|-------|------|--------|-----|--------|
| 1874.14 | 169.4 | 4.07 | 7.2... | 9.5 | 1n Kn  |
| 1876.26 | 165.0 | 3.52 | 6.7... | 9.0 | 3n Δ   |
| 1877.12 | 164.5 | 3.66 | 7.0... | 9.0 | 2n Cin |
| 1885.65 | 168.7 | 3.58 | 7.5... | 9.7 | 2n W   |
| 1887.95 | 165.2 | 3.54 | 6.8... | 9.0 | 2n T   |
| 1888.12 | 166.6 | 3.70 | 7.8... | 9.4 | 3n Lv  |
| 1888.86 | 167.0 | 3.65 | 6.5... | 9.0 | 2n T   |
| 1898.16 | 165.2 | 3.92 | ...    | ... | 1n See |

Discovered with the 6-inch. Apparently fixed.

[β (1)...β (Mon. Not. XXXIII, 351)...Knott (*Mem. R. A. S. XLIII*)...Δ (1)...Cin⁴...Wilson (Cin<sup>10</sup>)...Lv²...Tarrant (2899,2991)...See ( )...]

**β 195.** O. Arg. S. 5539

R.A. 6<sup>h</sup> 37<sup>m</sup> 26<sup>s</sup> }  
Decl. - 23° 7' }

A and B

|         |       |      |        |      |        |
|---------|-------|------|--------|------|--------|
| 1877.13 | 217.6 | 6.05 | 7.0... | 11.0 | 1n Cin |
| 1892.18 | 215.2 | 5.71 | 7.1... | 11.1 | 4n Lv  |
| 1898.23 | 212.9 | 5.97 | ...    | ...  | 1n See |
| 1898.84 | 216.9 | 5.77 | 7.5... | 10.5 | 1n β   |

A and C

|         |       |       |     |      |        |
|---------|-------|-------|-----|------|--------|
| 1892.15 | 178.4 | 35.04 | ... | 12.0 | 1n Lv  |
| 1898.23 | 177.0 | 34.27 | ... | ...  | 1n See |
| 1898.84 | 178.6 | 34.71 | ... | 11.3 | 1n β   |

Discovered with the 6-inch. There is no material change.

[β (IV)...β (Mon. Not. XXXIV, 382)...Cin⁴...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...See ( )...]

$\beta$  756

R.A.  $6^h 41^m$  }  
Decl.  $+ 39^\circ 35'$  }

This 8 or  $8\frac{1}{2}$  m star was suspected with the 6-inch on Mt. Hamilton in 1879 to be a very close pair. I could find no double in or near this place with the 36-inch, 1890.78.

[ $\beta$  (XI)... $\beta^2$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* I, II)...]

 $\beta$  20. Lalande 13170

R.A.  $6^h 43^m 25^s$  }  
Decl.  $- 16^\circ 4'$  }

|         |      |   |      |            |    |          |
|---------|------|---|------|------------|----|----------|
| 1876.42 | 29.8 | " | 3.20 | 7.7...11.1 | 4n | $\Delta$ |
| 1878.12 | 29.3 | " | 2.95 | 8.0...10.5 | 1n | Cin      |
| 1880.11 | 34.6 | " | 2.99 | 7.8...10.8 | 4n | $\beta$  |
| 1886.13 | 30.1 | " | 3.70 | 8.0...11.0 | 1n | LM       |
| 1886.16 | 30.6 | " | 2.96 | 8.0...11.0 | 1n | W        |
| 1888.54 | 34.5 | " | 3.12 | 8.0...10.6 | 3n | Lv       |
| 1898.22 | 31.3 | " | 3.44 | ...        | 1n | See      |
| 1899.09 | 32.7 | " | 3.12 | 8.0...10.0 | 1n | $\beta$  |

The middle of three stars *nf* *Sirius*; discovered with the 6-inch. The measures do not show any motion.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\Delta$  (I)... $\beta^3$ ...Cin<sup>5</sup>...Lv<sup>1</sup>...LM...Wilson (Cin<sup>10</sup>)...See ( )...]

 $\beta$  1193. 36 *Geminorum*

R.A.  $6^h 44^m 21^s$  }  
Decl.  $+ 21^\circ 54'$  }

|         |       |   |       |            |    |         |
|---------|-------|---|-------|------------|----|---------|
| 1890.90 | 355.0 | " | 10.81 | 5.7...14.5 | 3n | $\beta$ |
| 1899.02 | 354.7 | " | 10.46 | ...14.0    | 1n | $\beta$ |

Discovered with the 36-inch. The *Berlin A. G. Catalogue* gives the proper motion of this star  $0''.043$  in the direction of  $208^\circ.8$ . There is a 13 m star,  $14''.4 : 34''.0$ .

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...]

 $\beta$  897. *Monocerotis* 97

R.A.  $6^h 44^m 42^s$  }  
Decl.  $- 0^\circ 23'$  }

|         |      |   |      |            |    |         |
|---------|------|---|------|------------|----|---------|
| 1879.14 | 30.9 | " | 5.60 | 6.5...12.0 | 3n | $\beta$ |
| 1892.00 | 32.0 | " | 6.00 | 6.2...11.4 | 3n | $\beta$ |
| 1898.84 | 31.8 | " | 5.74 | 6.0...12.5 | 1n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. The principal star (Lalande 13198) has a considerable proper motion:

|            |   |   |   |   |       |          |
|------------|---|---|---|---|-------|----------|
| Stumpe     | - | - | - | " | 0.182 | in 170.5 |
| Glasgow 2d | - | - | - | " | 0.225 | in 180.0 |
| Porter     | - | - | - | " | 0.162 | in 183.7 |

The measures show that this is common to both components.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

 $\beta$  324. Lacaille 2462

R.A.  $6^h 44^m 45^s$  }  
Decl.  $- 23^\circ 56'$  }

A and B

|         |       |   |      |            |    |     |
|---------|-------|---|------|------------|----|-----|
| 1877.11 | 202.5 | " | 1.88 | 7.0... 8.0 | 2n | Cin |
| 1889.04 | 203.3 | " | 1.71 | 7.1... 8.4 | 3n | Lv  |
| 1892.93 | 199.0 | " | 1.74 | 7.0... 8.2 | 1n | J   |
| 1894.13 | 208.3 | " | 2.±  | 7 ... 9    | 1n | Sel |
| 1898.14 | 203.3 | " | 2.60 | ...        | 1n | See |
| 1898.14 | 203.3 | " | 1.93 | 7 ... 8    | 3n | D   |

AB and C (= S 537)

|         |       |   |       |          |    |       |
|---------|-------|---|-------|----------|----|-------|
| 1825.16 | 281.9 | " | 30.30 | 7 ... 11 | 3n | South |
| 1898.14 | 281.1 | " | 30.68 | ...      | 1n | See   |
| 1898.14 | 281.8 | " | 30.63 | ... 9    | 1n | D     |

AB and D

|         |     |   |       |        |    |     |
|---------|-----|---|-------|--------|----|-----|
| 1898.14 | 2.8 | " | 28.26 | ...    | 1n | See |
| 1898.14 | 2.4 | " | 30.27 | ... 13 | 3n | D   |

The duplicity of the larger star of SOUTH's wide pair was discovered with the 6-inch. No change is apparent in any of the components.

[ $\beta$  (VI)... $\beta$  (2062)...Cin<sup>4</sup>...Lv<sup>1</sup>...Jones (*Proc. Haverford Coll. Obsy.* 1892)...Sellors (3303)...See ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 898.** O. Arg. S. 5753

R.A. 6<sup>h</sup> 45<sup>m</sup> 0<sup>s</sup> }  
Decl. — 15° 53' }

A and B

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.75 | 356.2 | 2.95 | 7.8...11.3 | 5 <sup>n</sup> | β   |
| 1886.11 | 349.8 | 3.23 | 8...11     | 1 <sup>n</sup> | LM  |
| 1892.00 | 357.5 | 3.23 | 8.0... 9.5 | 3 <sup>n</sup> | β   |
| 1898.22 | 354.8 | 3.40 | ...        | 1 <sup>n</sup> | See |
| 1899.02 | 353.6 | 3.01 | 8.0...10.5 | 1 <sup>n</sup> | β   |

C and D

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.52 | 271.7 | 1.54 | 9.8...10.6 | 3 <sup>n</sup> | β   |
| 1892.00 | 270.3 | 1.91 | 9.1... 9.3 | 3 <sup>n</sup> | β   |
| 1898.22 | 266.8 | 2.11 | ...        | 1 <sup>n</sup> | See |
| 1899.02 | 268.8 | 1.79 | 9.0... 9.2 | 1 <sup>n</sup> | β   |

A and C

|         | °     | "     |     |                |     |
|---------|-------|-------|-----|----------------|-----|
| 1879.69 | 283.1 | 96.50 | ... | 2 <sup>n</sup> | β   |
| 1892.00 | 282.1 | 96.77 | ... | 3 <sup>n</sup> | β   |
| 1898.22 | 282.1 | 96.49 | ... | 1 <sup>n</sup> | See |
| 1898.84 | 282.5 | 97.26 | ... | 1 <sup>n</sup> | β   |

A quadruple in the vicinity of *Sirius*; discovered with the 6-inch. Probably without change.

[β (XIII)...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* II)...LM...See ( )...]

**β 325.** O. Arg. S. 5814

R.A. 6<sup>h</sup> 46<sup>m</sup> 59<sup>s</sup> }  
Decl. — 26° 26' }

|         | °    | "    |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1877.11 | 32.1 | 2.05 | 8.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1884.09 | 37.0 | 2.06 | 9.0...10.0 | 1 <sup>n</sup> | W   |
| 1897.84 | 37.2 | 1.81 | 7.5... 9.6 | 1 <sup>n</sup> | See |
| 1898.10 | 30.3 | 1.79 | 8+... 9+   | 3 <sup>n</sup> | D   |

Discovered with the 6-inch; the *sf* of a wide pair. Probably fixed. The magnitude in Cord. D.M. is 7.7.

[β (VI)...β (2062)...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...See (3495)...Doolittle (*Pub. Flower Obsy.* 1)...]

**326.** Lalande 13404

R.A. 6<sup>h</sup> 49<sup>m</sup> 57<sup>s</sup> }  
Decl. + 2° 28' }

|         | °    | "    |            |                |    |
|---------|------|------|------------|----------------|----|
| 1876.19 | 63.0 | 1.23 | 8.0... 9.0 | 2 <sup>n</sup> | H1 |
| 1876.83 | 62.8 | 1.25 | 8.0... 9.5 | 2 <sup>n</sup> | Δ  |
| 1882.21 | 67.6 | 1.20 | 8.0... 9.5 | 2 <sup>n</sup> | Sp |
| 1886.22 | 58.2 | 1.47 | ...        | 2 <sup>n</sup> | HΣ |
| 1888.20 | 65.8 | 1.04 | ...        | 2 <sup>n</sup> | H1 |
| 1888.83 | 64.5 | 1.13 | 8.0... 9.2 | 4 <sup>n</sup> | Lv |
| 1893.20 | 60.5 | 1.08 | 8.0... 9.2 | 1 <sup>n</sup> | J  |
| 1898.18 | 56.4 | 1.33 | ...        | 1 <sup>n</sup> | Br |

Discovered with the 6-inch. No material change.

[β (VI)...β (2062)...Δ (1)...Sp (II)...Lv<sup>1</sup>...Hall (I, II)...OΣ (*Poulkowa Obsns.* x)...HΣ ( )...Jones (*A. J.* 312)...Brown ( )...]

**β 899.** W<sup>2</sup> VI. 1526

R.A. 6<sup>h</sup> 52<sup>m</sup> 9<sup>s</sup> }  
Decl. + 18° 53' }

A and B

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.14 | 261.4 | 0.68 | 9.0... 9.0 | 1 <sup>n</sup> | β   |
| 1889.78 | 263.9 | 0.5± | ...        | 5 <sup>n</sup> | Sp  |
| 1892.13 | 268.0 | 0.58 | 8.7... 9.3 | 2 <sup>n</sup> | β   |
| 1896.11 | 265.1 | 0.81 | ...        | 1 <sup>n</sup> | Lew |

AB and C

|         | °     | "     |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1879.14 | 174.2 | 24.07 | ...10   | 2 <sup>n</sup> | β |
| 1892.13 | 175.5 | 24.33 | ...10   | 2 <sup>n</sup> | β |
| 1899.08 | 176.0 | 24.10 | ... 9.2 | 1 <sup>n</sup> | β |

AB and D

|         | °    | "     |         |                |   |
|---------|------|-------|---------|----------------|---|
| 1879.14 | 48.1 | 40.46 | ... 9.0 | 2 <sup>n</sup> | β |
| 1892.13 | 47.8 | 40.46 | ... 9.0 | 2 <sup>n</sup> | β |
| 1899.08 | 48.1 | 40.69 | ... 8.7 | 1 <sup>n</sup> | β |

Discovered with the 18½-inch. Change in AB is probable. D is W<sup>2</sup> VI. 1531.

[β (XIII)...β<sup>3</sup>...β (3141)...β (*Pub. L. O.* II)...Sp (III)...Lewis (*Mon. Not.* LX, 400)...]

**$\beta$  327.** Lalande 13492

R.A.  $6^h 52^m 28^s$  }  
Decl.  $- 2^\circ 52'$  }

## A and B

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1876.83 | 100.8 | 0.96 | 7.5... 8.0 | 2n | $\Delta$ |
| 1878.12 | 96.8  | ...  | 8.0... 8.5 | 1n | Cin      |
| 1881.05 | 96.1  | 0.75 | 7.5... 7.5 | 1n | $\beta$  |
| 1888.10 | 96.1  | 0.75 | 8.0... 8.2 | 2n | Lv       |
| 1888.22 | 95.5  | 0.84 | 7.5... 8.0 | 4n | T        |
| 1892.08 | 95.8  | 0.79 | 8.2... 8.2 | 3n | $\beta$  |
| 1893.45 | 97.7  | 0.64 | ...        | 4n | Sp       |
| 1898.20 | 99.6  | 0.63 | ...        | 1n | Sp       |
| 1899.09 | 93.6  | 0.59 | 8.0...     | 1n | $\beta$  |

## AB and C

|         |       |       |          |    |          |
|---------|-------|-------|----------|----|----------|
| 1876.83 | 102.6 | 13.22 | ... 11.5 | 2n | $\Delta$ |
| 1878.12 | 99.4  | ...   | ... 11.0 | 1n | Cin      |
| 1880.63 | 100.2 | 13.21 | ... 11.2 | 2n | $\beta$  |
| 1888.22 | 97.8  | 13.72 | ... 11.5 | 4n | T        |
| 1892.10 | 100.0 | 13.10 | ... 11.6 | 2n | $\beta$  |
| 1899.09 | 98.9  | 13.25 | ... 11.0 | 1n | $\beta$  |

Discovered with the 6-inch. No material change.

[ $\beta$  (vi)... $\beta$  (2062,3141)... $\beta$  (*Pub. L. O.* II)... $\beta^3$ ...Cin<sup>5</sup>...  
Lv<sup>1</sup>...Tarrant (2991)...Sp (III)...]

 **$\beta$  1060.** Lalande 13491

R.A.  $6^h 52^m 38^s$  }  
Decl.  $+ 3^\circ 46'$  }

|         |      |      |             |    |         |
|---------|------|------|-------------|----|---------|
| 1889.15 | 58.3 | 3.01 | 7.0... 12.0 | 2n | $\beta$ |
| 1899.02 | 59.3 | 3.11 | 6.8... 13.5 | 1n | $\beta$ |

Discovered with the 36-inch.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...]

 **$\beta$  1022.** W<sup>1</sup> VI. 1557

R.A.  $6^h 53^m 15^s$  }  
Decl.  $+ 27^\circ 26'$  }

## A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1883.19 | 160.0 | 1.0  | 8.5... 8.5 |    | $\beta$ |
| 1899.02 | 133.8 | 0.48 | 8.5... 8.5 | 1n | $\beta$ |

## AB and C

|         |       |       |          |    |         |
|---------|-------|-------|----------|----|---------|
| 1899.02 | 196.3 | 31.35 | ... 12.5 | 1n | $\beta$ |
|---------|-------|-------|----------|----|---------|

Discovered with the 18½-inch. There must be change in both angle and distance of the close pair.

[ $\beta$  (xiii)... $\beta^3$  (app)...]

 **$\beta$  100.** W<sup>1</sup> VI. 1620

R.A.  $6^h 54^m 14^s$  }  
Decl.  $+ 12^\circ 34'$  }

|         |       |      |             |    |          |
|---------|-------|------|-------------|----|----------|
| 1875.36 | 258.1 | 3.27 | 7.0... 10.8 | 3n | $\Delta$ |
| 1880.63 | 262.0 | 3.14 | 7.5... 10.0 | 2n | $\beta$  |
| 1888.64 | 258.8 | 3.17 | 8.0... 10.4 | 2n | Lv       |
| 1892.13 | 256.0 | 2.92 | 7.5... 11.0 | 1n | Col      |

Discovered with the 6-inch. Fixed.

[ $\beta$  (ii)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^3$ ... $\Delta$  (i)...Lv<sup>1</sup>...  
Collins (*Proc. Haverford Coll. Obsy.* 1892) (*A. J.* 278)...]

 **$\beta$  572.** Lalande 13623

R.A.  $6^h 55^m 24^s$  }  
Decl.  $- 20^\circ 28'$  }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1879.39 | 143.9 | 5.07 | 7.2... 11.0 | 3n | $\beta$ |
| 1892.12 | 142.6 | 5.27 | 6.9... 11.0 | 3n | $\beta$ |
| 1897.80 | 143.6 | 5.92 | 6 ... 10.7  | 1n | See     |
| 1899.09 | 142.4 | 5.13 | 7.5... 10.2 | 2n | $\beta$ |

Discovered with the 18½-inch. Probably unchanged. Many small stars in the field.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)... See  
(3495)...]

 **$\beta$  573.** Lalande 13642

R.A.  $6^h 56^m 11^s$  }  
Decl.  $- 10^\circ 42'$  }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1878.17 | 244.8 | ...  | 8.0... 8.7 | 2n | Cin      |
| 1878.21 | 246.9 | 0.82 | 7.5... 8.0 | 1n | $\Delta$ |
| 1879.13 | 248.6 | 0.75 | 8.0... 8.2 | 1n | $\beta$  |
| 1899.19 | 256.3 | 0.74 | ...        | 2n | $\beta$  |

Discovered with the 18½-inch. This star is 7.0 m in Radcliffe and S.D.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\Delta$  (i)...Cin<sup>5</sup>...]

**β 900.** Lalande 13688

R.A. 6<sup>h</sup> 58<sup>m</sup> 33<sup>s</sup> }  
Decl. + 21° 11' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1880.20 | 272.6 | 1.58 | 8.2...11.7 | 2n | β |
| 1892.21 | 273.0 | 1.70 | 8.0...11.5 | 3n | β |

Discovered with the 18½-inch; 40' *nf* ζ *Geminorum*. Without material change.

[β (XIII)...β<sup>3</sup>...β (3141)...β (*Pub. L. O. II*)...]

**β 328.** *Canis Majoris* 139

R.A. 7<sup>h</sup> 1<sup>m</sup> 3<sup>s</sup> }  
Decl. — 11° 7' }

A and B

|         |       |       |            |    |     |
|---------|-------|-------|------------|----|-----|
| 1875.70 | 128.4 | 0.3   | 6.3... 7.5 | 4n | Δ   |
| 1878.17 | 127.8 | ...   | 6.0... 8.7 | 2n | Cin |
| 1879.13 | 117.8 | 0.48  | 7.0... 8.5 | 1n | β   |
| 1880.44 | 122.3 | 0.51  | 6.2... 7.5 | 4n | Sp  |
| 1887.18 | 116.1 | 0.42  | ...        | 2n | Sp  |
| 1891.15 | 116.4 | 0.45± | ...        | 2n | Sp  |
| 1892.11 | 118.0 | 0.51  | 6.3... 7.6 | 4n | β   |
| 1892.23 | 115.8 | 0.5±  | ...        | 1n | Sp  |
| 1893.23 | 119.2 | 0.5±  | ...        | 2n | Sp  |
| 1899.26 | 132.3 | 0.43  | 6.5... 8.0 | 1n | β   |

AB and C (= Σ 1026 *rej.*)

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1879.13 | 349.9 | 17.85 | ... 9.0  | 1n | β |
| 1892.04 | 348.9 | 17.45 | ... 10.4 | 3n | β |
| 1899.26 | 350.3 | 17.40 | ...      | 1n | β |

The large star of this wide pair was found to be a close double with the 6-inch. Motion is uncertain. This is a naked-eye star in *Canis Major*, 6 m in Argelander, Heis, and *Pos. Med.* Lalande 13811.

[β (VI)...β (2062,3114)...β<sup>3</sup>...β (*Pub. L. O. II*)...Δ (I)...  
Cin<sup>5</sup>...Sp (II, II app., III)...]

**β 574.** Lalande 13821

R.A. 7<sup>h</sup> 1<sup>m</sup> 18<sup>s</sup> }  
Decl. — 11° 9' }

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1878.04 | 306.7 | 1.76 | 8.0... 12   | 1n | β |
| 1892.04 | 311.3 | 2.26 | 8.1... 11.4 | 3n | β |
| 1898.88 | 302.3 | 2.28 | 8.0... 12.5 | 1n | β |

Discovered with the 18½-inch.

[β (X)...β<sup>2</sup>...β (3114)...β (*Pub. L. O. II*)...]

**β 1009.** τ *Geminorum*

R.A. 7<sup>h</sup> 3<sup>m</sup> 30<sup>s</sup> }  
Decl. + 30° 26' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1882.01 | 178.2 | 1.87 | 5 ... 11.5 | 2n | β |
| 1890.96 | 177.6 | 1.75 | ... 13.2   | 4n | β |

This fine and difficult pair was discovered at Mt. Hamilton with the 12-inch in 1881. AUWERS gives the proper motion, 0.064 in the direction of 222°.1. The measures are sufficient to show from the common proper motion that this is a physical pair. If the small star was fixed in space its position angle would be diminished 13° in the interval 1882-1890.

[β (XIII)...β<sup>3</sup>...β (3048)...β (*Pub. L. O. II*)...]

**β 329.** *Canis Majoris* 146

R.A. 7<sup>h</sup> 4<sup>m</sup> 9<sup>s</sup> }  
Decl. — 16° 2' }

|         |      |       |             |    |     |
|---------|------|-------|-------------|----|-----|
| 1880.67 | 97.6 | 29.52 | 6.4... 11.7 | 2n | β   |
| 1892.12 | 96.8 | 29.84 | 6.2... 11.5 | 3n | β   |
| 1898.16 | 96.5 | 30.02 | ...         | 1n | See |
| 1898.80 | 97.3 | 29.78 | 6.2... 11.0 | 2n | β   |

Distant companion noted with 6-inch. A naked-eye star (Lalande 13928); Heis 6 m; S.D. 7.2; Cord. 6.6. See notes a nearer star, 14.8 m, 110° : 6'.5, which I could not see on the occasion of the last measures with the 40-inch.

[β (VI)...β (2062,3141)...β<sup>3</sup>...β (*Pub. L. O. II*)...See ( )...]

**β 1279.** S.D. (3°) 1773

R.A. 7<sup>h</sup> 4<sup>m</sup> 26<sup>s</sup> }  
Decl. — 3° 54' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1899.23 | 10.4 | 1.02 | 9.0... 9.3 | 1n | β |
|---------|------|------|------------|----|---|

This was noted with the 18½-inch on December 16, 1878, but forgotten subsequently, and not measured or included in my catalogues of that time. A recent examination of my old observing book led to its recovery with the 40-inch. This instrument shows a 13 m star, 349°.8 : 14'.2.

**β 196.** W<sup>2</sup> VII. 142

R.A. 7<sup>h</sup> 6<sup>m</sup> 27<sup>s</sup> }  
Decl. - 5° 14' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1876.83 | 186.7 | 3.52 | 10.0...11.0 | 1n | Δ   |
| 1879.22 | 189.9 | ...  | 8.5...10.0  | 1n | Cin |
| 1880.22 | 189.7 | 3.33 | 9.5...11.0  | 1n | β   |
| 1882.12 | 191.1 | 2.92 | 9.0...11.0  | 1n | W   |
| 1899.09 | 189.8 | 3.26 | 9.0...10.0  | 1n | β   |

Discovered with the 6-inch. The *f* one of three stars in the field.

[β (1v)...β (*Mon. Not.* xxxiv, 382)...Δ (1)...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...]

**β 197.** Lalande 14026

R.A. 7<sup>h</sup> 7<sup>m</sup> 0<sup>s</sup> }  
Decl. - 6° 57' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.86 | 147.0 | 2.28 | 7.7...10.2 | 2n | Δ   |
| 1879.22 | 148.2 | 1.92 | 8.0... 9.5 | 1n | Cin |
| 1886.94 | 144.8 | 2.21 | 8.0... 9.3 | 1n | LM  |
| 1888.10 | 147.8 | 2.17 | 8.1... 9.4 | 3n | Lv  |

Discovered with the 6-inch. Without change.

[β (1v)...β (*Mon. Not.* xxxiv, 382)...Δ (1)...Cin<sup>5</sup>...LM...Lv<sup>1</sup>...]

**β 1023.** D.M. (26°) 1498

R.A. 7<sup>h</sup> 7<sup>m</sup> 45<sup>s</sup> }  
Decl. + 26° 5' }

|         |       |      |            |      |
|---------|-------|------|------------|------|
| 1882    | 310±  | 0.3± | 8.5... 8.5 | β    |
| 1891.23 | 294.0 | 0.25 | 8.4... 8.5 | 3n β |
| 1898.27 | 294.6 | 0.38 | 8.3... 8.6 | 1n A |

This star was suspected with the 18½-inch to be a close pair in 1882, and subsequently verified and measured with the 36-inch.

[β (xiii)...β<sup>3</sup> (app.)...β (3114)...β (*Pub. L. O.* II)...Aitken ( )...]

**β 757.** *Argus* 101

R.A. 7<sup>h</sup> 8<sup>m</sup> 10<sup>s</sup> }  
Decl. - 36° 21' }

|         |      |      |            |    |    |
|---------|------|------|------------|----|----|
| 1879.79 | 60±  | 1.5± | 6.0... 7.5 | 1n | β  |
| 1881.18 | 65.8 | 2.21 | ...        | 1n | Pt |

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1887.23 | 67.7 | 2.57 | 6.5... 8.0 | 2n | Pol |
| 1893.15 | 62.6 | 2.66 | 7 ... 9    | 2n | Sel |
| 1897.20 | 69.2 | 3.06 | 6.3...11.8 | 2n | See |

Discovered with the 6-inch on Mt. Hamilton in 1879. This is a naked-eye star in *Argo*. Lacaille 2628. There would appear to be some change, but this needs confirmation. There is a wide difference in the magnitudes assigned to the smaller star.

[β (xi)...β<sup>2</sup>...Pritchett (*Pub. Morrison Obsy.* No. 1)...Russell (*Mon. Not.* XLVII, 473)...Pollock (*Pub. Sydney Obsy.* 1891) (*Mem. R. A. S. L.*)...Sellors (3240)...See (3495)...]

**β 1268.** 24 *Monocerotis*

R.A. 7<sup>h</sup> 9<sup>m</sup> 11<sup>s</sup> }  
Decl. + 0° 3' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1892.21 | 313.2 | 3.81 | 6.0...11.8 | 4n | β  |
| 1898.94 | 310.6 | 3.90 | 6.0...13.0 | 2n | A  |
| 1899.11 | 309.9 | 3.85 | ...        | 2n | Hu |

This is one of the rejected stars (OΣ 169) of the Poulkova Catalogue. In the edition of 1850 it was given as "oblong?" the direction of the suspected elongation being roughly measured on two occasions 199° and 204°. MADLER has two observations (*Dorpat Observations* XI, XIII), 26°.4 : 0".5 (1843.28) and 22°.2 : 0".35 (1846.24). Subsequently DEMBOWSKI (*Measures*, Vol. I. 228) thought it might be elongated in 148°, but very uncertain. In 1873 I had a faint suspicion of a slight elongation in 310°, but it was very doubtful in 1874. It was finally rejected as single by OTTO STRUVE, and is probably not a close pair. It was certainly round in 1892 with all powers on the 36-inch. In the course of this examination I found the faint companion given above. It is not probable that this has anything to do with the early observations previously mentioned. The faintness of this star is a sufficient explanation of the failures to see it with other telescopes.

AUWERS gives for the proper motion of this star, 0".031 in the direction of 284°.9. The measures do not cover a sufficient time to show with certainty whether the small star shares in this movement.

[β (xix)...β (3141)...β (*Pub. L. O.* II)...Aitken ( )...Hussey ( )...]

**β 575. Canis Majoris 156**

R.A. 7<sup>h</sup> 9<sup>m</sup> 21<sup>s</sup> }  
Decl. - 15° 16' }

A and B

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1878.18 | 199.2 | 0.69 | 8.0... 8.0 | 2n | β   |
| 1878.17 | 195.3 | ...  | 7.8... 8.2 | 3n | Cin |
| 1889.15 | 199.9 | 0.70 | 8.0... 8.0 | 1n | Lv  |
| 1898.29 | 220.8 | 0.34 | ...        | 1n | See |
| 1899.19 | 216.0 | 0.64 | ...        | 1n | A   |

AB and C (= Σ 1057)

|         |     |       |            |    |     |
|---------|-----|-------|------------|----|-----|
| 1831.20 | 1.9 | 15.28 | 7.3... 9.8 | 3n | Σ   |
| 1845.20 | 1.9 | 16.10 | ...        | 1n | Ma  |
| 1867.99 | 1.5 | 15.50 | 7.0... 9.8 | 3n | Δ   |
| 1878.10 | 2.1 | 15.87 | ...        | 2n | β   |
| 1898.29 | 2.4 | 15.74 | ...        | 1n | See |

The duplicity of the principal star of Σ 1057 was discovered with the 18½-inch.

There is no sensible change in the distant star, C. All the measures are given. Lalande 14114.

[β (x)...β<sup>1</sup>...Cin<sup>5</sup>...Lv<sup>1</sup>...See ( )... Madler (*Fixstern-Systeme* 1)...Δ (II)...Aitken ( )...]

**β 330. D.M. (-0°) 1680**

R.A. 7<sup>h</sup> 13<sup>m</sup> 27<sup>s</sup> }  
Decl. - 0° 41' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1876.87 | 218.0 | 1.28 | 8.7... 10.5 | 2n | Δ   |
| 1878.12 | 211.7 | 1.22 | 8.5... 9.0  | 1n | Cin |
| 1886.84 | 213.5 | 1.25 | 8.5... 9.0  | 1n | LM  |
| 1888.42 | 215.6 | 1.23 | 8.0... 9.5  | 2n | Lv  |

Discovered with the 6-inch. Probably without change.

[β (v1)...β (2062)...Δ (t)...Cin<sup>5</sup>...Lv<sup>1</sup>...LM...]

**β 901. 65 Aurigae**

R.A. 7<sup>h</sup> 14<sup>m</sup> 1<sup>s</sup> }  
Decl. + 36° 59' }

A and B

|         |     |       |             |    |    |
|---------|-----|-------|-------------|----|----|
| 1879.31 | 7.9 | 10.56 | 5.8... 12.3 | 3n | β  |
| 1881.29 | 8.5 | 11.06 | 5.0... 11.5 | 1n | OΣ |

|         |     |       |             |    |    |
|---------|-----|-------|-------------|----|----|
| 1888.77 | 9.3 | 11.16 | ...         | 4n | HΣ |
| 1891.18 | 9.1 | 11.14 | ... 11.5    | 3n | β  |
| 1898.08 | 7.5 | 10.90 | 6.0... 12.2 | 2n | β  |

A and C

|         |      |       |          |    |   |
|---------|------|-------|----------|----|---|
| 1879.51 | 26.8 | 36.05 | ... 12.7 | 2n | β |
| 1898.08 | 30.3 | 37.76 | ... 12.7 | 2n | β |

Discovered with the 18½-inch. AUWERS assigns to this star a proper motion of 0.097 in the direction of 264°.7. With the position of B in 1879, and this annual movement of A, the companion, if fixed in space, should be 17°.1 : 11.12 for 1898. It is therefore very probable that it is moving with the principal star, while the more distant companion is fixed.

[β (XIII)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...OΣ (Poulkowa Obsns. x)...HΣ ( )...]

**β 577. Piazzi VII. 53**

R.A. 7<sup>h</sup> 14<sup>m</sup> 21<sup>s</sup> }  
Decl. + 0° 38' }

AB and C

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1892.19 | 100.0 | 12.75 | ... 13.5 | 2n | β   |
| 1895.19 | 106.1 | 14.15 | ...      | 1n | Lew |
| 1896.25 | 103.5 | 13.77 | ... 13.2 | 1n | Lew |
| 1899.08 | 97.9  | 12.42 | ... 13.3 | 3n | β   |

AB and D

|         |      |       |        |    |   |
|---------|------|-------|--------|----|---|
| 1878.21 | 9.9  | 14.54 | ... 13 | 1n | β |
| 1892.19 | 10.6 | 15.31 | ... 13 | 2n | β |
| 1897.27 | 10.7 | 15.17 | ...    | 1n | A |
| 1899.09 | 10.8 | 15.25 | ... 13 | 1n | β |

AB and E

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1892.18 | 278.0 | 53.62 | ... 10.8 | 3n | β |
| 1897.27 | 278.2 | 54.08 | ...      | 1n | A |

A and B (= Σ 1074)

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1831.54 | 115.4 | 0.48 | 7.8... 8.2 | 3n | Σ   |
| 1869.90 | 139.4 | 0.62 | ...        | 3n | OΣ  |
| 1882.89 | 141.5 | 0.64 | 7.7... 8.1 | 6n | En  |
| 1888.73 | 139.6 | 0.82 | 7.8... 8.0 | 3n | Lv  |
| 1892.18 | 142.7 | 0.55 | 8.1... 8.3 | 3n | β   |
| 1895.19 | 137.4 | 0.58 | ...        | 2n | Lew |
| 1896.25 | 133.8 | 0.68 | ...        | 1n | Lew |
| 1897.29 | 139.7 | 0.86 | 8 ... 8+   | 4n | A   |

The distant star, D, was noted with the 18½-inch, and the fainter and nearer star, C, added with the 36-inch. The close pair is probably in slow motion, although there has been but little change in the last twenty years. Only a few of the measures of this are given. The complete observations will be found in the references given below.

[β (x)...β¹...β (3141)...β (Pub. L. O. II)...Aitken (A. J. 429) (3465)...Lewis (Mon. Not. LIV, 314; LVI, 359; LIX, 400) (Greenwich Obsns. 1895) (Observatory XIX, 118)...Lewis ( )...Madler (Dorpat Obsns. XI, XIII, XV) (Fixstern-Systeme 1)...OZ (Poukova Obsns. IX)...Herschel (Mem. R. A. S. XXXVIII)...Wilson and Seabroke (Mem. R. A. S. XLII, XLVI, L)...Gledhill (Mem. R. A. S. XLII)...Annals Harvard Obsy. XIII...Flammarion (Etoiles Doubles et Multiples)...Pritchett (Pub. Morrison Obsy. 1)...Δ (1474)...Δ (II)...Sp (II, II app.)...Doberck (2307)...Engelmann (2678)...Hussey (A. J. 427)...Lv¹...Bigourdan (Bull. Ast. XVIII)...]

β 331. Cord. (— 24°) 5211

R.A. 7<sup>h</sup> 15<sup>m</sup> 2<sup>s</sup> }  
Decl. — 24° 12' }

|         |       |      |        |     |    |        |
|---------|-------|------|--------|-----|----|--------|
| 1877.13 | 115.9 | 2.04 | 8.2... | 9.0 | 2n | Cin    |
| 1889.15 | 114.7 | 1.93 | 8.2... | 8.9 | 2n | Lv     |
| 1894.14 | 115.4 | 1.75 | 8      | ... | 9  | 1n Sel |

Discovered with the 6-inch. It is *n* and a little *f* 29 *Canis Majoris*. Probably without change.

[β (VI)...β (2062)...Cin⁴...Lv¹...Sellors (3303)...]

β 1024. D.M. (29°) 1520

R.A. 7<sup>h</sup> 15<sup>m</sup> 33<sup>s</sup> }  
Decl. + 29° 32' }

|         |       |      |        |      |    |   |
|---------|-------|------|--------|------|----|---|
| 1882    | 110±  | 1±   | 9.0... | 11   |    | β |
| 1892.26 | 103.2 | 1.40 | 9.0... | 11.5 | 1n | β |

Discovered with the 18½-inch. Further measures are needed.

[β (XIII)...β³ (app.)...β (3141)...β (Pub. L. O. II)...]

β 758. *Lyncis* 51

R.A. 7<sup>h</sup> 19<sup>m</sup> 55<sup>s</sup> }  
Decl. + 48° 26' }

|         |      |       |        |      |    |    |
|---------|------|-------|--------|------|----|----|
| 1883.75 | 94.2 | 16.92 | 6.2... | 10.2 | 6n | En |
|---------|------|-------|--------|------|----|----|

|         |      |       |        |      |    |   |
|---------|------|-------|--------|------|----|---|
| 1892.14 | 93.1 | 16.56 | 6.0... | 11.1 | 3n | β |
| 1898.79 | 91.4 | 16.58 | 6.7... | 11.0 | 1n | β |

Discovered with the 6-inch. The magnitude in D.M. is 6.0. Unchanged. Lalande 14402.

[β (XI)...β²...β (3141)...β (Pub. L. O. II)...Engelmann (2678)...]

β 199. Lalande 14480

R.A. 7<sup>h</sup> 19<sup>m</sup> 57<sup>s</sup> }  
Decl. — 20° 56' }

|         |      |      |        |     |    |        |
|---------|------|------|--------|-----|----|--------|
| 1870.12 | 19.4 | 1.72 | 7.5... | 8.5 | 1n | Hd     |
| 1877.15 | 20.3 | 1.90 | 7.2... | 8.2 | 2n | Cin    |
| 1889.12 | 21.6 | 1.84 | 7.6... | 8.2 | 4n | Lv     |
| 1892.10 | 23.2 | 1.63 | ...    |     | 1n | Lv     |
| 1893.19 | 23.1 | 1.74 | 7      | ... | 8  | 2n Sel |
| 1896.03 | 24.7 | ...  | ...    |     |    | 3n Do  |
| 1898.15 | 20.7 | 1.71 | 8      | ... | 9  | 1n Ho  |

AB and C (= Ho 522)

|         |       |      |     |    |    |    |
|---------|-------|------|-----|----|----|----|
| 1898.15 | 120.2 | 6.10 | ... | 13 | 1n | Ho |
|---------|-------|------|-----|----|----|----|

Discovered with the 6-inch. Probably fixed. The faint star discovered by HOUGH with the 18½-inch.

[β (IV)...β (Mon. Not. XXXIV, 382)...Cin⁴...Lv¹...Annals Harvard Obsy. XIII...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Sellors (3240)...Doberck (3378)...Hough (3557)...]

β 198. Lalande 14503

R.A. 7<sup>h</sup> 20<sup>m</sup> 38<sup>s</sup> }  
Decl. — 20° 43' }

|         |       |      |        |      |     |        |
|---------|-------|------|--------|------|-----|--------|
| 1870.12 | 211.9 | 5.72 | 8      | ...  | 9.5 | 1n Hd  |
| 1877.12 | 214.2 | 5.97 | 8.0... | 10.5 | 2n  | Cin    |
| 1898.19 | 212.9 | 5.71 | ...    |      |     | 1n See |
| 1898.26 | 213.6 | 5.70 | 8.0... | 10.8 | 3n  | A      |

Discovered with the 6-inch. The larger star is red. Found independently at Cambridge. Without change. The 4" pair of 8½ m stars 40<sup>s</sup> *p* and 4' *s* is H 3964.

[β (IV)...β (Mon. Not. XXXIV, 382)...Annals Harvard Obsy. XIII...See ( )...Aitken ( )...]

**β 21. η Canis Minoris**

R.A. 7<sup>h</sup> 21<sup>m</sup> 35<sup>s</sup> }  
Decl. + 7° 11' }

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1875.39 | 27.4 | 4.09 | 5.5...11.3 | 3 <sup>n</sup> | Δ  |
| 1877.23 | 22.7 | 3.79 | 6...10.5   | 1 <sup>n</sup> | OΣ |
| 1886.28 | 23.6 | 4.01 | ...        | 1 <sup>n</sup> | HΣ |
| 1891.96 | 25.8 | 3.99 | 5.7...11.2 | 3 <sup>n</sup> | β  |
| 1898.12 | 24.3 | 4.33 | 6...11     | 2 <sup>n</sup> | A  |
| 1898.25 | 28.2 | 4.04 | ...        | 2 <sup>n</sup> | L  |

Discovered with the 6-inch. Probably without change. The proper motion of the principal star is 0".022 in the direction of 216°.7 (AUWERS). If the small star was fixed in space, the movement would increase the distance 0".5 in the time covered by the measures.

[β (1)...β (*Mon. Not.* xxxiii, 351)...β (3114)...β (*Pub. L. O.* II)...Δ (1)...OΣ (*Poulkowa Obsns.* x)...Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...HΣ ( )...]

**β 578. Lalande 14545**

R.A. 7<sup>h</sup> 21<sup>m</sup> 47<sup>s</sup> }  
Decl. - 17° 37' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1878.17 | 52.4 | ...  | 6.0...12.0 | 2 <sup>n</sup> | Cin |
| 1878.20 | 53.6 | 2.44 | 6.5...11.8 | 1 <sup>n</sup> | β   |
| 1878.22 | 50.6 | 2.51 | 7.5...10.5 | 1 <sup>n</sup> | Δ   |
| 1886.16 | 48.7 | 2.33 | 7.7...10.7 | 2 <sup>n</sup> | W   |
| 1898.21 | 46.8 | 2.29 | ...        | 1 <sup>n</sup> | See |
| 1898.26 | 46.4 | 2.26 | 6.3...10.9 | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. Very little, if any, change. The distance in my measure of 1878 is erroneously given in β<sup>r</sup> as 1".72. This is a naked-eye star in *Argo*; S.D. 6.0 m.

[β (x)...β<sup>r</sup>...Δ (1)...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...See ( )...Aitken ( )...]

**β 332. Piazzii VII. 116**

R.A. 7<sup>h</sup> 22<sup>m</sup> 13<sup>s</sup> }  
Decl. - 11° 19' }

A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.52 | 166.3 | 0.80 | 6.3... 8.2 | 3 <sup>n</sup> | Δ   |
| 1878.19 | 168.2 | 0.90 | 6.4... 8.2 | 2 <sup>n</sup> | Cin |
| 1880.65 | 169.1 | 1.07 | 6.3... 8.2 | 7 <sup>n</sup> | Sp  |
| 1887.15 | 165.8 | 0.89 | 6.3... 8.2 | 6 <sup>n</sup> | T   |

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1887.18 | 165.9 | 0.86 | ...        | 2 <sup>n</sup> | Sp |
| 1892.04 | 168.7 | 0.85 | 6.8... 8.1 | 3 <sup>n</sup> | β  |

AB and D

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1878.10 | 157.2 | 23.41 | ... 9.8  | 2 <sup>n</sup> | β |
| 1892.10 | 157.8 | 23.32 | ... 11.0 | 2 <sup>n</sup> | β |
| 1899.05 | 156.8 | 23.08 | ... 11.0 | 1 <sup>n</sup> | β |

AB and E

|         |      |       |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1878.16 | 41.4 | 31.06 | ... 12.5 | 1 <sup>n</sup> | β |
| 1892.10 | 42.8 | 32.21 | ... 11.7 | 2 <sup>n</sup> | β |
| 1899.05 | 43.0 | 32.28 | ... 12   | 1 <sup>n</sup> | β |

AB and C (= Σ 1097)

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1832.15 | 312.1 | 20.20 | 6.5... 8.7 | 2 <sup>n</sup> | Σ  |
| 1847.23 | 313.3 | 20.01 | ...        | 1 <sup>n</sup> | Ma |
| 1868.63 | 312.8 | 20.00 | 6.0... 8.9 | 4 <sup>n</sup> | Δ  |
| 1878.16 | 313.5 | 20.21 | ...        | 1 <sup>n</sup> | β  |
| 1880.21 | 312.7 | 20.02 | ... 8.9    | 4 <sup>n</sup> | Sp |
| 1887.15 | 314.5 | 20.66 | ... 8.9    | 6 <sup>n</sup> | T  |
| 1892.04 | 312.7 | 19.88 | ... 9.0    | 3 <sup>n</sup> | β  |
| 1899.05 | 313.4 | 19.84 | ... 10.0   | 1 <sup>n</sup> | β  |

The duplicity of the principal star of Σ 1097 was discovered with the 6-inch. It was suspected by Δ when measuring the Σ star in 1865. Thus far there is no certain change in the close pair. The small star D is mentioned by H in his *Second Catalogue*. All the measures of the small stars and the Σ companion are given above. The latter is certainly fixed. The 18½-inch shows a faint star about 12" from C in the direction of 305°.

The principal star (B.A.C. 2470 = Lalande 14551) is a naked-eye star; ARGELANDER and HEIS 6 m, and placed in *Monoceros*. This star is variable 6.1 to 6.8 in about 14 days; discovered by ESPIN in 1883 (*Mon. Not.* XLIII, 432) (*Observatory* XI, 192).

[β (VI)...β (2062,3141)...β<sup>r</sup>...β (*Am. Jour. Sci.* April 1875)...β (*Pub. L. O.* II)...Δ (II)...Sp (II, II app.)...Cin<sup>5</sup>...Tarrant (2899)...Madler (*Fixstern-Systeme* II)...Herschel (*Mem. R. A. S.* III, IX)...*Radcliffe Obsns.* xxiii...]

**β 1194. 65 Geminorum**

R.A. 7<sup>h</sup> 22<sup>m</sup> 21<sup>s</sup> }  
Decl. + 28° 10' }

|         |       |       |             |                |   |
|---------|-------|-------|-------------|----------------|---|
| 1890.88 | 289.5 | 13.91 | 5.5... 14.0 | 3 <sup>n</sup> | β |
| 1898.90 | 288.2 | 13.33 | 5.0... 14.2 | 3 <sup>n</sup> | A |
| 1899.02 | 288.8 | 13.23 | ... 13.5    | 1 <sup>n</sup> | β |

Discovered with the 36-inch. The proper motion, from AUWERS, is  $0^{\circ}.034$  in the direction of  $238^{\circ}.3$ .

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

$\beta$  22. W<sup>2</sup> VII. 689

R.A.  $7^{\text{h}} 25^{\text{m}} 30^{\text{s}}$  }  
Decl.  $+ 33^{\circ} 7'$  }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1875.32 | 149.5 | 6.48 | 8.0...11.0 | 4n | $\Delta$ |
| 1880.68 | 151.7 | 6.14 | 8.2...10.4 | 4n | $\beta$  |
| 1890.91 | 150.4 | 6.42 | 8.3...10.0 | 3n | $\beta$  |

Discovered with the 6-inch. Fixed.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  579. W<sup>2</sup> VII. 726

R.A.  $7^{\text{h}} 26^{\text{m}} 40^{\text{s}}$  }  
Decl.  $+ 33^{\circ} 23'$  }

A and B

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1878.24 | 219.1 | 0.84 | 7.2...11.5 | 1n | $\beta$    |
| 1886.31 | 219.6 | 1.07 | ...        | 1n | H $\Sigma$ |
| 1890.90 | 213.9 | 0.90 | 7.9...10.0 | 3n | $\beta$    |
| 1898.11 | 214.2 | 1.12 | ...        | 1n | D          |
| 1898.24 | 230.0 | 1.07 | ...        | 1n | L          |

A and C (= O $\Sigma$  173 *rej.*)

|         |       |       |         |    |            |
|---------|-------|-------|---------|----|------------|
| 1843.27 | 234.1 | 18.86 | ...     | 1n | Ma         |
| 1869.76 | 233.6 | 18.23 | ...12.0 | 1n | $\Delta$   |
| 1880.15 | 234.0 | 18.94 | ...10.9 | 2n | $\beta$    |
| 1886.31 | 233.0 | 19.11 | ...     | 1n | H $\Sigma$ |
| 1898.11 | 233.1 | 18.52 | ...     | 2n | D          |
| 1898.24 | 231.3 | 16.72 | ...     | 1n | L          |
| 1899.08 | 234.6 | 18.94 | ...11.5 | 1n | $\beta$    |

A and D

|         |       |       |         |    |            |
|---------|-------|-------|---------|----|------------|
| 1867.90 | 347.3 | 43.09 | ... 9.0 | 3n | $\Delta$   |
| 1880.15 | 349.7 | 43.06 | ... 8.5 | 1n | $\beta$    |
| 1886.31 | 347.7 | 43.41 | ...     | 1n | H $\Sigma$ |
| 1898.11 | 347.7 | 43.44 | ...     | 2n | D          |
| 1899.08 | 348.7 | 43.80 | ...10.0 | 1n | $\beta$    |

The duplicity of the principal star of O $\Sigma$  173 *rej.* was suspected with the 6-inch in 1875, and verified subsequently with the 18½-inch. The O $\Sigma$  pair was rejected in the second edition of the *Poulkova*

*Catalogue* by reason of the distance of the companions. All the measures of these stars are given.

[ $\beta$  (x)... $\beta^1$ ... $\beta^2$ ... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1, p. 157) ...Doolittle (*Pub. Flower Obs.* I)...Lewis (*Mon. Not.* LIX, 400)...Madler (*Dorpat Obs.* XI)...]

$\beta$  200. 70 *Geminorum*

R.A.  $7^{\text{h}} 30^{\text{m}} 40^{\text{s}}$  }  
Decl.  $+ 35^{\circ} 19'$  }

C and D

|         |       |      |             |    |          |
|---------|-------|------|-------------|----|----------|
| 1876.02 | 241.8 | 1.49 | 10.0...11.0 | 2n | $\Delta$ |
| 1880.11 | 241.8 | 1.42 | 9.0...10.0  | 3n | $\beta$  |
| 1892.06 | 242.2 | 1.74 | 9.3...10.1  | 3n | $\beta$  |
| 1898.96 | 244.2 | 1.82 | 9.5...11.5  | 1n | $\beta$  |

C and E

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1880.09 | 206.6 | 17.20 | ...13.0 | 1n | $\beta$ |
| 1892.10 | 203.3 | 17.48 | ...13.5 | 2n | $\beta$ |
| 1898.96 | 207.2 | 17.74 | ...13.0 | 1n | $\beta$ |

A and B (= H<sup>+</sup> VI. 70)

|         |       |       |         |    |          |
|---------|-------|-------|---------|----|----------|
| 1876.78 | 190.0 | 98.43 | ...11.0 | 1n | $\Delta$ |
| 1892.04 | 190.0 | 98.94 | ...10.2 | 2n | $\beta$  |
| 1898.79 | 190.6 | 99.23 | ...10.5 | 2n | $\beta$  |

A and C

|         |       |        |         |    |          |
|---------|-------|--------|---------|----|----------|
| 1876.02 | 98.7  | 162.02 | 5.0...  | 2n | $\Delta$ |
| 1880.15 | 100.7 | 160.47 | ...     | 2n | $\beta$  |
| 1892.04 | 98.5  | 161.46 | ...     | 2n | $\beta$  |
| 1898.79 | 98.8  | 160.66 | ... 9.7 | 2n | $\beta$  |

The distant stars, B and C, were noted by H<sup>+</sup>, and given without measures. The duplicity of C was discovered with the 6-inch. The above are all the measures of the several companions. AUWERS gives the proper motion of A  $0^{\circ}.029$  in the direction of  $35^{\circ}.5$ .

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* XXXIV, 382)... $\beta^1$ ... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...]

$\beta$  201. Lalande 14945

R.A.  $7^{\text{h}} 33^{\text{m}} 42^{\text{s}}$  }  
Decl.  $- 20^{\circ} 0'$  }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1876.41 | 330.6 | 2.89 | 8.0... 8.5 | 3n | $\Delta$ |
| 1878.05 | 329.0 | 2.82 | 7.4... 8.0 | 2n | Cin      |
| 1880.16 | 330.8 | 2.79 | 7.0... 8.0 | 1n | Cin      |

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1883.14 | 330.7 | 3.21 | 8.0... 8.3 | 2n | W   |
| 1886.20 | 331.0 | 2.80 | 7.0... 8.0 | 1n | LM  |
| 1889.02 | 331.1 | 2.84 | 7.8... 8.1 | 3n | Lv  |
| 1898.10 | 332.9 | 2.78 | 7 ... 8    | 2n | Sc  |
| 1898.16 | 332.6 | 3.46 | ...        | 1n | See |

Discovered with the 6-inch. Evidently fixed.

[ $\beta$  (iv)... $\beta$  (*Mon. Not.* xxxiv, 382)...*A* (i)...*Cin*<sup>5</sup>...*Cin*<sup>6</sup>  
...*Wilson* (*Cin*<sup>10</sup>)...*LM*...*Lv*<sup>1</sup>...*Scott* (*Mon. Not.* lix, 427)...*See* ( )...]

$\beta$  1061.  $\kappa$  *Argus*

R.A. 7<sup>h</sup> 33<sup>m</sup> 54<sup>s</sup> }  
Decl. - 26° 32' }

B and C

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1889.12 | 229.3 | 6.46 | ... 13.8    | 3n | $\beta$ |
| 1898.27 | 228.6 | 6.25 | ...         | 1n | See     |
| 1898.27 | 228.0 | 6.87 | .4 ... 14.5 | 2n | A       |

A and B (= H<sup>+</sup> III. 27)

|         |       |       |            |    |                |
|---------|-------|-------|------------|----|----------------|
| 1826.5  | 315.8 | 8.76  | 6½... 6½   |    | Dunlop         |
| 1836.67 | 317.8 | 10.41 | 5 ... 5    | 3n | H <sup>2</sup> |
| 1878.20 | 318.4 | 9.96  | 5.0... 5.0 | 1n | <i>Cin</i>     |
| 1882.10 | 318.2 | 10.13 | 4.3... 4.7 | 2n | <i>Wilson</i>  |
| 1889.12 | 318.5 | 9.98  | 4.1... 4.1 | 3n | $\beta$        |
| 1898.27 | 318.1 | 9.72  | 4+... 4+   | 2n | A              |

The minute star was discovered with the 36-inch. The bright star has no sensible proper motion.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...*See* ( )...*Aitken* ( )...]

The bright stars which make H<sup>+</sup> III.27 appear to be relatively fixed. Some of the measures are given. All will be found in the following:

[*Dunlop* (*Mem. R. A. S.* III)...*Herschel* (*Cape Obsns.*)...*Powell* (*Mem. R. A. S.* xxv)...*Jacob* (*Mem. R. A. S.* xvii)...*Worster and Jacob* (*Madras Obsns.* 2d Series)...*Secchi* (*Catalogo di 1321 Stelle Doppie*) (*Atti dell' Accad. Pont. de Nuovi Lincei*, Anno VII)...*Radcliffe Obsns.* xxiii...*Cin*<sup>5</sup>...*Wilson* (*Cin*<sup>10</sup>)...]

$\beta$  580.  $\beta$  *Geminorum* (*Pollux*)

R.A. 7<sup>h</sup> 37<sup>m</sup> 58<sup>s</sup> }  
Decl. + 28° 19' }

C and D

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1878.10 | 128.0 | 1.40 | 10 ... 12.5 | 2n | $\beta$ |
| 1889.14 | 130.9 | 1.14 | 9.5... 12.5 | 1n | $\beta$ |

|         |       |      |              |    |         |
|---------|-------|------|--------------|----|---------|
| 1892.14 | 130.6 | 1.14 | 10 ... 11.8  | 3n | $\beta$ |
| 1898.89 | 131.2 | 1.27 | 10.0... 13.0 | 1n | A       |
| 1899.02 | 140.7 | 1.02 | 9.7... 11.5  | 1n | $\beta$ |

A and B

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1880.22 | 275.3 | 41.39 | 2 ... 13.5 | 1n | $\beta$ |
| 1892.14 | 277.9 | 34.10 | ... 14.3   | 3n | $\beta$ |
| 1898.88 | 280.0 | 30.22 | ... 15.0   | 2n | A       |
| 1898.96 | 278.1 | 30.88 | ... 15.0   | 1n | $\beta$ |

A and C (= H<sup>+</sup> VI. 42 = S 559)

|         |      |        |          |    |                |
|---------|------|--------|----------|----|----------------|
| 1781.90 | 65.5 | 116.75 | ...      | 1n | H <sup>+</sup> |
| 1825.10 | 66.4 | 132.3± | ... 20   | 2n | S              |
| 1878.73 | 71.0 | 174.61 | ...      | 2n | $\beta$        |
| 1884.27 | 71.1 | 176.98 | ... 11.2 | 1n | H $\Sigma$     |
| 1898.81 | 71.7 | 187.57 | ... 10.7 | 1n | $\beta$        |
| 1898.87 | 71.8 | 187.72 | ... 10.0 | 1n | A              |

A and E

|         |      |        |          |    |         |
|---------|------|--------|----------|----|---------|
| 1877.08 | 90.4 | 205.5  | ... 12.5 | 1n | Flm     |
| 1879.24 | 90.0 | 206.30 | ... 9.5  | 1n | $\beta$ |
| 1898.81 | 90.0 | 218.54 | ... 11.0 | 1n | $\beta$ |
| 1898.87 | 90.0 | 219.10 | ... 10.0 | 1n | A       |

A and F (=  $\Sigma$  5 App. II)

|         |      |        |             |    |                |
|---------|------|--------|-------------|----|----------------|
| 1781.90 | 74.1 | 160.70 | ...         | 1n | H <sup>+</sup> |
| 1825.10 | 72.7 | 198.47 | ... 15      | 2n | S              |
| 1836.26 | 73.9 | 203.84 | 2.0... 11.0 | 3n | $\Sigma$       |
| 1850.71 | 74.4 | 213.28 | ... 10.5    | 2n | O $\Sigma$     |
| 1867.52 | 75.1 | 223.41 | ... 10.5    | 4n | J              |
| 1879.24 | 75.3 | 229.24 | ... 11.0    | 1n | $\beta$        |
| 1884.21 | 75.6 | 233.15 | ...         | 2n | H $\Sigma$     |
| 1898.81 | 76.3 | 242.87 | ... 10.5    | 1n | $\beta$        |
| 1898.87 | 75.8 | 242.57 | ... 10.0    | 1n | A              |

C and F

|         |      |       |     |    |            |
|---------|------|-------|-----|----|------------|
| 1851.88 | 89.8 | 57.40 | ... | 3n | O $\Sigma$ |
| 1884.16 | 89.5 | 57.98 | ... | 1n | H $\Sigma$ |
| 1898.96 | 89.4 | 58.01 | ... | 1n | $\beta$    |

C and E

|         |       |       |     |    |         |
|---------|-------|-------|-----|----|---------|
| 1898.96 | 145.2 | 71.12 | ... | 1n | $\beta$ |
|---------|-------|-------|-----|----|---------|

The duplicity of *Herschel's* distant companion to *Pollux* was discovered with the 18½-inch. The nearest star, B, was found with the same instrument. The measures show no sensible motion in CD.  $\beta$

*Geminorum* has a proper motion of  $0.637$  in the direction of  $266^\circ$  (AUWERS). The change in the position of the faint star, B, is due to this movement of A. With this proper motion and the measures of 1892, the minimum distance of  $7''.0$  will occur about 1945. It will then be a very difficult object, and beyond the reach of most telescopes. It is not easily seen now with any aperture.

The change in the distant stars, C, E, and F, corresponds to the proper motion of A.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2930,3141)... $\beta$  (*Pub. L. O. II*)... Aitken ( )...]

The following, in addition to the catalogues of H<sup>2</sup>, South and  $\Sigma$ , relate to the distant stars:

[ $\Delta$  (II)...Flammarion (*Etoiles Doubles et Multiples*)...O $\Sigma$  (*Poulkova Obsns. x, p. 77*)...]

### $\beta$ 1062. 82 *Geminorum*

R.A.  $7^h 41^m 23^s$  }  
Decl.  $+ 23^\circ 26'$  }

|         |        |        |                  |       |         |
|---------|--------|--------|------------------|-------|---------|
| 1889.10 | $32.3$ | $4.06$ | $6.0 \dots 13.5$ | $3^m$ | $\beta$ |
| 1898.96 | $35.8$ | $3.82$ | $\dots 13.5$     | $1^m$ | $\beta$ |

Discovered with the 36-inch. The principal star (*Berlin A.G. Catalogue*) has a proper motion of  $0.030$  in the direction of  $299^\circ.8$ . The interval is too short to show whether the companion has the same movement.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...]

### $\beta$ 1063. $\xi$ *Argus*

R.A.  $7^h 44^m 15^s$  }  
Decl.  $- 24^\circ 34'$  }

|         |         |        |                  |       |         |
|---------|---------|--------|------------------|-------|---------|
| 1889.12 | $188.7$ | $4.63$ | $4.0 \dots 13.8$ | $3^m$ | $\beta$ |
| 1898.24 | $223.8$ | $4.87$ | $\dots$          | $2^m$ | See     |
| 1898.27 | $189.8$ | $4.92$ | $4.2 \dots 14.0$ | $2^m$ | A       |

Discovered with the 36-inch. The principal star has a small proper motion,  $0.029$  in the direction of  $326^\circ.3$  (AUWERS). So far there is no change in the companion.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...See ( )...Aitken ( )...]

### $\beta$ 1195. Lalande 15331

R.A.  $7^h 45^m 35^s$  }  
Decl.  $- 9^\circ 6'$  }

|         |        |        |                 |       |         |
|---------|--------|--------|-----------------|-------|---------|
| 1891.00 | $81.4$ | $0.46$ | $7.3 \dots 7.6$ | $3^m$ | $\beta$ |
| 1898.06 | $81.6$ | $0.46$ | $7.7 \dots 7.7$ | $2^m$ | A       |

Discovered with the 36-inch.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

### $\beta$ 101. 9 *Argus*

R.A.  $7^h 46^m 13^s$  }  
Decl.  $- 13^\circ 35'$  }

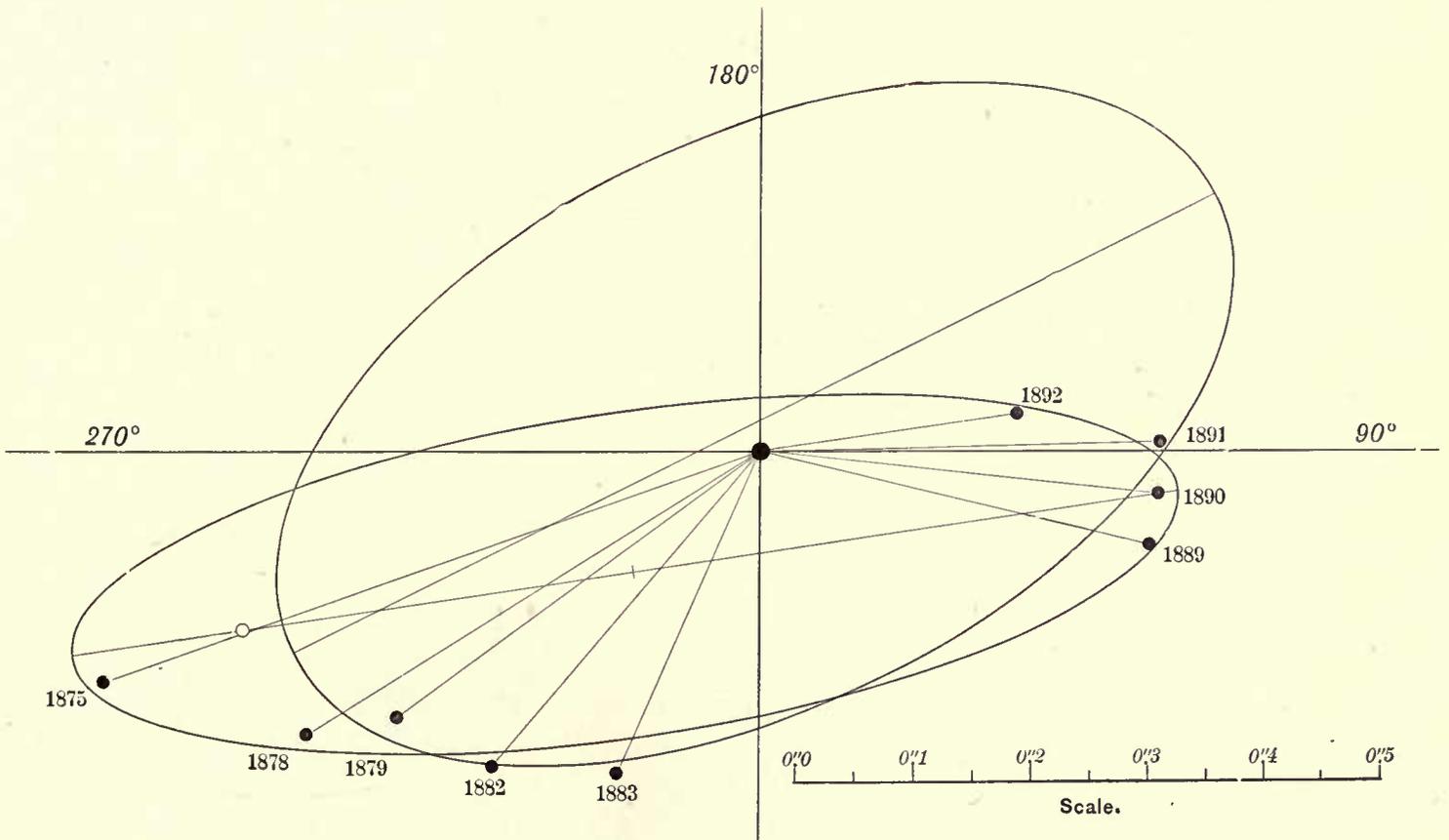
|         |         |           |                 |       |          |
|---------|---------|-----------|-----------------|-------|----------|
| 1875.24 | $289.7$ | $0.58$    | $5.6 \dots 6.7$ | $2^m$ | $\Delta$ |
| 1878.47 | $302.6$ | $0.45$    | $5.5 \dots 6.7$ | $4^m$ | Cin      |
| 1878.52 | $301.8$ | $0.46$    | $5.2 \dots 6.5$ | $2^m$ | $\beta$  |
| 1879.68 | $306.2$ | $0.38$    | $5.0 \dots 7.0$ | $2^m$ | H1       |
| 1882.21 | $319.7$ | $0.35$    | $6.0 \dots 7.0$ | $4^m$ | Sp       |
| 1883.11 | $336.2$ | $0.3 \pm$ | $\dots$         | $1^m$ | $\beta$  |
| 1888.26 | $356.1$ | $0.29$    | $\dots$         | $5^m$ | Sp       |
| 1889.08 | $76.4$  | $0.34$    | $5.7 \dots 6.3$ | $4^m$ | $\beta$  |
| 1890.19 | $83.0$  | $0.4 \pm$ | $\dots$         | $2^m$ | Sp       |
| 1890.26 | $84.6$  | $0.31$    | $\dots$         | $4^m$ | $\beta$  |
| 1890.96 | $88.3$  | $0.36$    | $5.8 \dots 6.3$ | $3^m$ | $\beta$  |
| 1891.15 | $94.7$  | $0.3 \pm$ | $\dots$         | $1^m$ | Sp       |
| 1892.05 | $98.7$  | $0.22$    | $\dots$         | $3^m$ | $\beta$  |
| 1892.26 | $165.2$ | $0.25$    | $\dots$         | $2^m$ | Sp       |
| 1893.24 | $158.0$ | $0.23$    | $\dots$         | $8^m$ | Sp       |
| 1894.06 | $282.0$ | $0.43$    | $\dots$         | $6^m$ | Bar      |
| 1894.24 | $286.6$ | $0.35$    | $\dots$         | $2^m$ | Com      |
| 1894.25 | $280.2$ | $0.44$    | $\dots$         | $6^m$ | Sp       |
| 1894.84 | $287.2$ | $0.63$    | $\dots$         | $4^m$ | Bar      |
| 1895.21 | $285.2$ | $0.42$    | $\dots$         | $2^m$ | Com      |
| 1895.22 | $285.4$ | $0.58$    | $\dots$         | $5^m$ | Bar      |
| 1895.24 | $282.4$ | $0.51$    | $\dots$         | $5^m$ | Sp       |
| 1895.30 | $283.8$ | $0.58$    | $\dots$         | $3^m$ | See      |
| 1896.21 | $288.1$ | $0.53$    | $\dots$         | $1^m$ | Sp       |
| 1896.24 | $287.0$ | $0.49$    | $\dots$         | $3^m$ | Com      |
| 1896.86 | $292.1$ | $0.54$    | $\dots$         | $3^m$ | Ait      |
| 1897.38 | $290.4$ | $0.69$    | $5.7 \dots 6.3$ | $4^m$ | Doo      |
| 1897.81 | $288.8$ | $0.64$    | $\dots$         | $1^m$ | $\beta$  |
| 1897.85 | $292.7$ | $0.62$    | $\dots$         | $3^m$ | Ait      |
| 1897.95 | $292.9$ | $0.61$    | $\dots$         | $3^m$ | Hussey   |
| 1898.13 | $294.3$ | $0.67$    | $\dots$         | $2^m$ | Hussey   |
| 1898.18 | $292.5$ | $0.62$    | $\dots$         | $2^m$ | Brown    |
| 1898.23 | $292.3$ | $0.63$    | $\dots$         | $2^m$ | Doo      |
| 1898.28 | $289.4$ | $0.61$    | $6.5 \dots 6.5$ | $3^m$ | Ait      |
| 1899.19 | $293.0$ | $0.60$    | $\dots$         | $2^m$ | Ait      |

Discovered with the 6-inch. One of the most interesting of the rapid binaries from its short period, and the proper motion of the system.

Four orbits have been found for this pair, using the measures to the dates given :

|      |           |             |                           |
|------|-----------|-------------|---------------------------|
| 1892 | Glasenapp | 40.54 years | <i>Mon. Not.</i> LII. 546 |
| 1892 | Burnham   | 23.3 years  | <i>Pub. L.O.</i> II. 239  |
| 1892 | Glasenapp | 23.33 years | <i>Mon. Not.</i> LIV. 318 |
| 1895 | See       | 22.00 years | <i>A. N.</i> 3297         |

be substantially correct by the measures of BARNARD in 1894 (*Ast. and A.-P.* XIII. 290) and subsequent observations. GLASENAPP'S second orbit is from this apparent ellipse, and of course gives the same elements. So far this ellipse appears to satisfy the observations as well as could be desired, and any improvement in the period and other elements can only come when a considerable portion of the second revolution has taken place, particularly on the following side where the angular



9 Argus.  $\beta$  101.

The first three are based upon the same measures, but GLASENAPP allowed an error much too great in the distance given in my measures in 1892. I called attention to this (*Astronomy and Astro-Physics*, XII. 494), and gave another orbit, which satisfied this as well as the prior measures, and predicted a change in the position-angle of more than  $180^\circ$  in the two years following the measures of 1892, thus completing nearly one entire revolution since the first measures. This orbit was shown to

change is rapid. These orbits are shown in the accompanying diagram, reproduced from *Publications of the Lick Observatory*, Vol. II :

This system has a considerable proper motion :

|        |   |   |   |   |       |    |       |
|--------|---|---|---|---|-------|----|-------|
| Auwers | - | - | - | " | 0.351 | in | 195.4 |
| Porter | - | - | - | " | 0.343 | in | 193.5 |

It was evident at the beginning, before it was measured at all, that this was a binary, as otherwise

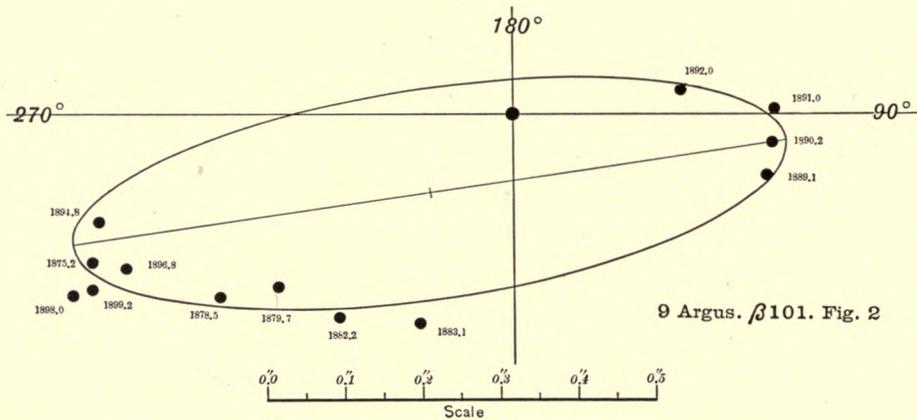
the proper motion of one star in two or three years would make it a very easy pair, and one which could not have been overlooked by prior observers.

In Fig. 2 the same ellipse, which is given in the previous diagram, is shown, with the addition of some of the recent positions. It will be seen that so far the orbit I found in 1892 satisfactorily represents the recent measures.

$\beta$  23. D.M. ( $3^\circ$ ) 1876

R.A.  $7^h 56^m 14^s$  }  
Decl.  $+ 3^\circ 26'$  }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1875.54 | 177.0 | 2.81 | 8.2...12.0 | 2n | $\Delta$ |
| 1891.97 | 181.9 | 2.62 | 8.0...10.8 | 3n | $\beta$  |
| 1898.12 | 178.0 | 2.48 | 8.0...11.5 | 2n | A        |



$\theta$  Argus.  $\beta$  101. Fig. 2

[ $\beta$  (II)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^2$ ... $\beta^3$  (2930,2979, 3048,3114)... $\beta$  (*Ast. & A.-P.* xii, 494; xiii, 290)... $\Delta$  (II)...HI (I)...HI (*Wash. Obsns.* 1879, 1880)...Cin<sup>5</sup>... Sp (II, II app., III)...Glaserapp (*Mon. Not.* lII, 546; lIV, 318)...Gore (*Mon. Not.* XLVII, 61)...Everett (*Mon. Not.* lVI, 464)...Comstock (*Ast. & A.-P.* xiii, 518) (*Pub. Washburn Obsy.* x)...See (*Evolution of the Stellar Systems* i) (*A. J.* 349, 378)...See (3297,3314)...Aitken (3465) (*A. J.* 429)...Hussey (*A. J.* 427)...Doolittle (*A. J.* 416)...Aitken ( )...Hussey ( )...Doolittle (*Pub. Flower Obsy.* i)...Barnard (*A. J.* 447)...Brown ( )...]

Discovered with the 6-inch. Probably unchanged. A faint pair in the field  $n p$ .

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Aitken ( )...]

$\beta$  902. Lalande 15575

R.A.  $7^h 52^m 22^s$  }  
Decl.  $- 10^\circ 34'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1879.18 | 247.1 | 1.33 | 8.0...11.0 | 1n | $\beta$ |
| 1879.27 | 244.3 | 1.18 | 8.0...11.0 | 1n | Cin     |
| 1892.20 | 243.7 | 1.17 | 8.0...11.3 | 3n | Lv      |

Discovered with the  $18\frac{1}{2}$ -inch. Further measures are needed.

[ $\beta$  (XIII)... $\beta^3$ ...Cin<sup>5</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.*, 1892)...]

$\beta$  333. Argus 269

R.A.  $7^h 56^m 7^s$  }  
Decl.  $- 22^\circ 0'$  }

A and B

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1877.19 | 43.1 | 2.03 | 7.0... 9.5 | 1n | Cin |
| 1879.09 | 45.4 | 1.44 | 7.0...10.2 | 4n | Cin |
| 1885.66 | 43.6 | 1.70 | 7.7...10.0 | 1n | W   |
| 1893.22 | 39.4 | 1.45 | 7 ... 9    | 2n | Sel |
| 1897.83 | 45.8 | 2.02 | 7 ... 8.8  | 1n | See |
| 1898.23 | 36.7 | 1.62 | 7 ... 10   | 1n | D   |

A and C

|         |      |       |            |    |   |
|---------|------|-------|------------|----|---|
| 1885.66 | 73.5 | 42.15 | 7.7... 7.7 | 2n | W |
| 1898.23 | 72.3 | 42.39 | ...        | 2n | D |

Discovered with the 6-inch. Apparently without change. Lalande 15720. C is Lalande 15721. The magnitudes are discordant; L  $8\frac{1}{2}$ ; S.D. 8.4; Cin.Z. 7.7.

[ $\beta$  (VI)... $\beta$  (2062)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...Sellors (3240)...See (3495)...Doolittle (*Pub. Flower Obsy.* i)...]

**β 202.** O. Arg. S. 7850

R.A. 7<sup>h</sup> 56<sup>m</sup> 59<sup>s</sup> }  
Decl. — 26° 53' }

A and B

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1876.09 | 164.8 | 8.18 | 7.5... 9.0  | 1 <sup>n</sup> | β   |
| 1878.16 | 160.4 | 7.74 | 7.0... 9.7  | 2 <sup>n</sup> | Cin |
| 1883.11 | 164.4 | ...  | 7.5... 10.0 | 1 <sup>n</sup> | W   |
| 1892.10 | 160.7 | 7.77 | 7.2... 10.0 | 3 <sup>n</sup> | β   |
| 1892.19 | 160.3 | 7.62 | 7.3... 10.4 | 3 <sup>n</sup> | Lv  |
| 1897.85 | 160.8 | 7.39 | 6 ... 11.5  | 1 <sup>n</sup> | See |
| 1899.09 | 161.2 | 7.60 | 8.0... 11.0 | 1 <sup>n</sup> | β   |

A and C

|         |      |       |          |                |     |
|---------|------|-------|----------|----------------|-----|
| 1897.85 | 77.1 | 19.37 | ... 13.6 | 1 <sup>n</sup> | See |
|---------|------|-------|----------|----------------|-----|

A and D

|         |       |       |        |                |     |
|---------|-------|-------|--------|----------------|-----|
| 1897.85 | 239.2 | 29.43 | ... 12 | 1 <sup>n</sup> | See |
|---------|-------|-------|--------|----------------|-----|

Discovered with the 6-inch. Probably fixed.

[β (iv)...β (*Mon. Not.* xxxiv, 382)...β (3114)...β (*Pub. L.* O. 11)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson(Cin<sup>10</sup>)...Lv(*Proc. Haverford Coll. Obsy.*, 1892)(*A. J.* 278)...See (3495)...]

**β 203.** O. Arg. S. 7874

R.A. 7<sup>h</sup> 57<sup>m</sup> 41<sup>s</sup> }  
Decl. — 27° 13' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.11 | 242.5 | 7.15 | 7.7... 8.5 | 7 <sup>n</sup> | Cin |
| 1879.09 | 243.8 | 6.94 | 7.0... 8.5 | 1 <sup>n</sup> | Cin |
| 1883.11 | 245.2 | 7.15 | 7.0... 9.0 | 1 <sup>n</sup> | W   |
| 1898.14 | 242.2 | 7.41 | ...        | 1 <sup>n</sup> | See |

Discovered with the 6-inch. No sensible change. A 9 m star 64" distant in 73° 7.

[β (iv)...β (*Mon. Not.* xxxiv, 382)...Cin<sup>3</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...See ( )...]

**β 581.** Lalande 15743

R.A. 7<sup>h</sup> 57<sup>m</sup> 43<sup>s</sup> }  
Decl. + 12° 38' }

A and B

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1878.15 | 176.9 | 0.40 | 8.0... 8.0 | 2 <sup>n</sup> | β |
| 1878.22 | 180.3 | 0.40 | 8.7... 8.7 | 1 <sup>n</sup> | Δ |

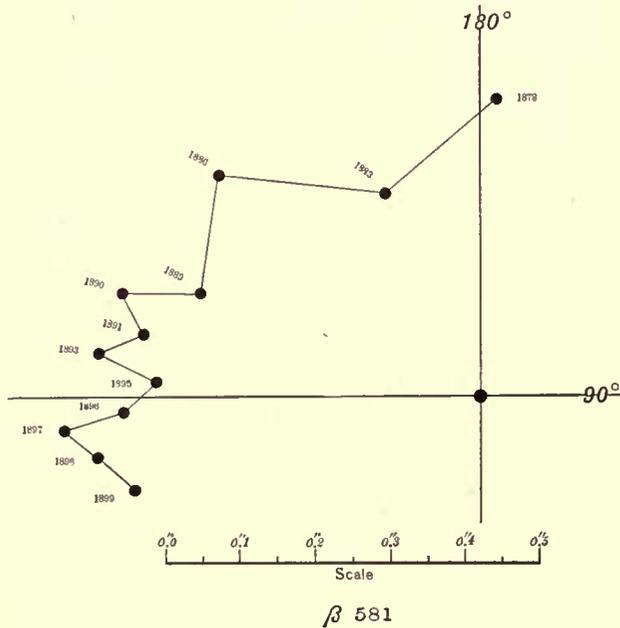
|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1883.37 | 205.2 | 0.30 | ...        | 5 <sup>n</sup> | En  |
| 1886.26 | 229.6 | 0.46 | ...        | 2 <sup>n</sup> | HΣ  |
| 1889.23 | 249.8 | 0.4± | ...        | 4 <sup>n</sup> | Sp  |
| 1890.21 | 253.7 | 0.5± | ...        | 4 <sup>n</sup> | Sp  |
| 1891.97 | 259.4 | 0.46 | 8.5... 8.6 | 4 <sup>n</sup> | β   |
| 1893.24 | 263.2 | 0.51 | ...        | 9 <sup>n</sup> | Sp  |
| 1893.31 | 273.1 | 0.84 | ...        | 1 <sup>n</sup> | Lew |
| 1893.93 | 266.0 | 0.55 | ...        | 1 <sup>n</sup> | Bar |
| 1894.17 | 262.3 | 0.50 | ...        | 4 <sup>n</sup> | HΣ  |
| 1894.27 | 266.8 | 0.47 | ...        | 4 <sup>n</sup> | Sp  |
| 1895.22 | 267.9 | 0.43 | ...        | 3 <sup>n</sup> | Sp  |
| 1895.24 | 266.8 | 0.50 | ...        | 1 <sup>n</sup> | HΣ  |
| 1895.28 | 278.3 | 0.45 | ...        | 1 <sup>n</sup> | Lew |
| 1895.28 | 271.9 | 0.34 | ...        | 3 <sup>n</sup> | Com |
| 1896.18 | 272.8 | 0.59 | ...        | 3 <sup>n</sup> | Lew |
| 1896.24 | 272.9 | 0.37 | ...        | 3 <sup>n</sup> | Com |
| 1896.94 | 274.9 | 0.56 | ...        | 3 <sup>n</sup> | A   |
| 1897.81 | 275.5 | 0.56 | ...        | 1 <sup>n</sup> | β   |
| 1898.16 | 271.0 | 0.35 | ...        | 1 <sup>n</sup> | Bow |
| 1898.18 | 282.0 | 0.59 | ...        | 3 <sup>n</sup> | Br  |
| 1898.25 | 281.4 | 0.49 | ...        | 1 <sup>n</sup> | Lew |
| 1898.27 | 278.0 | 0.45 | ...        | 1 <sup>n</sup> | Sp  |
| 1899.16 | 285.1 | 0.48 | 8.0... 8.0 | 2 <sup>n</sup> | A   |

AB and C

|         |       |      |          |                |     |
|---------|-------|------|----------|----------------|-----|
| 1878.13 | 185.3 | 4.76 | ... 10.5 | 3 <sup>n</sup> | β   |
| 1878.22 | 184.3 | 4.76 | ... 11.0 | 1 <sup>n</sup> | Δ   |
| 1886.25 | 189.5 | 4.36 | ...      | 1 <sup>n</sup> | HΣ  |
| 1891.97 | 192.7 | 4.60 | ... 11.5 | 4 <sup>n</sup> | β   |
| 1892.13 | 190.5 | ...  | ... 11.0 | 1 <sup>n</sup> | Col |
| 1894.17 | 191.6 | 4.58 | ...      | 4 <sup>n</sup> | HΣ  |
| 1895.24 | 192.3 | 4.60 | ...      | 1 <sup>n</sup> | HΣ  |
| 1895.28 | 199.3 | 4.82 | ...      | 1 <sup>n</sup> | Lew |
| 1896.18 | 197.0 | 5.13 | ...      | 3 <sup>n</sup> | Lew |
| 1896.94 | 196.7 | 4.42 | ... 11+  | 2 <sup>n</sup> | A   |
| 1897.81 | 193.3 | 4.50 | ...      | 1 <sup>n</sup> | β   |
| 1898.18 | 195.9 | 4.55 | ...      | 1 <sup>n</sup> | Br  |
| 1898.25 | 201.7 | 4.89 | ...      | 1 <sup>n</sup> | Lew |
| 1899.02 | 192.5 | 4.83 | ...      | 1 <sup>n</sup> | β   |
| 1899.16 | 194.1 | 4.73 | ... 11.0 | 2 <sup>n</sup> | A   |

This most interesting triple system was discovered with the 18½-inch. The close pair is in rapid direct angular motion, with no sensible change in the distance. The third star, C, is also moving in the same direction more slowly. This system bears a close resemblance, in all respects, to ζ *Cancri*, except as to the magnitudes of the com-

ponents. The principal positions of the close pair are shown in the following diagram :



The proper motion of this star, if any, is not large. PORTER finds, from an examination of the meridian observations, that an annual proper motion of  $0''.12$  in the direction of  $180^\circ$  would best represent them, but from the lack of observations this value is not certain. Whatever the movement may be, it is evidently common to the three components.

[ $\beta$  (x)... $\beta^x$ ... $\beta$  (*Mon. Not.* LII, 438)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Engelmann (2678)...Sp (III)...Collins (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Comstock (*Pub. Washburn Obsy.* x)...Lewis (*Mon. Not.* LIV, 315; LVI, 359; LIX, 400) (*Greenwich Obsns.* 1895)...Aitken (3465)...Lewis ( )...Barnard (*A. J.* 447)...Brown ( )...H $\Sigma$  ( )...Aitken ( )...]

$\beta$  582. D.M. ( $12^\circ$ ) 1760

R.A.  $7^h 58^m 6^s$  }  
Decl.  $+ 12^\circ 25'$  }

B and C

|         |      |      |         |    |         |
|---------|------|------|---------|----|---------|
| 1878.09 | 59.8 | 3.76 | ...12   | 2n | $\beta$ |
| 1879.28 | 59.1 | 3.60 | ...11   | 1n | Cin     |
| 1891.99 | 57.6 | 3.93 | ...11.5 | 3n | $\beta$ |
| 1896.14 | 58.0 | 4.39 | ...     | 1n | Lew     |
| 1899.02 | 55.1 | 3.59 | ...12.0 | 1n | $\beta$ |

A and B (=  $\Sigma$  1179)

|         |       |       |        |     |    |          |
|---------|-------|-------|--------|-----|----|----------|
| 1829.73 | 205.2 | 17.91 | 8.5... | 8.5 | 2n | $\Sigma$ |
| 1847.20 | 204.3 | 18.38 | ...    | ... | 1n | Ma       |
| 1863.13 | 205.0 | 20.71 | ...    | ... | 1n | En       |
| 1864.90 | 204.6 | 19.16 | 8.9... | 8.9 | 5n | J        |
| 1878.09 | 204.5 | 19.75 | ...    | ... | 2n | $\beta$  |
| 1879.28 | 204.8 | 19.86 | 8.0... | 8.0 | 1n | Cin      |
| 1880.18 | 203.5 | 19.52 | ...    | ... | 2n | Pt       |
| 1881.18 | 203.8 | 19.73 | ...    | ... | 1n | Big      |
| 1891.99 | 204.2 | 19.93 | 8.7... | 8.7 | 3n | $\beta$  |
| 1896.14 | 204.8 | 20.43 | ...    | ... | 1n | Lew      |
| 1899.02 | 203.9 | 20.26 | 8.3... | 8.3 | 1n | $\beta$  |

The small companion to B of  $\Sigma$  1179 was discovered with the  $18\frac{1}{2}$ -inch. The change in AB is due to proper motion, probably of the brighter component. This movement appears to be about  $0''.03$  in a direction nearly opposite B. All the measures of these stars are given above.

[ $\beta$  (x)... $\beta^x$ ... $\beta$  (3114)... $\beta$  (*Ast. & A.-P.* XIII, 17)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>...Lewis (*Mon. Not.* LIX, 400)...Madler (*Fixstern-Systeme* II)...Engelmann (*Mess. Neunzig Doppeltsternen*)...Bigourdan (*Paris Obsns.* 1883)...Pritchett (*Pub. Morrison Obsy.* 1)...]

$\beta$  903. Lalande 15768

R.A.  $7^h 58^m 9^s$  }  
Decl.  $- 1^\circ 31'$  }

|         |      |      |        |     |    |         |
|---------|------|------|--------|-----|----|---------|
| 1879.27 | 28.2 | 1.48 | 8.5... | 9.5 | 1n | Cin     |
| 1879.60 | 33.7 | 1.47 | 7.8... | 9.3 | 5n | $\beta$ |
| 1892.11 | 32.8 | 1.54 | 8.2... | 9.0 | 3n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. Unchanged.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>...]

$\beta$  334. Lalande 15933

R.A.  $8^h 2^m 3^s$  }  
Decl.  $- 21^\circ 42'$  }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1877.14 | 352.4 | 2.38 | 8.0... | 8.7 | 2n | Cin |
| 1880.18 | 354.2 | ...  | ...    | ... | 1n | Cin |
| 1894.23 | 352.3 | 2.55 | 8      | 9   | 1n | Sel |
| 1897.83 | 352.5 | 2.90 | 7.1... | 8.1 | 1n | See |

Discovered with the 6-inch. Apparently fixed.

[ $\beta$  (VI)... $\beta$  (2062)...Cin<sup>4</sup>...Cin<sup>6</sup>...Sellors (3303)...See (3496)...]

**β 583.** Lalande 15959

R.A. 8<sup>h</sup> 3<sup>m</sup> 18<sup>s</sup> }  
Decl. — 6° 21' }

|         |      |      |        |      |                |     |
|---------|------|------|--------|------|----------------|-----|
| 1878.10 | 68.5 | 1.82 | 8.5... | 8.7  | 1 <sup>n</sup> | β   |
| 1878.16 | 68.4 | 1.76 | 9.0... | 9.7  | 2 <sup>n</sup> | Cin |
| 1878.26 | 67.5 | 1.71 | 9.5... | 10.0 | 1 <sup>n</sup> | Δ   |
| 1892.11 | 69.5 | 1.70 | 8.9... | 9.1  | 3 <sup>n</sup> | β   |

Discovered with the 18½-inch. Without change.

[β (x)...β...β (3114)...β (Pub. L. O. II)...Δ (t)...Cin<sup>s</sup>...]

**β 1064.** 19 *Argus*

R.A. 8<sup>h</sup> 5<sup>m</sup> 39<sup>s</sup> }  
Decl. — 12° 34' }

A and B

|         |       |      |   |     |      |                |   |
|---------|-------|------|---|-----|------|----------------|---|
| 1889.08 | 244.9 | 1.84 | 6 | ... | 12.5 | 4 <sup>n</sup> | β |
| 1898.31 | 246.0 | 2.88 | 6 | ... | 12   | 1 <sup>n</sup> | A |
| 1899.26 | 244.2 | 2.31 | 6 | ... | 13.5 | 1 <sup>n</sup> | β |

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1898.29 | 298.6 | 33.20 | ... | 14.5 | 2 <sup>n</sup> | A |
|---------|-------|-------|-----|------|----------------|---|

A and D (= H<sup>+</sup> IV. 26 = Sh 91)

|         |       |       |     |     |     |                |    |
|---------|-------|-------|-----|-----|-----|----------------|----|
| 1826.65 | 256.0 | 70.17 | 4   | ... | 10  | 2 <sup>n</sup> | Sh |
| 1889.08 | 255.8 | 70.67 | 6   | ... | 9   | 3 <sup>n</sup> | β  |
| 1898.27 | 256.1 | 71.85 | 6   | ... | 9   | 1 <sup>n</sup> | A  |
| 1898.96 | 256.0 | 71.44 | ... | ... | ... | 1 <sup>n</sup> | β  |

The close star was discovered with the 36-inch. All the measures of the distant star, D, are given. The large star has a proper motion, according to AUWERS, of 0.050 in the direction of 295°.9. The faint star C was first noted by AITKEN. There is also a 11.5 m star, 277°.3 : 65.7.

[β (xv)...β (2929)...β (Pub. L. O. II)...Aitken ( )...]

**β 204.** Lalande 16074

R.A. 8<sup>h</sup> 7<sup>m</sup> 2<sup>s</sup> }  
Decl. + 10° 45' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1875.89 | 302.1 | 1.06 | 7.1... | 10.1 | 4 <sup>n</sup> | Δ  |
| 1877.25 | 305.0 | 0.95 | 7.0... | 9.5  | 1 <sup>n</sup> | OΣ |
| 1879.13 | 304.1 | 0.99 | 7.5... | 9.0  | 1 <sup>n</sup> | β  |
| 1886.21 | 298.4 | 1.40 | ...    | ...  | 1 <sup>n</sup> | HΣ |
| 1889.11 | 304.2 | 1.01 | 7.8... | 9.4  | 1 <sup>n</sup> | Lv |
| 1892.25 | 303.8 | 0.87 | ...    | ...  | 3 <sup>n</sup> | Sp |
| 1893.24 | 301.7 | 0.84 | ...    | ...  | 3 <sup>n</sup> | Sp |

Discovered with the 6-inch. There does not appear to be any motion.

[β (iv)...β (Mon. Not. xxxiv, 382)...β...OΣ (Poulkova Obsns. x)...Δ (i)...1.v<sup>1</sup>...Sp (III)...11Σ ( )...]

**β 1243.** B.A.C. 2759

R.A. 8<sup>h</sup> 7<sup>m</sup> 19<sup>s</sup> }  
Decl. + 18° 2' }

A and B

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1891.23 | 344.7 | 1.40 | 7.1... | 13  | 2 <sup>n</sup> | β   |
| 1894.15 | 343.2 | 1.38 | ...    | ... | 2 <sup>n</sup> | Bar |
| 1898.29 | 348.4 | 1.40 | ...    | ... | 1 <sup>n</sup> | β   |

A and C (= H<sup>+</sup> VI. 78)

|         |       |       |     |     |                |   |
|---------|-------|-------|-----|-----|----------------|---|
| 1898.31 | 301.7 | 64.60 | ... | 9.3 | 2 <sup>n</sup> | β |
|---------|-------|-------|-----|-----|----------------|---|

Discovered with the 36-inch. It is 2<sup>m</sup> f and 104" n of ζ *Cancrī*, and is the star which I suggested (*Mon. Not.* April 1891) would be suitable to compare with C of ζ *Cancrī* to determine whether the latter has any variable motion due to the presence of an invisible star. In measuring this difference of declination the very minute companion given above was detected. So far the measures show no certain change. The *Berlin A. G. Catalogue* gives the principal star a small proper motion, 0.033 in the direction of 334°.6.

The distant star C, making H<sup>+</sup> VI.78, was not measured by HERSCHEL, being merely noted as Class VI. All the measures of this star are given.

[β (xviii)...β (3113)...β (Pub. L. O. II, pp 66, 225)...Barnard (*A. J.* 447)...]

**β 1244.** D.M. (2°) 1904

R.A. 8<sup>h</sup> 7<sup>m</sup> 31<sup>s</sup> }  
Decl. + 2° 21' }

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1891.23 | 50.3 | 0.74 | 7.9... | 8.1 | 3 <sup>n</sup> | β   |
| 1892.88 | 51.1 | 0.70 | 8.0... | 8.0 | 1 <sup>n</sup> | J   |
| 1893.22 | 49.6 | 0.70 | ...    | ... | 2 <sup>n</sup> | Sp  |
| 1894.25 | 48.0 | 0.73 | ...    | ... | 3 <sup>n</sup> | Sp  |
| 1896.27 | 40.1 | 0.65 | ...    | ... | 1 <sup>n</sup> | Lew |
| 1897.29 | 46.9 | 0.82 | ...    | ... | 4 <sup>n</sup> | A   |

Discovered with the 36-inch. The measures do not show any sensible motion.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Jones (*Proc. Harvard Coll. Obsy.* 1892)...Aitken (3465)...I.cwis (*Mon. Not.* LIX, 400)...Sp (III)...]

**$\beta$  904.** S.D. ( $5^\circ$ ) 2435

R.A.  $8^h 7^m 52^s$  }  
Decl.  $- 5^\circ 23'$  }

|         |              |      |            |            |       |         |
|---------|--------------|------|------------|------------|-------|---------|
| 1880.16 | $81.3^\circ$ | "    | 3.12       | 8.4...10.0 | 4 $n$ | $\beta$ |
| 1892.18 | 80.2         | 3.18 | 8.0...11.0 | 4 $n$      | Lv.   | C       |

Discovered with the 18½-inch. One of the brighter stars of the large cluster, DREYER 2548.

[ $\beta$  (XIII)... $\beta^3$ ...Lv and Collins (*Proc. Haverford Coll. Obsy.* 1892) (*A. J.* 278)...]

 **$\beta$  1196.** D.M. ( $60^\circ$ ) 1127

R.A.  $8^h 8^m 55^s$  }  
Decl.  $+ 59^\circ 57'$  }

|         |              |      |            |            |       |         |
|---------|--------------|------|------------|------------|-------|---------|
| 1890.97 | $62.0^\circ$ | "    | 0.45       | 8.5...10.5 | 2 $n$ | $\beta$ |
| 1899.17 | 55.2         | 0.29 | 8.5...10.0 | 1 $n$      | A     |         |

This is  $63^s f$  a 6 m star, and  $40'' n$ . Discovered with the 36-inch. In D.M. 9.2 m.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

 **$\beta$  1065.**  $\beta$  *Cancri*

R.A.  $8^h 10^m 0^s$  }  
Decl.  $+ 9^\circ 33'$  }

|         |               |       |            |          |         |         |
|---------|---------------|-------|------------|----------|---------|---------|
| 1889.11 | $294.7^\circ$ | "     | 29.14      | 3.5...14 | 3 $n$   | $\beta$ |
| 1898.27 | 293.6         | 29.38 | 3.5...13.8 | 2 $n$    | A       |         |
| 1898.94 | 294.8         | 28.99 | ...13.6    | 3 $n$    | $\beta$ |         |

The faint companion was detected with the 36-inch. AUWERS gives  $0''.074$  in the direction of  $237^\circ.2$  as the proper motion of  $\beta$  *Cancri*. The companion seems to be moving with it, but further measures are necessary to make this certain.

[ $\beta$  (XV)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

 **$\beta$  454.** O. Arg. S. 8280

R.A.  $8^h 10^m 12^s$  }  
Decl.  $- 30^\circ 30'$  }

|         |              |      |            |            |         |         |
|---------|--------------|------|------------|------------|---------|---------|
| 1877.30 | $18.6^\circ$ | "    | $2 \pm$    | 8.0...10.0 | 1 $n$   | $\beta$ |
| 1892.20 | 16.3         | 2.41 | 8.1... 9.4 | 3 $n$      | $\beta$ |         |
| 1892.26 | 16.6         | 2.49 | 7.8... 9.8 | 2 $n$      | Lv      |         |
| 1898.27 | 16.0         | 2.49 | ...        | 1 $n$      | See     |         |

Discovered with the 6-inch. No evidence of motion. SEE measures a 14 m star  $287^\circ.5 : 19''.12$  (1898.27) 1 $n$ .

[ $\beta$  (IX)... $\beta$  (*Mon. Not. XXXVIII*, 78)... $\beta$  (3141)... $\beta$  (*Pub. L. O. II*)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.*, 1892)...See ( )...]

 **$\beta$  905.** O. Arg. S. 8288

R.A.  $8^h 10^m 59^s$  }  
Decl.  $- 15^\circ 57'$  }

|         |              |      |            |            |       |         |
|---------|--------------|------|------------|------------|-------|---------|
| 1879.72 | $12.2^\circ$ | "    | 3.75       | 7.8...10.4 | 4 $n$ | $\beta$ |
| 1883.86 | 13.7         | 3.75 | 8.2...10.4 | 2 $n$      | W     |         |
| 1888.57 | 11.0         | 4.06 | 8.1...10.4 | 2 $n$      | Lv    |         |
| 1893.20 | 12.1         | 3.76 | 8.0...10.0 | 1 $n$      | J     |         |
| 1898.19 | 14.5         | 3.94 | ...        | 1 $n$      | See   |         |
| 1898.26 | 12.2         | 3.92 | 8.0...10.5 | 3 $n$      | A     |         |

Discovered with the 18½-inch. Relatively fixed.

[ $\beta$  (XIII)... $\beta^1$ ...Wilson (*Cin<sup>10</sup>*)...Lv...Jones (*A. J.* 312)...See ( )...Aitken ( )...]

 **$\beta$  102.** Lalande 16234

R.A.  $8^h 11^m 0^s$  }  
Decl.  $- 8^\circ 39'$  }

|         |               |      |            |            |         |   |
|---------|---------------|------|------------|------------|---------|---|
| 1875.41 | $121.5^\circ$ | "    | 3.08       | 7.0...10.5 | 3 $n$   | J |
| 1892.08 | 120.8         | 3.30 | 7.4...10.0 | 3 $n$      | $\beta$ |   |

Discovered with the 6-inch. The change, if any, is insignificant.

[ $\beta$  (II)... $\beta$  (*Mon. Not. XXXIII*, 437)... $\beta$  (3141)... $\beta$  (*Pub. L. O. II*)...A (1)...]

 **$\beta$  906.** Lalande 16259

R.A.  $8^h 11^m 23^s$  }  
Decl.  $- 15^\circ 52'$  }

|         |               |      |            |            |       |         |
|---------|---------------|------|------------|------------|-------|---------|
| 1879.97 | $187.1^\circ$ | "    | 3.45       | 8.2...10.8 | 4 $n$ | $\beta$ |
| 1884.12 | 189.1         | 3.27 | 8.7...11.2 | 1 $n$      | W     |         |
| 1898.26 | 188.1         | 3.42 | ...        | 1 $n$      | See   |         |
| 1898.26 | 187.4         | 3.42 | 8.3...11.2 | 3 $n$      | A     |         |

Discovered with the 18½-inch. Fixed. Near  $\beta$  905.

[ $\beta$  (XIII)... $\beta^3$ ...Wilson (*Cin<sup>10</sup>*)...See ( )...Aitken ( )...]

**β 576.** Lalande 16300

R.A. 8<sup>h</sup> 13<sup>m</sup> 59<sup>s</sup> }  
Decl. + 34° 19' }

|         |       |      |          |                |   |
|---------|-------|------|----------|----------------|---|
| 1878.05 | 143.1 | 1.48 | 7 ... 13 | 1 <sup>n</sup> | β |
| 1899.02 | 147.9 | 1.37 | 7 ... 13 | 1 <sup>n</sup> | β |

Discovered with the 18½-inch. By a clerical mistake, the place of this star was given in β (x) with an error of 1<sup>h</sup> in R.A. and 1° in Decl., as appears from the record made at the time of discovery. The correct place is given above.

[β (x)...β'...]

**β 907.** S.D. (12°) 2462

R.A. 8<sup>h</sup> 14<sup>m</sup> 4<sup>s</sup> }  
Decl. - 12° 27' }

|         |      |      |              |                |   |
|---------|------|------|--------------|----------------|---|
| 1879.74 | 57.8 | 0.82 | 8.5 ... 10.7 | 2 <sup>n</sup> | β |
| 1892.18 | 55.2 | 0.88 | 8.7 ... 9.7  | 3 <sup>n</sup> | β |
| 1899.26 | 52.1 | 0.82 | 9.0 ... 9.4  | 1 <sup>n</sup> | β |

This close pair of small stars is 11<sup>s</sup> ρ and 99<sup>n</sup> η of a 7 m star. Discovered with the 18½-inch.

[β (xiii)...β³...β (3141)...]

**β 1066.** Lalande 16489

R.A. 8<sup>h</sup> 18<sup>m</sup> 31<sup>s</sup> }  
Decl. + 9° 49' }

|         |       |      |              |                |   |
|---------|-------|------|--------------|----------------|---|
| 1889.12 | 187.7 | 2.25 | 6.8 ... 13.2 | 3 <sup>n</sup> | β |
| 1898.96 | 185.5 | 2.28 | 7.0 ... 13.0 | 1 <sup>n</sup> | β |

Discovered with the 36-inch. The magnitude in D.M. is 7.6.

[β (xv)...β (2929)...β (Pub. L. O. II)...]

**β 1067.** ο *Ursae Majoris*

R.A. 8<sup>h</sup> 20<sup>m</sup> 17<sup>s</sup> }  
Decl. + 61° 7' }

|         |       |                       |             |                |     |
|---------|-------|-----------------------|-------------|----------------|-----|
| 1889.22 | 191.4 | 7.01                  | 3½ ... 15.2 | 3 <sup>n</sup> | β   |
| 1892.12 |       | Not seen with 36-inch |             | 2 <sup>n</sup> | β   |
| 1895.09 | 194.4 | 7.15                  | ...         | 2 <sup>n</sup> | Bar |
| 1899.17 | 192.3 | 7.15                  | ... 15.5    | 1 <sup>n</sup> | A   |

Discovered with the 36-inch. The large star has a proper motion of 0".176 in the direction of 229° 8

(AUWERS). There is no doubt of this being a physical system, as the small star is moving exactly with the other. If it was fixed in space, the position-angle would decrease 11° and the distance 1".27 in the interval between 1889 and 1899. It is evident from the measures that there has been no sensible change.

ENGELHARDT (*Obsns. Ast.*, II, III) measures two distant stars in the field :

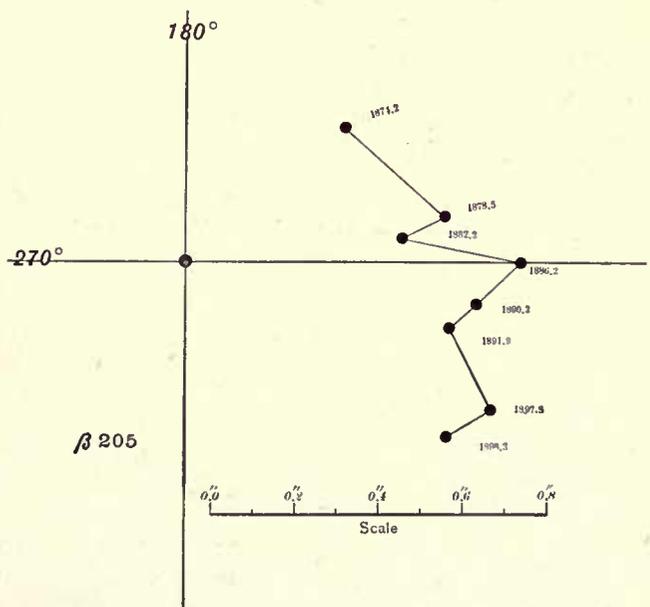
|         |       |        |                |
|---------|-------|--------|----------------|
| 1888.30 | 152.5 | 143.70 | 2 <sup>n</sup> |
| 1894.27 | 152.1 | 144.05 | 2 <sup>n</sup> |
| 1888.30 | 208.0 | 177.23 | 2 <sup>n</sup> |
| 1894.27 | 208.0 | 175.95 | 2 <sup>n</sup> |

[β (xv)...β (2929,3141)...β (Pub. L. O. II)...Barnard (*A. J.* 447)...Aitken ( )...]

**β 205.** O. Arg. S. 8685

R.A. 8<sup>h</sup> 27<sup>m</sup> 54<sup>s</sup> }  
Decl. - 24° 12' }

|         |        |      |             |                    |
|---------|--------|------|-------------|--------------------|
| 1874.19 | 310.0± | 0.5+ | 7 ... 7     | β                  |
| 1877.11 | 280.9  | 1.00 | 7.0 ... 7.2 | 1 <sup>n</sup> Cin |
| 1878.53 | 100.3  | 0.63 | 6.9 ... 7.3 | 1 <sup>n</sup> Cin |
| 1882.21 | 276.6  | 0.52 | 7.0 ... 7.0 | 3 <sup>n</sup> Sp  |
| 1886.17 | 270.1  | 0.80 | 8.5 ... 7.7 | 2 <sup>n</sup> W   |
| 1889.16 | 257.0  | 0.74 | 7.0 ... 7.2 | 1 <sup>n</sup> Lv  |



|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1890.28 | 261.9 | 0.70 | 7.5... | 7.5 | 2n | β   |
| 1891.87 | 256.2 | 0.65 | 7.2... | 7.5 | 3n | β   |
| 1893.20 | 252.6 | 0.3± | 7      | 7   | 1n | Sel |
| 1897.23 | 244.4 | 0.81 | ...    |     | 3n | Ait |
| 1898.16 | 242.5 | 0.75 | ...    |     | 1n | See |
| 1898.25 | 236.5 | 0.75 | 7.7... | 7.8 | 3n | Ait |

Discovered with the 6-inch. The change in angle is a little more than 2° per year, with perhaps a small increase in the distance, but the measures are not very accordant. The Cordoba magnitude is 6.4. Lacaille 3377. See measures a 14.5 m star, 354°5 : 26°.44 (1898.16) 1n.

The principal positions are shown in the accompanying diagram.

[β (1v)...β (Mon. Not. xxxiv, 382)...β (3048,3114)...β (Pub. L. O. 11)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...Sp (11)...Lv<sup>1</sup>...Sellors (3240)...Aitken (3465)...See ( )...Aitken ( )...]

β 206. Cord. G. C. 11565

R.A. 8<sup>h</sup> 30<sup>m</sup> 17<sup>s</sup> }  
Decl. — 24° 42' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1874.19 | 278.6 | 1.5± | 8.0... | 9.0 | 1n | β   |
| 1877.11 | 281.7 | 1.99 | 8.0... | 8.7 | 2n | Cin |
| 1880.27 | 279.5 | 1.62 | ...    |     | 1n | Pt  |
| 1886.21 | 285.2 | ...  | 8      | 9   | 1n | LM  |
| 1889.09 | 280.3 | 1.76 | 8.0... | 8.4 | 3n | Lv  |
| 1898.19 | 280.2 | 1.93 | ...    |     | 1n | See |

Discovered with the 6-inch. Probably unchanged.

[β (1v)...β (Mon. Not. xxxiv, 382)...Cin<sup>4</sup>...LM...Lv<sup>1</sup>...Pritchett (Pub. Morrison Obsy. 1)...See ( )...]

β 584. Piazzì VIII. 124

R.A. 8<sup>h</sup> 33<sup>m</sup> 3<sup>s</sup> }  
Decl. + 19° 58' }

A and B

|         |       |      |        |      |    |   |
|---------|-------|------|--------|------|----|---|
| 1878.05 | 291.0 | 1.61 | 8.0... | 12.0 | 2n | β |
| 1892.05 | 292.4 | 1.26 | 8.0... | 11.7 | 3n | β |

A and C (= S 571)

|         |       |       |        |     |    |     |
|---------|-------|-------|--------|-----|----|-----|
| 1825.13 | 157.0 | 45.04 | 7½...  | 8   | 2n | S   |
| 1875.07 | 156.3 | 45.12 | 7.0... | 7.3 | 3n | J   |
| 1876.49 | 156.3 | 44.70 | ...    |     | 3n | Sch |
| 1892.05 | 156.2 | 44.80 | ...    | 7.9 | 3n | β   |
| 1899.07 | 156.7 | 45.04 | ...    |     | 2n | β   |

A and D

|         |       |       |     |     |    |     |
|---------|-------|-------|-----|-----|----|-----|
| 1825.13 | 241.0 | 92.26 | ... | 6   | 2n | S   |
| 1875.07 | 241.2 | 92.76 | ... | 6.3 | 3n | J   |
| 1876.04 | 241.4 | 92.26 | ... |     | 2n | Sch |
| 1899.07 | 241.6 | 92.85 | ... |     | 2n | β   |

D and C

|         |      |       |     |  |    |     |
|---------|------|-------|-----|--|----|-----|
| 1875.07 | 87.9 | 99.72 | ... |  | 3n | J   |
| 1876.05 | 87.8 | 99.69 | ... |  | 3n | Sch |

The close attendant to this wide triple in *Praesepe* was discovered with the 18½-inch. The bright stars make S 571 = OΣ (App.) 95. Each of the three bright stars has a slightly different proper motion, according to RECHENBERG (A. N. 3482). He gives the movement of A as 0".114 in the direction of 262°.4. It is evident, if this star has any such annual change, that B is moving with it, as otherwise the change in A from 1878 to 1892 would amount to 1".6.

[β (x)...β<sup>1</sup>...β (3114)...β (Pub. L. O. 11)...Δ (1, p. 252)...Radcliffe Obsvs. xxiii...Schur (2255)...]

β 207. Lalande 17091

R.A. 8<sup>h</sup> 33<sup>m</sup> 16<sup>s</sup> }  
Decl. — 19° 19' }

|         |       |      |        |      |    |     |
|---------|-------|------|--------|------|----|-----|
| 1876.08 | 103.6 | 4.32 | 6.5... | 10.5 | 3n | J   |
| 1877.10 | 106.1 | 4.54 | 6.7... | 9.2  | 2n | Cin |
| 1880.71 | 102.2 | 4.18 | 7.1... | 9.5  | 2n | β   |
| 1888.65 | 102.8 | 4.06 | 7.0... | 10.2 | 2n | Lv  |
| 1893.20 | 101.6 | 4.34 | 7.2... | 10.5 | 2n | J   |
| 1898.21 | 101.6 | 4.47 | ...    |      | 1n | See |

Discovered with the 6-inch. Without change. The larger star is red.

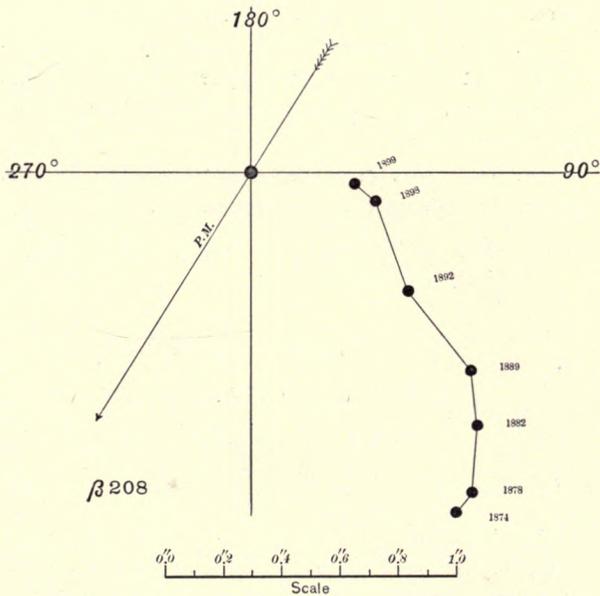
[β (1v)...β (Mon. Not. xxxiv, 382)...β<sup>3</sup>...Δ (1)...Cin<sup>4</sup>...Lv<sup>1</sup>...Jones (A. J. 312)...See ( )...]

**β 208.** Lalande 17103

R.A. 8<sup>h</sup> 33<sup>m</sup> 53<sup>s</sup> }  
Decl. - 22° 16' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1874.19 | 30.4 | 1.4± | 6.0... 9.0 | 1 <sup>n</sup> | β   |
| 1877.13 | 31.7 | 1.71 | 6.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1878.43 | 33.9 | 1.37 | 6.0... 8.0 | 5 <sup>n</sup> | Cin |
| 1882.21 | 40.9 | 1.21 | 6.0... 9.0 | 3 <sup>n</sup> | Sp  |
| 1886.18 | 43.2 | 1.27 | 6.0... 8.0 | 1 <sup>n</sup> | W   |
| 1889.15 | 47.5 | 1.06 | 7.0... 8.0 | 2 <sup>n</sup> | β   |
| 1892.11 | 52.3 | 0.70 | 6.8... 8.1 | 3 <sup>n</sup> | β   |
| 1894.26 | 47.6 | 0.57 | ...        | 1 <sup>n</sup> | Com |
| 1895.32 | 55.5 | 0.6± | ...        | 1 <sup>n</sup> | Com |
| 1897.83 | 74.7 | 0.39 | 6.2... 6.4 | 1 <sup>n</sup> | See |
| 1898.29 | 76.2 | 0.45 | 6.5... 8.2 | 2 <sup>n</sup> | A   |
| 1899.19 | 83.2 | 0.36 | 6.5... 8.0 | 1 <sup>n</sup> | A   |

Discovered with the 6-inch. It appears to be a most interesting system from the rapid relative change and from the large proper motion. PORTER gives this movement in space as 0".483 in the direction of 328°.3. Rapid motion in angle may be expected with the close approach of the two components. The principal positions are shown in the accompanying diagram.



This is a naked-eye star in *Argo*; Cord. G. C. 5.6 m.

[β (IV)...β (*Mon. Not.* xxxiv, 382)...β (2930,3141)...β (*Pub. L. O.* II)...β (*Ast. & A.-P.* XI, 464)...Sp (II)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (*Cin*<sup>10</sup>)...Comstock (*Pub. Washburn Obsy.* X)...See ( )...Aitken ( )...]

**β 585.** *Canceri* 109

R.A. 8<sup>h</sup> 34<sup>m</sup> 20<sup>s</sup> }  
Decl. + 20° 54' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.10 | 106.4 | 0.40 | 7.5... 9.0 | 1 <sup>n</sup> | β  |
| 1886.25 | 109.4 | 0.56 | ...        | 2 <sup>n</sup> | HΣ |
| 1889.72 | 110.3 | 0.46 | ...        | 6 <sup>n</sup> | Sp |
| 1893.72 | 110.3 | 0.43 | ...        | 2 <sup>n</sup> | Sp |

Discovered with the 18½-inch. One of the outlying stars of *Praesepe*. B.A.C. 2927. Magnitude in D.M. 7.0.

[β (x)...β<sup>1</sup>...Sp (III)...HΣ ( )...]

**β 209.** W<sup>2</sup> VIII. 849

R.A. 8<sup>h</sup> 35<sup>m</sup> 24<sup>s</sup> }  
Decl. + 39° 14' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.77 | 355.4 | 1.56 | 8.4... 8.7 | 4 <sup>n</sup> | Δ  |
| 1878.75 | 357.0 | 1.57 | 8.0... 8.7 | 4 <sup>n</sup> | Sp |
| 1881.28 | 357.7 | 1.43 | ...        | 1 <sup>n</sup> | Pt |

Discovered with the 6-inch. Later measures are needed, but so far there is no evidence of change.

[β (IV)...β (*Mon. Not.* xxxiv, 382)...Δ (I)...Sp (II)...Pritchett (*Pub. Morrison Obsy.* 1)...]

**β 586.** *Monocerotis* 237

R.A. 8<sup>h</sup> 41<sup>m</sup> 49<sup>s</sup> }  
Decl. - 16° 37' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1878.15 | 53.2 | 0.75 | 6.5... 9.0 | 1 <sup>n</sup> | β   |
| 1878.20 | 55.6 | ...  | 6.8... 9.3 | 3 <sup>n</sup> | Cin |
| 1878.26 | 45.7 | 0.54 | 6.5... 8.5 | 1 <sup>n</sup> | Δ   |
| 1887.75 | 55.4 | 0.66 | ...        | 3 <sup>n</sup> | Sp  |
| 1898.19 | 56.8 | 0.63 | ...        | 1 <sup>n</sup> | See |

Discovered with the 18½-inch. Probably unchanged. In *Hydra*, according to GOULD, 6.7 m. Lalande 17355.

[β (x)...β<sup>1</sup>...Δ (I)...Cin<sup>5</sup>...Sp (III)...See ( )...]

**$\beta$  335.** Lalande 17341

R.A.  $8^h 41^m 58^s$  }  
Decl.  $+ 3^\circ 4'$  }

|         | $^\circ$ | "    |            |            |            |
|---------|----------|------|------------|------------|------------|
| 1875.99 | 268.3    | 2.72 | 7.2...10.5 | 2 <i>n</i> | $\Delta$   |
| 1879.26 | 268.7    | 3.09 | 7.2... 9.5 | 2 <i>n</i> | O $\Sigma$ |
| 1886.30 | 269.2    | 2.77 | ...        | 2 <i>n</i> | H $\Sigma$ |
| 1892.06 | 270.1    | 2.58 | 7.3...10.7 | 3 <i>n</i> | $\beta$    |
| 1899.09 | 265.8    | 2.74 | 7.0...10.0 | 1 <i>n</i> | $\beta$    |

Discovered with the 6-inch. The  $p$  of three stars in the field. Without relative motion.

[ $\beta$  (vi)... $\beta$  (2062,3141)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (i)...O $\Sigma$  (*Poulkowa Obsns.* x)...H $\Sigma$  ( )...]

 **$\beta$  1068.** Lalande 17381

R.A.  $8^h 43^m 2^s$  }  
Decl.  $+ 9^\circ 19'$  }

## A and B

|         | $^\circ$ | "          |            |            |         |
|---------|----------|------------|------------|------------|---------|
| 1889.19 | 189.9    | 0.45       | 7.7... 8.8 | 3 <i>n</i> | $\beta$ |
| 1890.24 | 190.1    | 0.4 $\pm$  | ...        | 1 <i>n</i> | Sp      |
| 1893.25 | 190.3    | 0.25 $\pm$ | ...        | 2 <i>n</i> | Sp      |
| 1894.25 | 188.9    | 0.25 $\pm$ | ...        | 2 <i>n</i> | Sp      |

## AB and C

|         |       |       |         |            |         |
|---------|-------|-------|---------|------------|---------|
| 1889.14 | 313.0 | 17.80 | ...12.8 | 2 <i>n</i> | $\beta$ |
| 1899.02 | 313.4 | 17.85 | ...13.0 | 1 <i>n</i> | $\beta$ |

Discovered with the 36-inch. The observations indicate some change in distance.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...Sp (III)...]

 **$\beta$  1069.** Lalande 17416

R.A.  $8^h 43^m 41^s$  }  
Decl.  $- 10^\circ 34'$  }

|         | $^\circ$ | "    |            |            |         |
|---------|----------|------|------------|------------|---------|
| 1889.09 | 60.8     | 2.13 | 6.6...11.0 | 3 <i>n</i> | $\beta$ |
| 1899.19 | 60.2     | 2.42 | 7.0...11.5 | 1 <i>n</i> | A       |

Discovered with the 36-inch.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 **$\beta$  587.** 15 *Hydrae*

R.A.  $8^h 45^m 41^s$  }  
Decl.  $- 6^\circ 44'$  }

## A and B

|         | $^\circ$ | "    |            |            |         |
|---------|----------|------|------------|------------|---------|
| 1878.19 | 159.9    | 0.45 | 6.0... 9.0 | 2 <i>n</i> | $\beta$ |
| 1878.37 | 163.6    | 0.37 | 6.0... 8.0 | 1 <i>n</i> | Cin     |
| 1879.18 | 157.7    | 0.47 | 5.7... 7.2 | 2 <i>n</i> | $\beta$ |
| 1892.10 | 151.9    | 0.59 | 6.3... 8.2 | 3 <i>n</i> | $\beta$ |
| 1893.85 | 149.2    | 0.55 | ...        | 5 <i>n</i> | Sp      |
| 1897.25 | 143.4    | 0.93 | 6+... 9+   | 3 <i>n</i> | A       |

AB and C (= H<sup>+</sup> V. 120)

|         |           |       |         |            |                |
|---------|-----------|-------|---------|------------|----------------|
| 1783.03 | 340 $\pm$ | 43.03 | ...     | 1 <i>n</i> | H <sup>+</sup> |
| 1878.14 | 356.8     | 45.75 | ...     | 1 <i>n</i> | $\beta$        |
| 1892.06 | 357.3     | 45.35 | ...10.6 | 2 <i>n</i> | $\beta$        |
| 1899.02 | 358.2     | 45.45 | ... 9.2 | 1 <i>n</i> | $\beta$        |

## AB and D

|         |      |       |         |            |         |
|---------|------|-------|---------|------------|---------|
| 1878.14 | 53.0 | 49.99 | ...     | 1 <i>n</i> | $\beta$ |
| 1892.06 | 53.2 | 50.24 | ...11.2 | 2 <i>n</i> | $\beta$ |
| 1899.02 | 53.0 | 50.76 | ... 9.3 | 1 <i>n</i> | $\beta$ |

The duplicity of the principal star was discovered with the 18½-inch. There is no question as to its being a binary. The measures show retrograde motion, and the components have the same proper motion. AUWERS gives this as 0".069 in the direction of 270°.0.

All the measures of the distant stars, C and D, noted by HERSCHEL, are given above.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>... Aitken (3465)...Sp (III)...]

 **$\beta$  407.** W<sup>+</sup> VIII. 1159

R.A.  $8^h 45^m 50^s$  }  
Decl.  $- 6^\circ 20'$  }

|         | $^\circ$ | "    |            |            |          |
|---------|----------|------|------------|------------|----------|
| 1877.87 | 165.4    | 6.09 | 7.7...10.0 | 1 <i>n</i> | $\Delta$ |
| 1879.09 | 164.5    | 5.52 | 8.0...11.0 | 1 <i>n</i> | Cin      |
| 1879.52 | 164.5    | 5.94 | 7.9...10.4 | 3 <i>n</i> | $\beta$  |
| 1890.20 | 161.4    | 6.01 | ...        | 2 <i>n</i> | T        |
| 1899.09 | 164.8    | 5.78 | 8.2...10.5 | 1 <i>n</i> | $\beta$  |

Discovered with the 6-inch. Evidently unchanged.

[ $\beta$  (VII)... $\beta$  (2103)... $\beta^3$ ... $\Delta$  (1)...Cin<sup>5</sup>...Tarrant (3186)...]

**β 24.** Lalande 17586

R.A. 8<sup>h</sup> 48<sup>m</sup> 24<sup>s</sup> }  
Decl. — 8° 18' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.15 | 171.9 | 1.03 | 7.9... 9.0 | 3 <sup>n</sup> | Δ   |
| 1878.19 | 177.3 | 1.12 | 7.8... 9.0 | 1 <sup>n</sup> | β   |
| 1878.88 | 175.0 | 1.08 | 7.3... 8.3 | 3 <sup>n</sup> | Cin |
| 1886.84 | 173.5 | 1.26 | ...        | 1 <sup>n</sup> | LM  |
| 1888.91 | 173.8 | 1.19 | 7.5... 8.4 | 4 <sup>n</sup> | Lv  |
| 1890.22 | 170.5 | 1.23 | ...        | 3 <sup>n</sup> | T   |
| 1892.13 | 174.7 | 1.02 | 7.5... 8.0 | 1 <sup>n</sup> | Col |
| 1892.93 | 172.2 | 0.95 | 7.5... 8.0 | 1 <sup>n</sup> | J   |
| 1893.22 | 177.4 | 1.06 | 8.0... 8.7 | 2 <sup>n</sup> | J   |

Discovered with the 6-inch. No evidence of motion.

[β (I)...β (*Mon. Not.* xxxiii, 351)...Δ (I)...Cin<sup>5</sup>...LM...Lv<sup>1</sup>...Tarrant (3186)...Jones and Collins (*Proc. Haverford Coll. Obsy.* 1892) (*A. J.* 212, 278)...]

**β 408.** Radcliffe 2231

R.A. 8<sup>h</sup> 48<sup>m</sup> 58<sup>s</sup> }  
Decl. + 63° 53' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1877.80 | 344.0 | 2.94 | 7.8... 10.3 | 3 <sup>n</sup> | Δ  |
| 1879.35 | 346.7 | 2.94 | 7.0... 9.5  | 1 <sup>n</sup> | OΣ |
| 1883.64 | 345.7 | 3.50 | 7.3... 10.2 | 5 <sup>n</sup> | En |
| 1886.35 | 342.3 | 3.01 | ...         | 2 <sup>n</sup> | HΣ |
| 1898.15 | 340.6 | 3.34 | 7+... 10    | 4 <sup>n</sup> | D  |

Discovered with the 6-inch. Probably no change.

[β (VII)...β (2103)...Δ (I)...Engelmann (2678)...OΣ (*Poulkowa Obsns.* x)...HΣ ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 103.** Lalande 17611

R.A. 8<sup>h</sup> 49<sup>m</sup> 2<sup>s</sup> }  
Decl. — 7° 22' }

|         |      |      |             |                |    |
|---------|------|------|-------------|----------------|----|
| 1875.08 | 73.9 | 2.90 | 8.0... 11.2 | 2 <sup>n</sup> | Δ  |
| 1879.52 | 73.9 | 2.86 | 7.9... 10.8 | 3 <sup>n</sup> | β  |
| 1880.76 | 73.7 | 2.71 | ...         | 1 <sup>n</sup> | Pt |
| 1885.14 | 69.7 | 2.77 | 8.5... 10.7 | 1 <sup>n</sup> | W  |
| 1898.20 | 71.0 | 3.11 | 8... 10     | 3 <sup>n</sup> | D  |

Discovered with the 6-inch. So far relatively fixed.

[β (II)...β (*Mon. Not.* xxxiii, 437)...β<sup>3</sup>...Δ (I)...Wilson (Cin<sup>10</sup>)...Pritchett (*Pub. Morrison Obsy.* 1)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 210.** Lalande 17696

R.A. 8<sup>h</sup> 51<sup>m</sup> 18<sup>s</sup> }  
Decl. — 16° 58' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.48 | 181.6 | 2.40 | 7.0... 7.4 | 3 <sup>n</sup> | Δ   |
| 1876.12 | 183.2 | 2.80 | 7.7... 7.8 | 6 <sup>n</sup> | Cin |
| 1878.18 | 181.6 | 2.62 | 7.5... 7.5 | 1 <sup>n</sup> | Cin |
| 1879.25 | 181.0 | 2.54 | 6.5... 6.5 | 2 <sup>n</sup> | Cin |
| 1882.21 | 183.1 | 2.62 | 7.0... 7.4 | 2 <sup>n</sup> | Sp  |
| 1882.45 | 181.3 | 2.64 | 7.3... 7.6 | 3 <sup>n</sup> | W   |
| 1886.85 | 183.3 | 2.76 | 7.0... 7.0 | 3 <sup>n</sup> | LM  |
| 1893.20 | 183.0 | 2.66 | 6.8... 6.8 | 2 <sup>n</sup> | J   |
| 1893.22 | 182.6 | 2.67 | 7... 7     | 1 <sup>n</sup> | Sel |
| 1898.09 | 183.5 | 2.56 | 6½... 6½   | 3 <sup>n</sup> | Sc  |
| 1898.16 | 183.5 | 2.96 | ...        | 1 <sup>n</sup> | See |

Discovered with the 6-inch. Evidently fixed.

[β (IV)...β (*Mon. Not.* xxxiv, 382)...Δ (I)...Cin<sup>3</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...LM...Sp (II)...Jones (*A. J.* 312)...Sellors (3240)...Scott (*Mon. Not.* LIX, 427)...See ( )...]

**β 409.** Lalande 17812

R.A. 8<sup>h</sup> 54<sup>m</sup> 55<sup>s</sup> }  
Decl. — 8° 43' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.26 | 184.3 | 9.65 | 8.0... 10.5 | 1 <sup>n</sup> | Δ  |
| 1879.52 | 184.7 | 9.77 | 7.8... 10.6 | 3 <sup>n</sup> | β  |
| 1880.24 | 184.6 | 9.68 | ...         | 1 <sup>n</sup> | Pt |
| 1884.01 | 185.6 | 9.94 | 7.5... 9.9  | 5 <sup>n</sup> | En |
| 1899.07 | 184.1 | 9.66 | 7.7... 11.0 | 1 <sup>n</sup> | β  |

Discovered with the 6-inch. There is no indication of any change.

[β (VII)...β (2103)...β<sup>3</sup>...Δ (I)...Pritchett (*Pub. Morrison Obsy.* 1)...Engelmann (2678)...]

**β 211.** *Hydrae* 68

R.A. 8<sup>h</sup> 55<sup>m</sup> 44<sup>s</sup> }  
Decl. + 3° 9' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1875.27 | 257.7 | 1.11 | 7.5... 10.0 | 2 <sup>n</sup> | Δ   |
| 1877.25 | 254.4 | 1.08 | 7.5... 9.5  | 1 <sup>n</sup> | OΣ  |
| 1879.27 | 261.9 | 1.08 | 7.0... 9.0  | 1 <sup>n</sup> | Cin |
| 1886.30 | 260.0 | 1.46 | ...         | 2 <sup>n</sup> | HΣ  |
| 1888.51 | 262.0 | 1.05 | 7.1... 9.1  | 2 <sup>n</sup> | Lv  |
| 1890.20 | 262.5 | 1.12 | ...         | 2 <sup>n</sup> | T   |
| 1892.25 | 264.3 | 1.02 | ...         | 2 <sup>n</sup> | Sp  |
| 1893.26 | 261.2 | 0.99 | ...         | 4 <sup>n</sup> | Sp  |

Discovered with the 6-inch. It is probably unchanged. Lalande 17831. In the field with Σ 1302.

[β (IV)...β (*Mon. Not.* xxxiv, 382)...Δ (I)...Cin<sup>5</sup>...Lv<sup>1</sup>...OΣ (*Poulkowa Obsns.* x)...Tarrant (3186)...Sp (III)...HΣ ( )...]

**$\beta$  410.** B.A.C. 3127

R.A.  $9^h 4^m 30^s$  }  
Decl.  $-25^\circ 19'$  }

|         | $^\circ$ | "    |        |     |            |         |
|---------|----------|------|--------|-----|------------|---------|
| 1877.11 | 160.5    | 1.78 | 7.5... | 9.0 | 2 <i>n</i> | Cin     |
| 1892.24 | 160.9    | 1.63 | 7.3... | 9.2 | 3 <i>n</i> | Lv      |
| 1892.24 | 161.2    | 1.67 | 7.6... | 8.6 | 3 <i>n</i> | $\beta$ |
| 1898.16 | 163.7    | 2.13 | ...    |     | 1 <i>n</i> | See     |

Discovered with the 6-inch. Unchanged. In Cord. G. C. 7.0 m.

[ $\beta$  (vii)... $\beta$  (2103,3141)... $\beta$  (*Pub. L. O. II*)...Cin<sup>4</sup>...Lv (*A. J. 278*) (*Proc. Haverford Coll. Obsy.* 1892)...See ( )...]

 **$\beta$  104.** Lalande 18134

R.A.  $9^h 5^m 19^s$  }  
Decl.  $+0^\circ 47'$  }

|         | $^\circ$ | "    |        |      |            |            |
|---------|----------|------|--------|------|------------|------------|
| 1875.15 | 107.7    | 3.30 | 7.0... | 11.8 | 3 <i>n</i> | $\Delta$   |
| 1877.25 | 111.6    | 2.95 | 7.0... | 10.0 | 1 <i>n</i> | O $\Sigma$ |
| 1880.29 | 110.1    | 2.85 | ...    |      | 1 <i>n</i> | Pt         |
| 1886.31 | 106.8    | 3.35 | ...    |      | 1 <i>n</i> | H $\Sigma$ |
| 1892.13 | 106.8    | 2.88 | 7.0... | 11.0 | 3 <i>n</i> | $\beta$    |
| 1899.09 | 104.5    | 2.79 | 7.0... | 10.7 | 1 <i>n</i> | $\beta$    |

Discovered with the 6-inch. Probably fixed.

[ $\beta$  (ii)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta$  (3141)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (i)...O $\Sigma$  (*Poulkova Obsns.* x)...Pritchett (*Pub. Morrison Obsy.* 1)...11 $\Sigma$  ( )...]

 **$\beta$  336.** Lalande 18173

R.A.  $9^h 6^m 11^s$  }  
Decl.  $-16^\circ 19'$  }

|         | $^\circ$ | "    |        |     |            |            |     |
|---------|----------|------|--------|-----|------------|------------|-----|
| 1876.17 | 238.2    | 1.93 | 8.7... | 9.5 | 2 <i>n</i> | $\Delta$   |     |
| 1878.05 | 239.9    | 1.82 | 8.2... | 9.2 | 2 <i>n</i> | Cin        |     |
| 1898.20 | 236.3    | 1.92 | 8      | ... | 9          | 3 <i>n</i> | D   |
| 1898.24 | 236.7    | 1.85 | ...    |     |            | 1 <i>n</i> | See |

Discovered with the 6-inch. No relative motion.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (i)...Cin<sup>4</sup>...Cin<sup>5</sup>...Doolittle (*Pub. Flower Obsy.* 1)...See ( )...]

 **$\beta$  908.** S.D. (7°) 2763

R.A.  $9^h 8^m 25^s$  }  
Decl.  $-7^\circ 47'$  }

B and C

|         | $^\circ$ | "    |        |      |            |         |
|---------|----------|------|--------|------|------------|---------|
| 1880.29 | 234.6    | 0.82 | 9.2... | 11.0 | 3 <i>n</i> | $\beta$ |
| 1892.21 | 230.7    | 0.74 | 9.2... | 10.6 | 2 <i>n</i> | $\beta$ |

A and BC

|         | $^\circ$ | "     |        |     |            |         |
|---------|----------|-------|--------|-----|------------|---------|
| 1880.25 | 184.6    | 60.56 | 9.0... | 9.1 | 2 <i>n</i> | $\beta$ |
| 1892.21 | 184.5    | 60.58 | 8.6... |     | 2 <i>n</i> | $\beta$ |
| 1899.11 | 184.3    | 60.88 | 8.5... | 8.7 | 2 <i>n</i> | $\beta$ |

Discovered with the 18½-inch. B is S.D. (7°) 2762. There is a 12.5 m star in the direction of 222° from A.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3141)... $\beta$  (*Pub. L. O. II*)...]

 **$\beta$  455.** Lalande 18231

R.A.  $9^h 8^m 34^s$  }  
Decl.  $+4^\circ 43'$  }

|         | $^\circ$ | "    |        |      |            |    |
|---------|----------|------|--------|------|------------|----|
| 1877.30 | 65.2     | 1.94 | 9.5... | 10.5 | 2 <i>n</i> | H1 |
| 1888.95 | 70.3     | 1.93 | 8.2... | 10.2 | 3 <i>n</i> | Lv |
| 1898.20 | 69.5     | 1.81 | 8+     | ...  | 3 <i>n</i> | D  |

Discovered with the 6-inch. Change uncertain. Magnitude in L, 7½; D.M. 8.1.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)...Hall (i) (2147)...Lv<sup>1</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  212.** *Hydrae* 95

R.A.  $9^h 10^m 11^s$  }  
Decl.  $-7^\circ 51'$  }

|         | $^\circ$ | "    |        |      |            |          |
|---------|----------|------|--------|------|------------|----------|
| 1875.61 | 230.5    | 1.48 | 7.5... | 8.2  | 2 <i>n</i> | $\Delta$ |
| 1878.23 | 225.8    | 1.36 | 7.2... | 7.7  | 4 <i>n</i> | Cin      |
| 1880.50 | 228.9    | 1.26 | 7.9... | 8.2  | 4 <i>n</i> | $\beta$  |
| 1880.55 | 223.9    | 1.51 | 7.5... | 8.5  | 3 <i>n</i> | Sp       |
| 1885.23 | 225.6    | 1.47 | 8.0... | 8.5  | 1 <i>n</i> | W        |
| 1887.01 | 223.8    | 1.59 | 7.3... | 8.0  | 1 <i>n</i> | LM       |
| 1888.56 | 225.4    | 1.35 | 7.7... | 7.9  | 3 <i>n</i> | Lv       |
| 1890.20 | 227.4    | 1.34 | 7.5... | 10.0 | 3 <i>n</i> | T        |

Discovered with the 6-inch. The change, if any, is very slow. Lalande 18296.

[ $\beta$  (iv)... $\beta$  (*Mon. Not.* xxxiv, 382)... $\Delta$  (i)... $\beta^3$ ...Cin<sup>5</sup>...Wilson (Cin<sup>20</sup>)...LM...Lv<sup>1</sup>...Sp (ii)...Tarrant (3186)...]

**β 588.** *Hydrae* 96

R.A. 9<sup>h</sup> 10<sup>m</sup> 30<sup>s</sup> }  
Decl. + 1° 14' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1878.19 | 123.2 | 2.38 | 65...11.0  | 2n | β  |
| 1892.05 | 125.1 | 2.45 | 7.1...11.2 | 3n | β  |
| 1886.31 | 124.1 | 2.72 | ...        | 2n | HΣ |
| 1899.09 | 129.4 | 2.43 | 7.0...10.2 | 2n | β  |

Discovered with the 18½-inch. No sensible motion. Lalande 18302. In HEIS 6-7 m; D.M. 6.8. [β (x)...β<sup>1</sup>...β (3141)...β (Pub. L. O. II)...HΣ ( )...]

**β 337.** Lalande 18502

R.A. 9<sup>h</sup> 16<sup>m</sup> 54<sup>s</sup> }  
Decl. - 17° 23' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.17 | 320.8 | 7.70 | 7.0...11.0 | 2n | Δ   |
| 1877.13 | 322.3 | 8.00 | 7.2...10.0 | 2n | Cin |
| 1892.19 | 326.8 | 7.83 | 7.0...10.2 | 3n | Lv  |
| 1898.29 | 325.5 | 8.16 | ...        | 1n | See |

Discovered with the 6-inch. Unchanged. [β (v1)...β (2062)...Δ (1)...Cin<sup>4</sup>...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...See ( )...]

**β 338.** Lalande 18518

R.A. 9<sup>h</sup> 17<sup>m</sup> 15<sup>s</sup> }  
Decl. - 14° 59' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.17 | 274.3 | 6.65 | 8.2...10.0 | 2n | Δ   |
| 1877.12 | 274.3 | 7.14 | 8.5... 9.5 | 2n | Cin |
| 1893.24 | 274.2 | 7.24 | 9.0...10.5 | 2n | J   |
| 1893.64 | 276.3 | 6.97 | 8.3...10.2 | 3n | W   |
| 1898.16 | 273.5 | 7.41 | ...        | 1n | See |
| 1899.09 | 274.2 | 6.78 | 8.3...10.5 | 2n | β   |

Discovered with the 6-inch. Without change. [β (v1)...β (2062)...Δ (1)...Cin<sup>4</sup>...Jones (A. J. 312)...Wilson ( )...See ( )...]

**β 105.** *κ Leonis*

R.A. 9<sup>h</sup> 17<sup>m</sup> 40<sup>s</sup> }  
Decl. + 26° 42' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1876.20 | 203.8 | 3.05 | 4.9...10.7 | 5n | Δ  |
| 1877.75 | 208.8 | 3.22 | 5.2... 9.2 | 2n | OΣ |

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1878.33 | 203.8 | 2.88 | 5...11     | 2n | H1 |
| 1879.06 | 202.4 | 2.89 | 4.5...10.5 | 1n | β  |
| 1881.30 | 205.0 | 3.00 | ...        | 1n | Pt |
| 1883.47 | 205.1 | 3.36 | 5.1...10.2 | 8n | En |
| 1886.23 | 202.2 | 3.37 | ...        | 3n | HΣ |
| 1889.13 | 203.9 | 2.79 | 4.5...10.9 | 3n | β  |
| 1898.27 | 205.3 | 2.96 | 4...11.3   | 3n | A  |

Discovered with the 6-inch. A fine pair even with a small aperture. The measures thus far show no relative change. AUWERS gives the proper motion, 0.057 in the direction of 231°.7. With this value, and the position of B in 1876, as found by Δ, the relation at the date of the last measure in 1898 should be, 187° : 2.0; so it is obvious that the companion has the same proper motion.

ENGELMANN suspected a star 11 m distant 10" in the direction of 65°. The 36-inch does not show any other companion.

[β (II)...β (Mon. Not. xxxiii, 437)...β<sup>3</sup>...β (2930)...β (Pub. L. O. II)...Δ (1)...OΣ (Poulkova Obsns. x)...Hall (1)...Pritchett (Pub. Morrison Obsy. 1)...Burton (Copernicus 1, p. 54)...Engelmann (2678)...Aitken ( )...HΣ ( )...]

**β 1070.** D.M. (26°) 1940

R.A. 9<sup>h</sup> 18<sup>m</sup> 8<sup>s</sup> }  
Decl. + 26° 47' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1889.13 | 71.8 | 0.50 | 9.1...10.2 | 3n | β |
| 1898.43 | 74.6 | 0.34 | 10...10    | 1n | A |

This close pair of small stars, discovered with the 36-inch, is 27<sup>s</sup> f and 4.8 n of *κ Leonis* (β 105). The magnitude in D.M. is 8.8.

[β (xv)...β (2929)...β (Pub. L. O. II)...Aitken ( )...]

**β 589.** Lalande 18585

R.A. 9<sup>h</sup> 20<sup>m</sup> 15<sup>s</sup> }  
Decl. + 7° 3' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1878.08 | 219.1 | 2.30 | 7.5...12.5 | 1n | β  |
| 1886.31 | 213.3 | 3.10 | ...        | 2n | HΣ |
| 1892.06 | 218.9 | 3.13 | 7.5...11.2 | 3n | β  |

Discovered with the 18½-inch. [β (x)...β<sup>1</sup>...β (3141) (Pub. L. O. II)...HΣ ( )...]

**β 590.** 29 *Hydrae*

R.A. 9<sup>h</sup> 21<sup>m</sup> 22<sup>s</sup> }  
Decl. — 8° 42' }

|         |       |       |            |            |     |
|---------|-------|-------|------------|------------|-----|
| 1878.16 | 176.9 | 10.10 | 7.5...11.7 | 2 <i>n</i> | Cin |
| 1878.17 | 176.8 | 10.80 | 6.7...11.7 | 2 <i>n</i> | β   |
| 1891.27 | 176.0 | 10.95 | 6.0...11.0 | 2 <i>n</i> | β   |
| 1899.00 | 174.7 | 10.52 | 6.5...12.7 | 2 <i>n</i> | β   |

Discovered with the 18½-inch. Relatively fixed. The principal star has a proper motion of 0".068 in the direction of 268°.3 (AUWERS), which seems to belong to the companion, as otherwise its angle should have diminished 8° in the interval covered by the measures.

[β (x)...β<sup>3</sup>...β (3114)...Cin<sup>5</sup>...]

**β 213.** Lalande 18648

R.A. 9<sup>h</sup> 22<sup>m</sup> 25<sup>s</sup> }  
Decl. — 7° 34' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1875.76 | 177.2 | 1.60 | 8.0...10.5 | 2 <i>n</i> | Δ   |
| 1879.19 | 176.8 | 1.34 | 8.0...10.0 | 2 <i>n</i> | Cin |
| 1892.09 | 179.5 | 1.62 | 8.0...9.4  | 3 <i>n</i> | β   |

Discovered with the 6-inch. Unchanged. This pair is 34½' *n* of α *Hydrae*.

[β (iv)...β (*Mon. Not.* xxxiv, 382)...β (3141)...β (*Pub. L. O.* 11)...Δ (i)...Cin<sup>5</sup>...]

**β 591.** W<sup>1</sup> IX. 477

R.A. 9<sup>h</sup> 23<sup>m</sup> 33<sup>s</sup> }  
Decl. — 2° 36' }

|         |      |      |           |            |    |
|---------|------|------|-----------|------------|----|
| 1878.11 | 35.8 | 0.73 | 7.7...8.5 | 2 <i>n</i> | β  |
| 1878.21 | 31.9 | 0.73 | 8.0...9.0 | 1 <i>n</i> | Δ  |
| 1884.03 | 39.8 | 0.67 | 7.5...8.5 | 5 <i>n</i> | En |
| 1886.21 | 44.8 | 0.60 | 7.3...8.0 | 2 <i>n</i> | T  |
| 1890.26 | 31.8 | 0.66 | ...       | 4 <i>n</i> | Sp |
| 1892.08 | 35.4 | 0.72 | 8.0...8.7 | 3 <i>n</i> | β  |
| 1892.57 | 34.8 | 0.74 | ...       | 6 <i>n</i> | Sp |

Discovered with the 18½-inch. Without change.

[β (x)...β<sup>3</sup>...β (3141)...β (*Pub. L. O.* 11)...Δ (i)...Tarrant (2866)...Engelmann (2742)...Sp (111)...]

**β 1071.** θ *Ursae Majoris*

R.A. 9<sup>h</sup> 24<sup>m</sup> 49<sup>s</sup> }  
Decl. + 52° 13' }

|         |      |      |          |            |   |
|---------|------|------|----------|------------|---|
| 1889.23 | 74.9 | 5.09 | 3...13.7 | 3 <i>n</i> | β |
| 1890.38 | 79.1 | 4.87 | ...13.5  | 3 <i>n</i> | β |
| 1892.05 | 75.3 | 5.15 | ...14.2  | 3 <i>n</i> | β |
| 1898.27 | 76.4 | 5.22 | ...14.0  | 1 <i>n</i> | β |
| 1898.34 | 87.1 | 5.00 | ...      | 1 <i>n</i> | L |
| 1898.49 | 78.4 | 5.06 | ...14    | 2 <i>n</i> | A |

Very minute companion discovered with the 36-inch. It was obvious from the measures made with that instrument, in connection with the large proper motion of the principal star, that the two constituted a physical system. AUWERS (*Fundamentae Catalogue*) gives this proper motion, 1".101 in the direction of 240°.2. The measures to this time show no sensible relative motion. If the small star was fixed in space, the distance at the date of the last measure would be 15".1 and the angle 65°.

[β (xv)...β (2929,3048,3141)...β (*Pub. L. O.* 11)...Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...]

**β 339.** Lalande 18737

R.A. 9<sup>h</sup> 25<sup>m</sup> 17<sup>s</sup> }  
Decl. — 15° 13' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1876.17 | 215.8 | 1.28 | 8.8...9.6  | 2 <i>n</i> | Δ   |
| 1878.53 | 215.1 | 1.32 | 8.5...9.3  | 1 <i>n</i> | Cin |
| 1885.23 | 220.2 | 1.50 | 8.5...9.5  | 1 <i>n</i> | W   |
| 1888.23 | 219.3 | 1.31 | 9.0...10.2 | 1 <i>n</i> | Lv  |
| 1898.31 | 218.0 | 1.35 | ...        | 1 <i>n</i> | See |

Discovered with the 6-inch. No sensible change.

[β (vi)...β (2062)...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...Δ (i)...Lv<sup>1</sup>... See ( )...]

**β 909.** Lalande 18714

R.A. 9<sup>h</sup> 25<sup>m</sup> 25<sup>s</sup> }  
Decl. + 22° 23' }

|         |      |      |            |            |   |
|---------|------|------|------------|------------|---|
| 1879.48 | 91.5 | 5.66 | 7.2...12.0 | 3 <i>n</i> | β |
| 1892.17 | 91.1 | 5.94 | 7.3...12.0 | 3 <i>n</i> | β |

Discovered with the 18½-inch. There is no change.

[β (xiii)...β<sup>3</sup>...β (3141)...β (*Pub. L. O.* 11)...]

**β 910.** Lalande 18800

R.A. 9<sup>h</sup> 27<sup>m</sup> 10<sup>s</sup> }  
Decl. — 13° 28' }

|         |       |      |            |            |   |
|---------|-------|------|------------|------------|---|
| 1879.87 | 304.9 | 6.84 | 7.7...10.2 | 3 <i>n</i> | β |
| 1882.15 | 304.7 | 6.96 | 7.0... 9.5 | 1 <i>n</i> | W |
| 1892.06 | 305.9 | 6.68 | 7.3...10.7 | 3 <i>n</i> | β |
| 1893.22 | 305.0 | 6.33 | 7.4...10.4 | 2 <i>n</i> | J |

Discovered with the 18½-inch. Probably fixed.

[β (XIII)...β<sup>3</sup>...β (3141)...β (*Pub. L. O. 11*)...Wilson (Cin<sup>10</sup>)  
...Jones (*A. J. 312*)...]

**β 214.** Lalande 19064

R.A. 9<sup>h</sup> 35<sup>m</sup> 52<sup>s</sup> }  
Decl. — 17° 56' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1875.28 | 261.1 | 3.09 | 7.2...11.0 | 2 <i>n</i> | J   |
| 1877.11 | 259.2 | 2.92 | 7.5... 9.8 | 2 <i>n</i> | Cin |
| 1886.29 | 261.3 | 3.21 | 8.0...10.5 | 1 <i>n</i> | LM  |
| 1898.16 | 258.7 | 3.54 | ...        | 1 <i>n</i> | See |
| 1898.25 | 256.5 | 3.21 | 7.6...11.0 | 3 <i>n</i> | A   |

Discovered with the 6-inch. The motion, if any, is slow.

[β (IV)...β (*Mon. Not. xxxiv*, 382)...Δ (1)...Cin<sup>4</sup>...LM...  
See ( )...Aitken ( )...]

**β 215.** Lacaille 4058

R.A. 9<sup>h</sup> 48<sup>m</sup> 41<sup>s</sup> }  
Decl. — 27° 26' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1877.11 | 337.5 | 1.75 | 7.5... 9.0 | 1 <i>n</i> | Cin |
| 1884.21 | 345.2 | 1.88 | 7.5... 9.5 | 2 <i>n</i> | W   |
| 1893.32 | 341.5 | 1.52 | 7 ... 11   | 1 <i>n</i> | Sel |
| 1894.21 | 345.0 | 1.90 | 7.5... 9.8 | 2 <i>n</i> | W   |
| 1898.25 | 339.7 | 1.97 | 7.5...11.0 | 3 <i>n</i> | A   |
| 1898.28 | 346.0 | 1.71 | ...        | 1 <i>n</i> | See |

Discovered with the 6-inch. There is no evidence of motion.

[β (IV)...β (*Mon. Not. xxxiv*, 382)...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)  
...Sellors (3240)...Wilson ( )...Aitken ( )...See  
( )...]

**β 592.** O. Arg. S. 10209

R.A. 9<sup>h</sup> 49<sup>m</sup> 16<sup>s</sup> }  
Decl. — 15° 38' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1878.22 | 191.8 | 9.80 | 6.5...12.5 | 2 <i>n</i> | β   |
| 1879.27 | 191.7 | 9.57 | 7.5...12.0 | 1 <i>n</i> | Cin |
| 1879.82 | 191.6 | 9.86 | 6.6...11.7 | 3 <i>n</i> | β   |
| 1883.17 | 191.2 | ...  | 6.0...13.0 | 1 <i>n</i> | W   |
| 1898.28 | 193.0 | 9.95 | ...        | 1 <i>n</i> | See |

Discovered with the 18½-inch. Fixed.

[β (x)...β<sup>r</sup>...β<sup>3</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...See ( )...]

**β 216.** Lacaille 4074

R.A. 9<sup>h</sup> 51<sup>m</sup> 20<sup>s</sup> }  
Decl. — 25° 59' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1877.20 | 161.2 | 3.08 | 6.0...11.2 | 2 <i>n</i> | Cin |
| 1879.27 | 161.1 | 2.57 | 7.0...12.0 | 1 <i>n</i> | Cin |
| 1894.23 | 164.2 | 2.97 | 7.0...11.5 | 1 <i>n</i> | W   |
| 1898.16 | 162.2 | 4.00 | ...        | 1 <i>n</i> | See |
| 1899.02 | 160.2 | 3.37 | 6.5...10.0 | 1 <i>n</i> | β   |

Discovered with the 6-inch. Probably fixed.

[β (IV)...β (*Mon. Not. xxxiv*, 382)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson  
( )...See ( )...]

**β 1072.** Lalande 19689

R.A. 9<sup>h</sup> 58<sup>m</sup> 20<sup>s</sup> }  
Decl. — 17° 31' }

A and B

|         |      |       |            |            |     |
|---------|------|-------|------------|------------|-----|
| 1889.13 | 42.6 | 10.90 | 6.9...12.3 | 3 <i>n</i> | β   |
| 1898.34 | 43.5 | 11.16 | ...        | 1 <i>n</i> | See |
| 1899.04 | 43.9 | 10.94 | ...13.2    | 2 <i>n</i> | β   |

A and C (= Sh 110)

|         |       |       |            |            |     |
|---------|-------|-------|------------|------------|-----|
| 1823.34 | 272.7 | 21.50 | 7.0... 7.5 | 1 <i>n</i> | Sh  |
| 1889.13 | 273.2 | 21.23 | 6.9... 7.1 | 3 <i>n</i> | β   |
| 1898.34 | 273.0 | 21.45 | ...        | 1 <i>n</i> | See |
| 1899.04 | 273.8 | 20.84 | 7.0... 7.2 | 2 <i>n</i> | β   |

The faint companion to the principal star of H<sup>1</sup>N.25 (= Sh 110) was added with the 36-inch. All the measures of AC are given above. These stars appear to be fixed. They are Cord. G. C. 13722 and 13721.

[β (xv)...β (2929)...β (*Fub. L. O. 11*)...See ( )...]

**β 217.** Cord. G. C. 13789

R.A. 10<sup>h</sup> 1<sup>m</sup> 17<sup>s</sup> }  
Decl. — 24° 18' }

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1868.17 | 276.0 | 1.66 | ...        | 1 <sup>n</sup> | Hd  |
| 1876.10 | 94.9  | 1.90 | 7.9... 8.0 | 4 <sup>n</sup> | Cin |
| 1878.47 | 274.1 | 1.85 | 7.8... 7.9 | 3 <sup>n</sup> | Cin |
| 1880.22 | 277.6 | 2.08 | ...        | 1 <sup>n</sup> | Cin |
| 1882.18 | 274.6 | 2.03 | 7.7... 8.0 | 2 <sup>n</sup> | W   |
| 1893.32 | 279.7 | 1.75 | 7½... 7½   | 2 <sup>n</sup> | Sel |
| 1898.22 | 282.0 | 1.90 | ...        | 1 <sup>n</sup> | See |

Discovered with the 6-inch. Probably without motion. It had been previously seen by the Harvard observers, but not published until after β (1v).

[β (1v)...β (*Mon. Not.* xxxiv, 382)...Cin<sup>3</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>... Wilson (Cin<sup>10</sup>)...*Annals Harvard Obsy.* xiii...Sellors (3240)...See ( )...]

**β 218.** Lalande 19765

R.A. 10<sup>h</sup> 1<sup>m</sup> 41<sup>s</sup> }  
Decl. — 19° 7' }

|         | °     | "    |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.26 | 122.6 | 0.99 | 7.9... 8.4 | 4 <sup>n</sup> | Δ   |
| 1877.12 | 120.8 | 0.99 | 8.0... 8.2 | 2 <sup>n</sup> | Cin |
| 1878.53 | 121.9 | 0.97 | 7.9... 8.4 | 3 <sup>n</sup> | Cin |
| 1880.27 | 117.9 | 0.96 | 8.0... 8.2 | 1 <sup>n</sup> | β   |
| 1888.11 | 120.1 | 0.91 | 7.5... 7.9 | 2 <sup>n</sup> | Lv  |
| 1892.14 | 124.4 | 0.91 | 8.0... 8.1 | 3 <sup>n</sup> | β   |
| 1898.26 | 122.7 | 0.92 | ...        | 1 <sup>n</sup> | See |

Discovered with the 6-inch. The measures show no motion. This is the *p* star of a small equilateral triangle.

[β (1v)...β (*Mon. Not.* xxxiv, 382)...β<sup>3</sup>...β (3142)...β (*Pub. L. O.* 11)...Δ (1)...Cin<sup>4</sup>...Cin<sup>5</sup>...Lv<sup>1</sup>...See ( )...]

**β 911.** Lalande 19780

R.A. 10<sup>h</sup> 2<sup>m</sup> 41<sup>s</sup> }  
Decl. — 19° 10' }

A and B

|         | °     | "    |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1880.25 | 311.5 | 4.75 | 7.5... 11.2 | 2 <sup>n</sup> | β |
| 1892.10 | 313.4 | 4.77 | 7.3... 10.7 | 3 <sup>n</sup> | β |

|         | °     | "    |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1898.25 | 310.0 | 4.80 | ...         | 1 <sup>n</sup> | See |
| 1898.25 | 310.0 | 4.84 | 7.7... 12.0 | 3 <sup>n</sup> | A   |
| 1899.13 | 314.0 | 4.49 | 8.0... 12.0 | 1 <sup>n</sup> | β   |

A and C

|         | °    | "     |          |                |     |
|---------|------|-------|----------|----------------|-----|
| 1880.26 | 83.1 | 47.30 | ... 9.3  | 3 <sup>n</sup> | β   |
| 1892.10 | 79.1 | 49.34 | ... 10.0 | 3 <sup>n</sup> | β   |
| 1898.25 | 77.0 | 50.85 | ...      | 1 <sup>n</sup> | See |
| 1898.22 | 76.1 | 50.69 | ...      | 1 <sup>n</sup> | D   |
| 1898.25 | 77.4 | 51.29 | ... 9.7  | 3 <sup>n</sup> | A   |
| 1899.13 | 76.7 | 51.20 | ... 10.0 | 1 <sup>n</sup> | β   |

Discovered with the 18½-inch. The principal star has a large proper motion:

|           |   |   |                  |
|-----------|---|---|------------------|
| Radcliffe | - | - | " 0.364 in 195.8 |
| Porter    | - | - | 0.365 in 207.2   |

With the data given by Porter's value, and the measures of A and C in 1880, the position of C, if fixed, should be for 1898.25, 77° 0' : 51".26, which is practically identical with the actual measures made at Mt. Hamilton at the last-named date. The observations of AB show, beyond question, that the small star is moving in space at the same rate as A.

[β (xiii)...β<sup>3</sup>...β (3142)...β (*Pub. L. O.* 11)...See ( )... Doolittle (*Pub. Flower Obsy.* 1)...Aitken ( )...]

**β 790.** W<sup>1</sup> X. 26

R.A. 10<sup>h</sup> 4<sup>m</sup> 5<sup>s</sup> }  
Decl. — 12° 17' }

|         | °    | "    |             |                |     |
|---------|------|------|-------------|----------------|-----|
| 1881.36 | 67.9 | 2.17 | 8.6... 10.1 | 3 <sup>n</sup> | β   |
| 1888.74 | 70.0 | 2.18 | 9.0... 10.6 | 3 <sup>n</sup> | Com |
| 1888.96 | 67.2 | 2.13 | 9.2... 10.4 | 4 <sup>n</sup> | Lv  |
| 1899.09 | 67.2 | 1.97 | 8.8... 9.5  | 1 <sup>n</sup> | β   |

Discovered with the 15½-inch at the Washburn Observatory. The measures show no change. The magnitude in S.D. is 8.8. It is 10<sup>5</sup> *p* and 3.8 *s* of a 6 m star in *Hydra*.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy.* vi)...Lv<sup>1</sup>...]

**β 593. λ Hydrae**

R.A. 10<sup>h</sup> 4<sup>m</sup> 44<sup>s</sup> }  
Decl. — 11° 46' }

|         |       |       |   |         |                |   |
|---------|-------|-------|---|---------|----------------|---|
| 1878.23 | 118.4 | 50.76 | 4 | ...13.5 | 1 <sup>n</sup> | β |
| 1892.10 | 118.8 | 53.58 | 4 | ...13.3 | 3 <sup>n</sup> | β |
| 1898.98 | 117.5 | 54.46 |   | ...13.5 | 2 <sup>n</sup> | β |

The faint companion was noted with the 18½-inch. The proper motion of λ Hydrae is given by AUWERS (*Fundamental Catalogue*) as 0'.227 in the direction of 253°.3. This movement explains the change in the position of B.

[β (x)...β<sup>1</sup>...β (3142)...β (*Pub. L. O. 11*)...]

**β 25. W<sup>1</sup> X. 242**

R.A. 10<sup>h</sup> 15<sup>m</sup> 46<sup>s</sup> }  
Decl. — 9° 10' }

|         |       |       |        |     |                |     |
|---------|-------|-------|--------|-----|----------------|-----|
| 1867.10 | 187.9 | 0.88± | ...    |     | 1 <sup>n</sup> | Hd  |
| 1872.76 | 185.1 | 1.81  | 8.6... | 9.0 | 2 <sup>n</sup> | Du  |
| 1875.23 | 180.5 | 1.76  | 8.4... | 9.0 | 4 <sup>n</sup> | Δ   |
| 1878.23 | 179.6 | 1.66  | 8.0... | 9.0 | 2 <sup>n</sup> | Cin |
| 1880.24 | 180.8 | 1.85  | ...    |     | 1 <sup>n</sup> | Pt  |
| 1881.19 | 180.9 | 1.78  | 8.1... | 8.6 | 3 <sup>n</sup> | β   |
| 1886.30 | 178.9 | 1.96  | 8.0... | 9.0 | 1 <sup>n</sup> | LM  |
| 1888.22 | 178.6 | 1.86  | 8.0... | 8.8 | 2 <sup>n</sup> | Lv  |
| 1890.22 | 176.5 | 1.79  | ...    |     | 3 <sup>n</sup> | T   |

Discovered with the 6-inch but it had been previously seen by SCHJELLERUP (A. N. 1485; *Catalogue of 10,000 Stars*, p. xxiv). The measures are discordant in angle, and there is probably no sensible motion.

[β (1)...β (*Mon. Not.* xxxiii, 351)...β<sup>3</sup>...*Annals Harvard Obsy.* XIII)...Δ (1)...Dunér (*Mesures Microm.* 1876)...Cin<sup>5</sup>...Pritchett (*Pub. Morrison Obsy.* 1)...LM...Lv<sup>1</sup>...Tarrant (3186)...]

**β 219. Hydrae 214**

R.A. 10<sup>h</sup> 15<sup>m</sup> 56<sup>s</sup> }  
Decl. — 21° 55' }

|         |       |      |        |     |                |      |
|---------|-------|------|--------|-----|----------------|------|
| 1876.14 | 188.6 | 2.33 | 7.5... | 9.2 | 3 <sup>n</sup> | Cin  |
| 1878.70 | 188.5 | 2.05 | 6.7... | 8.7 | 1 <sup>n</sup> | Cin  |
| 1892.21 | 188.1 | 2.14 | 7.0... | 9.1 | 4 <sup>n</sup> | Lv.C |
| 1892.26 | 186.4 | 2.07 | 7.0... | 8.5 | 3 <sup>n</sup> | β    |
| 1898.16 | 187.7 | 2.77 | ...    |     | 1 <sup>n</sup> | See  |
| 1899.26 | 186.9 | 2.15 | 7.5... | 8.3 | 1 <sup>n</sup> | β    |

Discovered with the 6-inch. Evidently fixed. The principal star is 6.5 m in Cord. G. C., No. 14126.

[β (1v)...β (*Mon. Not.* xxxiv, 382)...β (3142)...β (*Pub. L. O. 11*)...Cin<sup>3</sup>...Cin<sup>5</sup>...Collins and Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...See ( )...]

**β 912. W<sup>1</sup> X. 253**

R.A. 10<sup>h</sup> 16<sup>m</sup> 26<sup>s</sup> }  
Decl. — 13° 4' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1879.17 | 106.3 | 0.95 | 8.6... | 11.9 | 2 <sup>n</sup> | β   |
| 1880.24 | 101.4 | ...  | 8.5... | 11.0 | 1 <sup>n</sup> | Cin |
| 1883.16 | 100.1 | ...  | 9.0... | 12.0 | 2 <sup>n</sup> | W   |
| 1894.19 | 106.0 | 1.30 | 9.0... | 11.8 | 2 <sup>n</sup> | W   |
| 1898.30 | 104.4 | 1.14 | 8.1... | 10.6 | 4 <sup>n</sup> | A   |

Discovered with the 6-inch. Probably without change. The magnitude in S.D. is 8.7.

[β (xiii)...β<sup>3</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Wilson ( )...Aitken ( )...]

**β 1280. Lalande 20225**

R.A. 10<sup>h</sup> 19<sup>m</sup> 55<sup>s</sup> }  
Decl. + 4° 33' }

B and C

|         |      |      |        |       |                |   |
|---------|------|------|--------|-------|----------------|---|
| 1892.06 | ...  | 1±   | 9      | ...11 |                | β |
| 1899.40 | 17.8 | 0.88 | 9.1... | 11.7  | 2 <sup>n</sup> | A |

A and BC

|         |       |        |        |     |                |   |
|---------|-------|--------|--------|-----|----------------|---|
| 1899.25 | 191.5 | 116.26 | 7.2... | 8.8 | 3 <sup>n</sup> | β |
|---------|-------|--------|--------|-----|----------------|---|

An examination of my observing book at the L.O. shows that the small star of this wide pair was noted as double with the 36 inch on January 22, 1892, and estimated as given above. It was forgotten, and not subsequently examined. I have looked at it several times with the 40-inch, and on one occasion it had the appearance of being double. It must be a difficult object, and the distance is probably less than 1".

These stars are 6.6 and 8.5 in Boss (*A.G.C.*). His positions for 1875 give 190° 2 : 116' 50.

[Since the foregoing was written, I have received from AITKEN the measures of the close pair inserted above.]

[Aitken ( )...]

**$\beta$  1281.** Lalande 20278

R.A.  $10^{\text{h}} 21^{\text{m}} 18^{\text{s}}$  }  
 Decl.  $+ 4^{\circ} 10'$  }

1899.26 71.8 0.87 8.2... 9.7 4<sup>n</sup>  $\beta$

This was discovered with the 40-inch in looking for the last preceding pair ( $\beta$  1280). It is not difficult. According to BOSS (*A.G.C.*) this star has a proper motion of  $0''.149$  in the direction of  $264^{\circ}.2$ . The magnitude in D.M. is 7.5. It is certain to be a physical system, since the components must have a common proper motion.

 **$\beta$  1073.** *Sextantis* 101

R.A.  $10^{\text{h}} 26^{\text{m}} 26^{\text{s}}$  }  
 Decl.  $- 5^{\circ} 27'$  }

1889.29 46.9 3.02 7.0... 11.5 3<sup>n</sup>  $\beta$   
 1898.13 46.8 3.42 7.0... 11.8 2<sup>n</sup> A

Discovered with the 36-inch. No material change. Lalande 20428. Magnitude in L  $6\frac{1}{2}$ ; in S.D. 7.2.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

 **$\beta$  1269.** 44 *Hydrae*

R.A.  $10^{\text{h}} 28^{\text{m}} 18^{\text{s}}$  }  
 Decl.  $- 23^{\circ} 8'$  }

1892.23 63.8 18.33 5 ... 14 1<sup>n</sup>  $\beta$   
 1898.22 59.7 19.09 ... 1<sup>n</sup> See  
 1899.04 59.9 18.75 ... 13.2 2<sup>n</sup>  $\beta$

Distant companion noted with the 36-inch. The principal star has a proper motion of  $0''.047$  in the direction of  $309^{\circ}.9$  (AUWERS).

[ $\beta$  (xix)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)...See ( )...]

 **$\beta$  1074.** Lalande 20453

R.A.  $10^{\text{h}} 28^{\text{m}} 20^{\text{s}}$  }  
 Decl.  $+ 46^{\circ} 16'$  }

1889.27 208.4 2.10 6.4... 11.2 3<sup>n</sup>  $\beta$   
 1899.33 205.0 2.50 6.5... 11.2 2<sup>n</sup> A

Discovered with the 36-inch. The magnitude in D.M. is 7.2.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

 **$\beta$  411.** Lacaille 4360

R.A.  $10^{\text{h}} 30^{\text{m}} 25^{\text{s}}$  }  
 Decl.  $- 26^{\circ} 3'$  }

1878.28 294.6 1.33 6.7... 8.0 2<sup>n</sup> Cin  
 1892.28 288.3 1.08 6.4... 8.2 3<sup>n</sup>  $\beta$   
 1892.30 290.6 1.29 6.8... 8.5 4<sup>n</sup> Lv  
 1893.32 287.6 1.00 7 ... 8.0 2<sup>n</sup> Sel  
 1898.16 278.8 0.87 ... 1<sup>n</sup> See

Discovered with the 6-inch. Change is uncertain. A naked-eye star according to HEIS. In Cord. G. C. 6.6 m *Hydra*.

[ $\beta$  (vii)... $\beta$  (2103,3141)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>4</sup>...Cin<sup>5</sup>...  
 Collins and Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsv.*  
 1892)...Sellors (3240)...See ( )...]

 **$\beta$  1075.**  $\phi^2$  *Hydrae*

R.A.  $10^{\text{h}} 30^{\text{m}} 25^{\text{s}}$  }  
 Decl.  $- 15^{\circ} 43'$  }

1889.14 277.1 3.03 6 ... 13.0 3<sup>n</sup>  $\beta$   
 1898.22 283.1 2.92 ... 1<sup>n</sup> See  
 1899.02 275.3 3.25 ... 13.1 2<sup>n</sup>  $\beta$

Discovered with the 36-inch. AUWERS gives the proper motion of the bright star,  $0''.065$  in the direction of  $287^{\circ}.0$ . This is nearly in the line of the companion, so that it will soon be a very difficult object if the companion does not have the same movement. The measures point to common proper motion.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...See ( )...]

 **$\beta$  913.** 40 *Leonis Minoris*

R.A.  $10^{\text{h}} 36^{\text{m}} 26^{\text{s}}$  }  
 Decl.  $+ 26^{\circ} 57'$  }

A and B

1880.30 122.8 10.92 6.0... 13.0 4<sup>n</sup>  $\beta$   
 1892.14 119.9 12.27 6.0... 12.7 3<sup>n</sup>  $\beta$   
 1898.34 119.3 12.85 6.0... 13.0 3<sup>n</sup> A  
 1899.02 118.1 13.10 ... 12.5 1<sup>n</sup>  $\beta$

A and C

1898.31 77.3 39.71 ... 14 1<sup>n</sup> A

A and D

1899.02 275.9 55.75 ... 13.5 in  $\beta$

Discovered with the 18½-inch. The distant star, C, was added by AITKEN with the 36-inch. PORTER gives the proper motion of the principal star, 0.131 in the direction of 259°.7. This seems to account for the change in the companion.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (*Ast. Reg.* XVIII, 140)... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

$\beta$  914. Lalande 20750

R.A. 10<sup>h</sup> 39<sup>m</sup> 46<sup>s</sup> }  
Decl. - 10° 14' }

1880.27 338.6 1.30 6.8...11.4 2n  $\beta$   
1894.24 337.8 1.46 7.7...12.0 2n W

Discovered with the 18½-inch.

[ $\beta$  (XIII)... $\beta^3$ ...Wilson ( )...]

$\beta$  595. Lalande 20804

R.A. 10<sup>h</sup> 41<sup>m</sup> 48<sup>s</sup> }  
Decl. - 14° 29' }

1878.21 14.6 2.32 9.0...11.0 1n  $\beta$   
1879.20 17.8 2.00 8.5...10.0 1n  $\beta$   
1880.26 18.1 1.95 ... 1n Pt  
1884.99 13.0 1.95 8.1...10.5 3n W  
1898.26 12.4 2.24 9.0...10.5 3n A

Discovered with the 18½-inch. Probably without change.

[ $\beta$  (X)... $\beta^1$ ... $\beta^3$ ...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...Pritchett (*Pub. Morrison Obsy.* 1)...Aitken ( )...]

$\beta$  596. Leonis 222

R.A. 10<sup>h</sup> 43<sup>m</sup> 2<sup>s</sup> }  
Decl. + 17° 47' }

1878.26 277.3 2.38 6.5...13 2n  $\beta$   
1886.22 274.7 2.96 ... 2n H $\Sigma$   
1891.28 278.6 2.56 6.7...11.7 3n  $\beta$

Discovered with the 18½-inch. Unchanged. Lalande 20827.

(X)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...H $\Sigma$  ( )...]

$\beta$  915. D.M. (25°) 2303

R.A. 10<sup>h</sup> 43<sup>m</sup> 13<sup>s</sup> }  
Decl. + 24° 55' }

1880.37 232.9 1.18 9.0... 9.2 2n  $\beta$   
1892.30 232.5 0.7± 9.0... 9.0 4n Lv  
1895.35 226.7 1.14 ... 1n Lew  
1896.52 231.2 1.26 ... 2n A  
1897.30 226.2 ... 1n Bow

Discovered with the 18½-inch. Apparently without change. Near  $\Sigma$  1478.

[ $\beta$  (XIII)... $\beta^3$ ...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Aitken (3395)...Bowyer (*Mon. Not.* LIX, 400)...]

$\beta$  III. S.D. (8°) 3023

R.A. 10<sup>h</sup> 45<sup>m</sup> 11<sup>s</sup> }  
Decl. - 8° 28' }

1875.21 3.3 3.32 9.9...10.3 3n  $\Delta$   
1880.66 6.3 3.59 9.0... 9.3 2n  $\beta$   
1881.28 6.2 3.51 ... 1n Pt  
1884.57 5.0 3.65 9.0... 9.3 3n W  
1886.30 3.3 3.54 9.0... 9.0 1n LM  
1888.24 5.4 3.51 9.4... 9.5 5n Lv  
1898.25 4.6 3.52 9.0... 9.0 3n A

Discovered with the 6-inch. Without change.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\Delta$  (1)...LM...Lv<sup>1</sup>...Wilson (Cin<sup>10</sup>)...Pritchett (*Pub. Morrison Obsy.* 1)...Aitken ( )...]

$\beta$  597. D.M. (24°) 2285

R.A. 10<sup>h</sup> 48<sup>m</sup> 20<sup>s</sup> }  
Decl. + 24° 24' }

1878.22 46.9 0.88 8.5...11.0 2n  $\beta$   
1894.24 46.2 0.79 8.8...10.7 3n W

Discovered with the 18½-inch.

[ $\beta$  (X)... $\beta^1$ ...Wilson ( )...]

**β 1076.** 55 *Leonis*

R.A. 10<sup>h</sup> 49<sup>m</sup> 32<sup>s</sup> }  
Decl. + 1° 23' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1889.28 | 49.7 | 0.99 | 5.8...10.3 | 3 <sup>n</sup> | β |
| 1898.22 | 35.0 | 0.88 | 6.0...10.7 | 3 <sup>n</sup> | A |
| 1899.12 | 31.9 | 0.82 | 6.0...10.5 | 1 <sup>n</sup> | A |

Discovered with the 36-inch. AUWERS gives the proper motion of this star 0".086 in the direction of 84°.7. It is obvious from the measures that, if this value is approximately correct, the movement belongs to both components, and that the companion has a retrograde motion around the primary. With this proper motion, and the relation given by the measures of 1889, the position of the companion in 1898, if fixed in space, should have been 358°.1 : 0".57.

[β (xv)...β (2929)...β (*Pub. L.O.* 11)...Aitken ( )...]

**β 598.** 59 *Leonis*

R.A. 10<sup>h</sup> 54<sup>m</sup> 32<sup>s</sup> }  
Decl. + 6° 45' }

|         |       |       |            |                |   |
|---------|-------|-------|------------|----------------|---|
| 1878.24 | 220.9 | 46.76 | 5.5...13   | 1 <sup>n</sup> | β |
| 1892.12 | 221.2 | 46.05 | 5.7...13.4 | 3 <sup>n</sup> | β |
| 1898.26 | 221.3 | 46.40 | 5.5...14.0 | 2 <sup>n</sup> | A |
| 1898.96 | 220.5 | 46.83 | ...        | 1 <sup>n</sup> | β |

Discovered with the 18½-inch. The proper motion of 59 *Leonis* from AUWERS is 0".085 in the position angle of 270°.

[β (x)...β<sup>r</sup>...β (3142)...β (*Pub. L. O.* 11)...Aitken ( )...]

**β 1077.** α *Ursae Majoris*

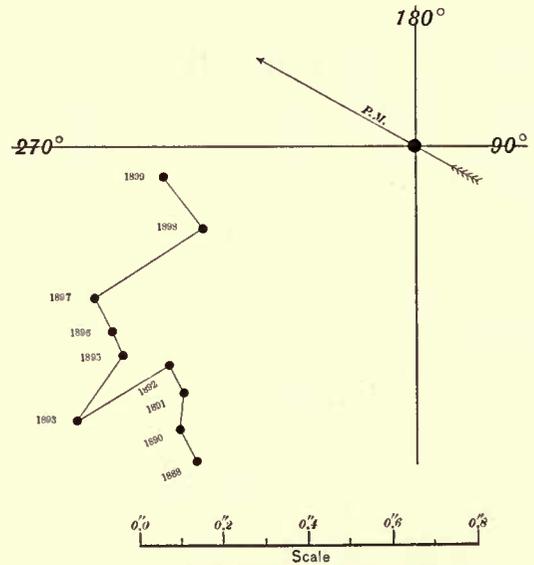
R.A. 10<sup>h</sup> 56<sup>m</sup> 19<sup>s</sup> }  
Decl. + 62° 24' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1888.19 | 326.1 | 0.91 | 2.0...11.1 | 4 <sup>n</sup> | β   |
| 1890.26 | 320.1 | 0.87 | ...        | 4 <sup>n</sup> | β   |
| 1890.53 | 316.7 | 0.81 | ...        | 3 <sup>n</sup> | HΣ  |
| 1891.30 | 316.8 | 0.80 | ...11.0    | 4 <sup>n</sup> | β   |
| 1892.11 | 311.5 | 0.78 | ...11.0    | 3 <sup>n</sup> | β   |
| 1893.49 | 308.9 | 1.03 | ...        | 2 <sup>n</sup> | Bar |
| 1895.25 | 305.5 | 0.85 | ...        | 1 <sup>n</sup> | Com |
| 1896.30 | 301.4 | 0.84 | ...        | 2 <sup>n</sup> | Com |
| 1897.81 | 295.4 | 0.84 | ...        | 1 <sup>n</sup> | β   |

|         |       |      |     |                |   |
|---------|-------|------|-----|----------------|---|
| 1898.35 | 291.1 | 0.54 | ... | 1 <sup>n</sup> | β |
| 1899.17 | 277±  | 0.6± | ... | 1 <sup>n</sup> | A |

This interesting system was discovered with the 36-inch. The measures at Mt. Hamilton were sufficient to show that it was a binary, since the proper motion of the principal star would have been apparent after a short interval in the changed position of the companion. AUWERS (*Fundamental Catalogue*) gives the proper motion of α *Ursae* as 0".149 in the direction of 240°.2, and it was evident at the time it was first seen double that the companion had the same movement in space, as otherwise it would have been recorded as a double star long before. The orbital motion is retrograde, and thus far about 3".5 per year. There seems to have been no great change in the distance. It is not improbable that this is about the maximum distance, and that it may prove to have a short period. With a much nearer approach it will be difficult, if not impossible, to measure with the largest instruments now in use.

The principal positions are shown on the accompanying diagram :



α *Ursae Majoris* β 1077

There is a small star 384".95 distant from α in the direction of 203°.5 (1881.12) which has nearly the same proper motion, 0".222 in 232°.5.

[β (xv)...β (2891,2929,2979,3048,3114,3142)...β (*Knowledge*, July 1891)...β (*Pub. L. O.* 11)...Comstock (*Pub. Washburn Obsy.* x)...Barnard (*A. J.* 417)...HΣ ( )...Aitken ( )...]

**β 599. 65 Leonis**

R.A. 11<sup>h</sup> 0<sup>m</sup> 47<sup>s</sup> }  
Decl. + 2° 36' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1878.20 | 82.4 | 1.78 | 5.5...11.5 | 4 <sup>n</sup> | β   |
| 1879.27 | 84.3 | 1.47 | 6.0... 9.5 | 1 <sup>n</sup> | Cin |
| 1886.28 | 88.7 | 2.23 | ...        | 2 <sup>n</sup> | HΣ  |
| 1887.32 | 87.0 | 1.66 | 5.5...11.0 | 3 <sup>n</sup> | T   |
| 1889.27 | 88.5 | 1.78 | 5.6...10.5 | 3 <sup>n</sup> | β   |
| 1893.34 | 86.7 | 1.87 | ...        | 2 <sup>n</sup> | Sp  |
| 1894.24 | 85.3 | 1.94 | 6.0...10.8 | 3 <sup>n</sup> | W   |
| 1899.13 | 93.2 | 1.95 | ...        | 1 <sup>n</sup> | β   |

Discovered with the 18½-inch. AUWERS gives the proper motion of this star 0".434 in the direction of 262°.1. It is obvious from the measures that this belongs also to the small star, and they must form a physical system. The relative motion appears to be direct.

[β (x)...β<sup>2</sup>...β (2930)...β (Pub. L. O. II)...Cin<sup>5</sup>...Tarrant (2899)...Sp (III)...Wilson ( )...HΣ ( )...]

**β 220. Crateris 22**

R.A. 11<sup>h</sup> 6<sup>m</sup> 33<sup>s</sup> }  
Decl. - 17° 51' }

|         |       |      |            |                 |     |
|---------|-------|------|------------|-----------------|-----|
| 1875.27 | 143.6 | 0.58 | 6.4... 7.0 | 2 <sup>n</sup>  | Δ   |
| 1877.29 | 150.1 | 0.65 | 5.8... 6.2 | 1 <sup>n</sup>  | Cin |
| 1877.93 | 143.5 | 0.55 | 6.4... 7.0 | 10 <sup>n</sup> | Sp  |
| 1878.22 | 140.0 | ...  | 6.0... 6.8 | 2 <sup>n</sup>  | Cin |
| 1880.21 | 323.8 | 0.87 | 6.0... 7.0 | 1 <sup>n</sup>  | Cin |
| 1880.33 | 151.1 | 0.68 | ...        | 1 <sup>n</sup>  | Pt  |
| 1884.10 | 149.1 | 0.45 | 5.0... 6.4 | 5 <sup>n</sup>  | En  |
| 1887.27 | 140.3 | 0.58 | ...        | 3 <sup>n</sup>  | Sp  |
| 1889.10 | 136.1 | 0.71 | 6.1... 6.8 | 4 <sup>n</sup>  | Lv  |
| 1890.24 | 137.0 | 0.65 | 6.5... 7.0 | 3 <sup>n</sup>  | T   |
| 1893.38 | 140.3 | 0.66 | 6.2... 6.6 | 2 <sup>n</sup>  | J   |
| 1898.16 | 138.8 | 0.44 | ...        | 1 <sup>n</sup>  | See |

Discovered with the 6-inch. This is ψ Crateris of BODE. In ARGELANDER and HEIS 6 m. Lalande 21445. Very little, if any, change.

[β (IV)...β (Mon. Not. xxxiv, 382)...Δ (I)...Δ (2086)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Sp (2133)...Sp (II app.)...Pritchett (Pub. Morrison Obsy. I)...Engelmann (2678)...Lv...Tarrant (3186)...Jones (A. J. 312)...See ( )...]

**β 1282. δ Leonis**

R.A. 11<sup>h</sup> 7<sup>m</sup> 43<sup>s</sup> }  
Decl. + 21° 11' }

|          |       |        |          |                |   |
|----------|-------|--------|----------|----------------|---|
| B and C  |       |        |          |                |   |
| 1889.09  | 190°± | "±     | 9.5...12 |                | β |
| A and BC |       |        |          |                |   |
| 1899.13  | 344.5 | 187.32 | 3 ...    | 1 <sup>n</sup> | β |

I find in my L. O. Observing book, under date of February 4, 1889, with the 36-inch, noted, "The distant companion to δ Leonis is a very difficult double," with angle and distance estimated as given above. I have examined this several times with the 40-inch, but have not been able to see the close pair. As there was no doubt expressed of the duplicity of the small star, it is inserted here.

[Since the foregoing was written I have received from AITKEN a set of measures with the 36-inch, giving:

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1899.44 | 204.3 | 0.36 | 9.0... 9.3 | 3 <sup>n</sup> | A |
|---------|-------|------|------------|----------------|---|

There is, therefore, no doubt of the duplicity of this star.]

**β 916. Crateris 31**

R.A. 11<sup>h</sup> 8<sup>m</sup> 4<sup>s</sup> }  
Decl. - 14° 47' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.13 | 360°± | 0.7± | 7.5...     |                | β   |
| 1879.27 | 354.4 | ...  | 8.5... 9.0 | 1 <sup>n</sup> | Cin |
| 1880.33 | 368.0 | ...  | ...        | 1 <sup>n</sup> | Pt  |
| 1884.77 | 362.2 | ...  | 8.0... 9.5 | 2 <sup>n</sup> | W   |
| 1888.45 | 357.7 | 0.64 | 7.0... 8.2 | 3 <sup>n</sup> | Lv  |
| 1889.25 | 360.2 | 0.88 | 7.5... 8.3 | 3 <sup>n</sup> | β   |
| 1897.23 | 354.5 | 0.72 | 7+... 8+   | 1 <sup>n</sup> | D   |
| 1898.27 | 360.6 | 0.66 | 7.4... 7.6 | 4 <sup>n</sup> | A   |

Discovered with the 18½-inch. Early measures are wanting, but the change, if any, is slow. The magnitude in S.D. is 8.0. Lalande 21488.

[β (XIII)...β<sup>3</sup>...β (2930)...β (Pub. L. O. II)...Cin<sup>5</sup>...Pritchett (Pub. Morrison Obsy. I)...Wilson (Cin<sup>10</sup>)...Lv<sup>1</sup>...Doolittle (Pub. Flower Obsy. I)...Aitken ( )...]

**$\beta$  1283.** D.M. (16°) 2235

R.A. 11<sup>h</sup> 8<sup>m</sup> 7<sup>s</sup> }  
Decl. + 16° 10' }

In my L.O. observing book of February 4, 1889, I find this star was under observation with the 36-inch, and it was noted: "The 9 m star *nf*  $\theta$  *Leonis* is 0'.5 double." I have examined this several times with the 40-inch, and on one occasion it appeared elongated, but nothing further could be done with it. The D.M. magnitude is 9.0. It is 10° 0' *f*, and 4' 58" *n* of  $\theta$  *Leonis*. I am certain this star will prove to be a close pair, and therefore give it a place in this catalogue.

 **$\beta$  600.** *Crateris* 36

R.A. 11<sup>h</sup> 10<sup>m</sup> 53<sup>s</sup> }  
Decl. - 6° 29' }

## A and B

|         |        |      |            |                |         |
|---------|--------|------|------------|----------------|---------|
| 1878.15 | 226.4  | 1.25 | 6.5...12.0 | 1 <sup>n</sup> | $\beta$ |
| 1892.17 | 216.0  | 1.23 | 6.5...13.0 | 2 <sup>n</sup> | $\beta$ |
| 1898.27 | 240.67 | 0.98 | 6.0...12.0 | 3 <sup>n</sup> | A       |

A and C (= H<sup>x</sup> N. 26)

|         |      |       |            |                |         |
|---------|------|-------|------------|----------------|---------|
| 1823.31 | 97.6 | 67.06 | ...        | 1 <sup>n</sup> | Sh      |
| 1878.89 | 97.4 | 61.25 | 6.0... 8.0 | 3 <sup>n</sup> | $\beta$ |
| 1892.16 | 97.6 | 60.46 | 6.7... 8.6 | 3 <sup>n</sup> | $\beta$ |
| 1898.27 | 97.7 | 60.59 | 6.0... 8.5 | 3 <sup>n</sup> | A       |
| 1898.29 | 97.4 | 60.53 | 7.0... 8.7 | 1 <sup>n</sup> | $\beta$ |

The minute attendant to this wide pair of HERSCHEL (= Sh 120) was discovered with the 18½-inch. There appears to be a decided change in the close pair. All the measures of A and C are given above. The distance in Sh is probably too large. These stars are respectively W<sup>x</sup> XI. 148 and 152. HEIS gives this as a naked-eye star, 6-7 m; Cord. G.C. 6.0. Lalande 21540.

[ $\beta$  (x)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

 **$\beta$  791.** W<sup>x</sup> XI. 197

R.A. 11<sup>h</sup> 13<sup>m</sup> 26<sup>s</sup> }  
Decl. + 7° 32' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.32 | 199.9 | 2.06 | 8.3...10.3 | 3 <sup>n</sup> | $\beta$ |
| 1888.38 | 198.5 | 2.21 | 8.5...10.0 | 3 <sup>n</sup> | Com     |
| 1898.27 | 197.3 | 2.15 | 8.7...10.8 | 3 <sup>n</sup> | A       |

Discovered with the 15½-inch at the Washburn Observatory. In D.M. 9.0 m.

[ $\beta$  (XII)... $\beta^2$ ...Comstock (*Pub. Washburn Obsy.* vi)...Aitken ( )...]

 **$\beta$  26.** Lalande 21697

R.A. 11<sup>h</sup> 17<sup>m</sup> 42<sup>s</sup> }  
Decl. - 9° 46' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.50 | 70.3 | 2.80 | 7.2...10.2 | 4 <sup>n</sup> | $\Delta$ |
| 1879.31 | 66.4 | 2.66 | 7.5...10.0 | 2 <sup>n</sup> | Cin      |
| 1888.67 | 68.7 | 2.86 | 7.9...10.4 | 2 <sup>n</sup> | Lv       |
| 1890.23 | 71.0 | 2.92 | 7.0...10.5 | 2 <sup>n</sup> | T        |
| 1899.11 | 70.8 | 2.60 | 7.7...10.0 | 2 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Probably without change.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...Lv<sup>1</sup>...Tarrant (3186)...]

 **$\beta$  601.** S.D. (16°) 3259

R.A. 11<sup>h</sup> 23<sup>m</sup> 15<sup>s</sup> }  
Decl. - 16° 41' }

## B and C

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.32 | 226.9 | 0.81 | 8.0... 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1879.34 | 232.3 | 0.73 | 8.0... 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1879.18 | 224.6 | 0.87 | 7.2... 8.7 | 2 <sup>n</sup> | Cin     |
| 1880.29 | 224.9 | ...  | 8.0... 9.0 | 1 <sup>n</sup> | Cin     |
| 1886.29 | 217.9 | ...  | 7 ... 9    | 1 <sup>n</sup> | LM      |
| 1886.31 | 219.9 | 1.04 | 8.5... 9.0 | 1 <sup>n</sup> | W       |
| 1888.65 | 223.2 | 0.75 | 7.7... 8.7 | 2 <sup>n</sup> | Lv      |
| 1898.26 | 220.0 | 1.01 | 8.5... 9.3 | 3 <sup>n</sup> | A       |
| 1898.38 | 220.9 | 0.95 | ...        | 1 <sup>n</sup> | See     |

## A and BC (= S 627)

|         |       |       |            |                |                |
|---------|-------|-------|------------|----------------|----------------|
| 1783.34 | 148.7 | 26.25 | ...        | 1 <sup>n</sup> | H <sup>x</sup> |
| 1825.25 | 330.7 | 29.96 | 8.5... 9   | 3 <sup>n</sup> | S              |
| 1878.34 | 331.6 | 28.16 | 7.5...     | 2 <sup>n</sup> | $\beta$        |
| 1879.30 | 330.9 | 28.21 | 8.0... 8.5 | 2 <sup>n</sup> | Cin            |
| 1880.29 | 331.6 | 28.30 | 6.0...     | 2 <sup>n</sup> | Cin            |
| 1886.31 | 330.8 | 27.69 | 8.0...     | 1 <sup>n</sup> | W              |
| 1898.26 | 330.4 | 28.31 | 7.5... 8.5 | 3 <sup>n</sup> | A              |
| 1898.38 | 331.1 | 28.36 | ...        | 1 <sup>n</sup> | See            |

The close pair was discovered with the 18½-inch. There is no material change, and the wide pair is

certainly fixed. The foregoing are all the measures (= H<sup>r</sup> IV. 112 = S 627).

[ $\beta$  (x)... $\beta^r$ ... $\beta^s$ ...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Lv<sup>1</sup>...LM...See ( )...Aitken ( )...]

$\beta$  340. W<sup>r</sup> XI. 390

R.A. 11<sup>h</sup> 23<sup>m</sup> 49<sup>s</sup> }  
Decl. + 3° 52'

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1876.33 | 7.2  | 3.87 | 8.0...10.2 | 3 <sup>n</sup> | $\Delta$ |
| 1880.28 | 6.8  | 3.94 | ...        | 1 <sup>n</sup> | Pt       |
| 1883.84 | 8.3  | 4.25 | 7.9...10.1 | 9 <sup>n</sup> | En       |
| 1893.33 | 9.0  | 4.28 | 8.1...10.5 | 2 <sup>n</sup> | Gl       |
| 1898.20 | 16.8 | 4.23 | ...        | 3 <sup>n</sup> | D        |
| 1899.04 | 7.5  | 4.26 | 8.4...9.6  | 2 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Change, if any, is small.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (1)...Pritchett (*Pub. Morrison Obsy.* 1)...Engelmann (2678)...Glaserapp (11)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  456. Lalande 22020

R.A. 11<sup>h</sup> 30<sup>m</sup> 44<sup>s</sup> }  
Decl. - 11° 41'

|         |       |       |           |                |         |
|---------|-------|-------|-----------|----------------|---------|
| 1877.35 | 248.0 | 0.65  | 10...10   | 2 <sup>n</sup> | H1      |
| 1878.22 | 257.0 | ...   | 8.7...9.0 | 2 <sup>n</sup> | Cin     |
| 1880.24 | 255.2 | ...   | 9.5...9.5 | 1 <sup>n</sup> | Cin     |
| 1892.37 | 274.2 | 0.46  | 8.7...9.0 | 3 <sup>n</sup> | $\beta$ |
| 1894.28 | 278.7 | 0.31  | ...       | 1 <sup>n</sup> | Com     |
| 1895.32 | 269.7 | 0.25± | ...       | 1 <sup>n</sup> | Com     |
| 1898.21 | 290.8 | 0.41  | 8.5...9.0 | 3 <sup>n</sup> | A       |

Discovered with the 6-inch. It is a binary system beyond question. In S.D. 9.0 m. Rapid motion in angle will continue. It should be carefully measured each year for the present.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...Hall (1)...Hall (2147)...Cin<sup>5</sup>...Cin<sup>6</sup>...Comstock (*Pub. Washburn Obsy.* x)...Aitken ( )...]

$\beta$  1078. Crateris 79

R.A. 11<sup>h</sup> 33<sup>m</sup> 47<sup>s</sup> }  
Decl. - 13° 48'

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1889.30 | 49.8 | 8.22 | 6.3...12.2 | 3 <sup>n</sup> | $\beta$ |
| 1898.25 | 51.8 | 8.11 | 6.0...13.5 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. No sensible change. This is a naked-eye star, HEIS 6-7 m; GOULD 6.2. Lalande 22102.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

$\beta$  792. Schj. 4219

R.A. 11<sup>h</sup> 35<sup>m</sup> 32<sup>s</sup> }  
Decl. + 3° 32'

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.34 | 204.5 | 1.92 | 8.3...11.0 | 3 <sup>n</sup> | $\beta$ |
| 1888.35 | 199.2 | 1.94 | 8.2...11.1 | 4 <sup>n</sup> | Com     |
| 1898.20 | 198.9 | 2.23 | 8...11     | 3 <sup>n</sup> | D       |
| 1898.27 | 202.7 | 2.19 | 8.5...11.0 | 3 <sup>n</sup> | A       |

Discovered with the 15½-inch at the Washburn Observatory. Apparently fixed.

[ $\beta$  (xii)... $\beta^2$ ...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken ( )...]

$\beta$  917. Lalande 22179

R.A. 11<sup>h</sup> 37<sup>m</sup> 25<sup>s</sup> }  
Decl. + 11° 22'

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1880.31 | 175.0 | 3.70 | 8.0...10.4 | 4 <sup>n</sup> | $\beta$ |
| 1892.24 | 177.1 | 3.59 | 8.1...10.3 | 3 <sup>n</sup> | $\beta$ |
| 1892.24 | 175.4 | 3.19 | 7.8...11.0 | 4 <sup>n</sup> | Col     |
| 1898.17 | 175.3 | 3.86 | 8...11     | 4 <sup>n</sup> | D       |
| 1898.32 | 176.3 | 3.63 | 7.8...10.8 | 3 <sup>n</sup> | A       |

Discovered with the 18½-inch. There is no change.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...Collins (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Aitken ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  793. D.M. (7°) 2474

R.A. 11<sup>h</sup> 37<sup>m</sup> 26<sup>s</sup> }  
Decl. + 7° 14'

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.32 | 114.2 | 1.33 | 9.6...10.3 | 3 <sup>n</sup> | $\beta$ |
| 1888.35 | 113.1 | 1.66 | 9.2...10.8 | 3 <sup>n</sup> | Com     |
| 1898.21 | 112.5 | 1.62 | 9...10+    | 4 <sup>n</sup> | D       |
| 1898.40 | 111.2 | 1.58 | 9.5...10.3 | 3 <sup>n</sup> | A       |

Discovered with the 15½-inch at the Washburn Observatory. The apparent change in the angle may not be real.

[ $\beta$  (xii)... $\beta^2$ ...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken ( )...]

**β 602.** Lalande 22262

R.A. 11<sup>h</sup> 40<sup>m</sup> 39<sup>s</sup> }  
Decl. + 15° 40' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1878.15 | 73.4 | 0.57 | 8.5...11.0 | 1 <sup>n</sup> | β |
| 1891.30 | 80.0 | 0.47 | 8.3...11.0 | 3 <sup>n</sup> | β |
| 1898.44 | 76.9 | 0.43 | 8.0...12.5 | 2 <sup>n</sup> | A |

Discovered with the 18½-inch. The measures are insufficient to decide as to the question of motion. It has been a more difficult pair than the magnitudes and distance would indicate.

[β (x)...β<sup>1</sup>...β (3114)...β (Pub. L. O. II)...Aitken ( )...]

**β 603.** Leonis 472. B.A.C. 3992

R.A. 11<sup>h</sup> 42<sup>m</sup> 28<sup>s</sup> }  
Decl. + 14° 57' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1878.21 | 337.2 | 1.52 | 6.7...11.0 | 2 <sup>n</sup> | β   |
| 1880.28 | 335.7 | 1.13 | 6.5... 9.7 | 2 <sup>n</sup> | β   |
| 1882.33 | 335.4 | 0.90 | 6 ... 10   | 1 <sup>n</sup> | Ho  |
| 1886.28 | 324.4 | 1.33 | ...        | 2 <sup>n</sup> | HΣ  |
| 1889.27 | 326.7 | ...  | 7.0...10.0 | 1 <sup>n</sup> | Lv  |
| 1889.71 | 329.1 | 0.68 | ...        | 1 <sup>n</sup> | Sp  |
| 1891.26 | 328.7 | 1.16 | 6.4...10.2 | 3 <sup>n</sup> | β   |
| 1894.85 | 324.7 | 1.16 | ...        | 2 <sup>n</sup> | Bar |
| 1895.67 | 326.3 | 1.05 | ...        | 1 <sup>n</sup> | Lew |
| 1897.33 | 321.2 | 0.88 | ...        | 3 <sup>n</sup> | Lew |
| 1897.34 | 320.9 | 1.07 | 6+...10    | 3 <sup>n</sup> | A   |
| 1898.32 | 321.1 | 0.88 | ...        | 1 <sup>n</sup> | Bow |

Discovered with the 18½-inch. This star is 1134".3 from β Leonis in the position-angle of 201°.5 (1864.4) Knott. In B.A.C. 6½ m; D.M. 7.0. Certainly binary in slow retrograde motion. A more rapid change in the angle may be expected. PORTER gives this star a proper motion of 0".141 in the direction of 284°.4.

[β (x)...β<sup>1</sup>...β<sup>3</sup>...β (Mon. Not. XXXVIII, 408)...β (3114)...β (Pub. L. O. II)...Ho (2978)...Lv<sup>1</sup>...Sp (III)...Lewis (Greenwich Obsns. 1895) (Mon. Not. LIX, 400)...Dyson (Mon. Not. LVI, 359)...Knott (Mem. R. A. S. XLIII)...Aitken (3465)...Barnard (A. J. 447)...Lewis ( )...HΣ ( )...]

**β 604.** β Leonis

R.A. 11<sup>h</sup> 42<sup>m</sup> 56<sup>s</sup> }  
Decl. + 15° 15' }

## A and B

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1898.40 | 346.2 | 39.74 | ...15.5 | 3 <sup>n</sup> | A |
|---------|-------|-------|---------|----------------|---|

## A and C

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1878.28 | 344.2 | 77.14 | 2 ... 13 | 1 <sup>n</sup> | β |
| 1892.19 | 349.0 | 78.10 | ... 14   | 2 <sup>n</sup> | β |
| 1898.34 | 351.2 | 79.36 | ... 15   | 1 <sup>n</sup> | β |
| 1898.40 | 351.4 | 78.89 | ... 14.3 | 3 <sup>n</sup> | A |

The faint star, C, was noted with the 18½-inch. The change in its position is due to the proper motion of the large star. AUWERS gives this, 0".522 in the direction of 258°.7.

The fainter attendant, B, was added by AITKEN with the 36-inch. He calls it exceedingly faint and difficult with that instrument.

[β (x)...β<sup>1</sup>...β (Mon. Not. XXXVIII, 408)...β (3142)...β (Pub. L. O. II)...Aitken ( )...]

**β 794.** O. Arg. N. 12149

R.A. 11<sup>h</sup> 47<sup>m</sup> 2<sup>s</sup> }  
Decl. + 74° 26' }

## A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.34 | 106.6 | 0.42 | 6.5... 7.8 | 5 <sup>n</sup> | β   |
| 1885.85 | 119.0 | 0.50 | ...        | 3 <sup>n</sup> | HΣ  |
| 1889.37 | 133.3 | 0.41 | 7.5... 8.5 | 2 <sup>n</sup> | Com |
| 1890.35 | 126.9 | 0.50 | ...        | 4 <sup>n</sup> | β   |
| 1891.30 | 133.4 | 0.43 | 7.1... 8.7 | 3 <sup>n</sup> | β   |
| 1892.15 | 136.9 | 0.42 | 7.3... 9.2 | 3 <sup>n</sup> | β   |
| 1892.40 | 135.7 | 0.4± | ...        | 1 <sup>n</sup> | Sp  |
| 1898.31 | 160.7 | 0.37 | 7.0... 7.7 | 2 <sup>n</sup> | β   |
| 1898.57 | 162.6 | 0.40 | 6.3... 7.3 | 3 <sup>n</sup> | A   |

## AB and C

|         |      |      |          |                |    |
|---------|------|------|----------|----------------|----|
| 1886.34 | 71.5 | 5.70 | ...      | 1 <sup>n</sup> | HΣ |
| 1890.37 | 71.8 | 5.71 | ... 13.7 | 2 <sup>n</sup> | β  |
| 1891.30 | 72.3 | 5.54 | ... 14.2 | 3 <sup>n</sup> | β  |
| 1892.15 | 73.2 | 5.65 | ... 13.7 | 3 <sup>n</sup> | β  |
| 1898.31 | 73.6 | 5.55 | ... 13.5 | 2 <sup>n</sup> | β  |
| 1898.57 | 72.1 | 5.36 | ... 14.3 | 3 <sup>n</sup> | A  |

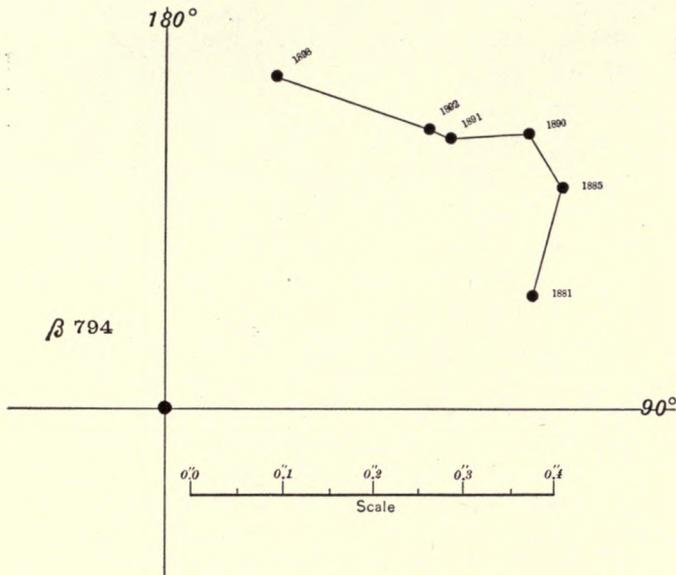
## AB and D

|         |      |       |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1890.37 | 78.6 | 26.73 | ... 13   | 2 <sup>n</sup> | β |
| 1898.27 | ...  | 26.83 | ... 13   | 1 <sup>n</sup> | β |
| 1898.57 | 78.4 | 27.12 | ... 14.2 | 3 <sup>n</sup> | A |

The close pair was discovered with the 15½-inch at the Washburn Observatory. A naked-eye star in Draco; HEIS 6-7 m; D.M. 6.7. This is in rapid

orbital motion, and will probably have a short period.

The arc so far described will be seen from the accompanying diagram.



The distant companions, C and D, were added with the 36-inch, but C had been seen by HΣ in measuring AB. Thus far the positions are unchanged.

[β (XII)...β²...β (3048,3114,3142)...β (Sid. Mess. IX, 299)  
...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy. VI, X)...Sp (III)...Aitken ( )...HΣ ( )...]

**β 918.** Lalande 22496

R.A. 11<sup>h</sup> 50<sup>m</sup> 36<sup>s</sup> }  
Decl. + 32° 52' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1880.37 | 231.3 | 7.45 | 6.8...13.0 | 2n | β |
| 1891.22 | 234.3 | 7.33 | 6.4...12.7 | 3n | β |
| 1899.13 | 230.8 | 7.21 | 6.6...13.0 | 2n | β |

Discovered with the 18½-inch. In HEIS and ARGELANDER, as a naked-eye star, 6.7 m (*Ursa Major*). Three faint nebulae in a low field-power *p*.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...]

**β 919.** W² XI. 1013

R.A. 11<sup>h</sup> 53<sup>m</sup> 7<sup>s</sup> }  
Decl. + 33° 50' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1880.37 | 16.2 | 4.22 | 6.3...12.3 | 3n | β |
| 1891.22 | 14.3 | 4.60 | 6.2...11.7 | 3n | β |
| 1899.11 | 15.7 | 4.30 | 6.7...12.5 | 2n | β |

Discovered with the 18½-inch. A naked-eye star in *Ursa Major* (HEIS). Magnitude in D.M. 6.0.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...]

**β 795.** Radcliffe 2778

R.A. 11<sup>h</sup> 53<sup>m</sup> 51<sup>s</sup> }  
Decl. + 71° 20' }

A and B

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1881.30 | 327.0 | 13.82 | 7.7...13 | 3n | β   |
| 1885.61 | 329.3 | 14.44 | ...      | 2n | HΣ  |
| 1888.40 | 327.2 | 14.44 | 8...12.8 | 2n | Com |
| 1896.43 | 328.0 | 14.39 | ...      | 3n | A   |

C and D

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.30 | 116.2 | 5.78 | 7.7...12.5 | 3n | β   |
| 1885.61 | 116.3 | 6.06 | ...        | 1n | HΣ  |
| 1888.32 | 116.0 | 5.58 | 8...12.3   | 2n | Com |
| 1896.43 | 114.0 | 6.25 | ...        | 3n | A   |

A and C (= OΣ 242 rej.)

|         |       |       |           |    |      |
|---------|-------|-------|-----------|----|------|
| 1868.11 | 149.6 | 33.72 | 7.1...7.3 | 3n | Δ    |
| 1881.30 | 150.9 | 33.59 | 7.7...7.7 | 3n | β    |
| 1885.61 | 150.7 | 33.52 | ...       | 1n | HΣ   |
| 1888.28 | 151.4 | 33.91 | 8...8     | 1n | Com  |
| 1896.58 | 150.9 | 33.49 | ...       | 3n | Eich |

The faint companions to the wide pair of OΣ were noted with the 15½-inch at the Washburn Observatory. All the measures of A and C are given. These stars are fixed.

[β (XII)...β²...Comstock (Pub. Washburn Obsy. VI)...Aitken (3395)...Δ (1)...Eichelberger (A.J. 397)...HΣ ( )...]

**β 1079.** Lalande 22586

R.A. 11<sup>h</sup> 54<sup>m</sup> 34<sup>s</sup> }  
Decl. - 21° 7' }

|         |       |       |            |    |     |
|---------|-------|-------|------------|----|-----|
| 1889.30 | 147.9 | 11.69 | 6.2...13.3 | 3n | β   |
| 1898.26 | 148.3 | 11.55 | ...        | 1n | See |

Discovered with the 36-inch. In GOULD 6.5 m (*Corvus*).

[β (XV)...β (2929)...β (Pub. L. O. II)...See ( )...]

**$\beta$  457.** O. Arg. S. 11836

R.A.  $11^{\text{h}} 55^{\text{m}} 15^{\text{s}}$  }  
Decl.  $- 20^{\circ} 52'$  }

|         |      |      |             |       |     |
|---------|------|------|-------------|-------|-----|
| 1877.37 | 84.2 | 0.89 | 8... 9      | 2 $n$ | HI  |
| 1883.80 | 81.4 | 1.05 | 8.5... 9.2  | 1 $n$ | W   |
| 1886.30 | 81.3 | 1.18 | 8.0... 10.0 | 1 $n$ | LM  |
| 1898.24 | 82.1 | 1.24 | 8.0... 9.0  | 2 $n$ | D   |
| 1898.26 | 86.2 | 1.27 | ...         | 1 $n$ | See |
| 1898.26 | 80.1 | 1.18 | 8.2... 9.8  | 3 $n$ | A   |

Discovered with the 6-inch. Probably without change.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)...Hall (1) (2147)...LM  
...Wilson (*Cin*<sup>10</sup>)...Doolittle (*Pub. Flower Obsy.* 1)...  
See ( )...Aitken ( )...]

 **$\beta$  458.** Lalande 22677

R.A.  $11^{\text{h}} 58^{\text{m}} 8^{\text{s}}$  }  
Decl.  $- 20^{\circ} 22'$  }

|         |       |       |             |       |         |
|---------|-------|-------|-------------|-------|---------|
| 1879.34 | 232.5 | 30.35 | 8.0... 10.5 | 1 $n$ | $\beta$ |
| 1883.22 | 233.3 | 30.53 | 7.0... 9.0  | 1 $n$ | W       |
| 1898.26 | 233.1 | 30.49 | ...         | 1 $n$ | See     |
| 1898.26 | 233.0 | 30.55 | 7.7... 9.5  | 3 $n$ | A       |
| 1899.05 | 232.9 | 30.38 | 8.0... 10.0 | 1 $n$ | $\beta$ |

Noted with the 6-inch in observing the preceding pair. Relatively fixed. See measures a 14.2 m star nearer,  $183^{\circ}.4 : 12^{\text{m}}.33$  (1898.26) 1 $n$ . Not seen with the 40-inch at the time of the last measure given above.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)...Wilson (*Cin*<sup>10</sup>)...See  
( )...Aitken ( )...]

 **$\beta$  412.** Lalande 22772

R.A.  $12^{\text{h}} 2^{\text{m}} 10^{\text{s}}$  }  
Decl.  $- 17^{\circ} 55'$  }

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1877.29 | 163.8 | 2.33 | 8.5... 9.0 | 1 $n$ | Cin      |
| 1877.86 | 163.0 | 2.16 | 8.0... 8.5 | 2 $n$ | $\Delta$ |
| 1879.26 | 167.1 | 2.59 | 8.0... 9.0 | 1 $n$ | Cin      |
| 1886.30 | 160.2 | 1.77 | 8.0... 9.0 | 1 $n$ | LM       |
| 1894.18 | 162.9 | 2.10 | 8.0... 8.5 | 1 $n$ | W        |

Discovered with the 6-inch. No change is shown.

[ $\beta$  (VII)... $\beta$  (2103)... $\Delta$  (1)...*Cin*<sup>4</sup>...*Cin*<sup>5</sup>...LM...Wilson  
( )...]

 **$\beta$  920.** Corvi 17

R.A.  $12^{\text{h}} 9^{\text{m}} 34^{\text{s}}$  }  
Decl.  $- 22^{\circ} 41'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1879.37 | 232.4 | 0.77 | 6.5... 7.0 | 1 $n$ | $\beta$ |
| 1880.36 | 232.4 | 0.92 | ...        | 1 $n$ | Pt      |
| 1892.25 | 252.4 | 0.79 | 6.4... 8.4 | 3 $n$ | $\beta$ |
| 1892.34 | 250.5 | 0.81 | 6.5... 7.8 | 4 $n$ | Lv      |
| 1894.18 | 248.8 | 1.13 | 7.0... 9.0 | 1 $n$ | W       |
| 1896.52 | 244.0 | 0.84 | ...        | 1 $n$ | A       |
| 1897.32 | 253.7 | 0.94 | ...        | 3 $n$ | A       |
| 1898.26 | 251.7 | 1.04 | 6.5... 7.3 | 3 $n$ | A       |

Discovered with the 18½-inch. My single observation in 1879 is noted, "Very poor measure," and the apparent motion in angle is probably not real. There seems to be no change since my measures of 1892. The magnitude in GOULD is 6.7. Lalande 22971.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...Pritchett (*Pub. Morrison Obsy.* 1)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Wilson ( )...Aitken (3395,3465)...  
Aitken ( )...]

 **$\beta$  796.** Lalande 23014

R.A.  $12^{\text{h}} 11^{\text{m}} 19^{\text{s}}$  }  
Decl.  $+ 7^{\circ} 16'$  }

|         |       |      |            |       |            |
|---------|-------|------|------------|-------|------------|
| 1881.34 | 270.9 | 0.31 | 8.0... 8.8 | 3 $n$ | $\beta$    |
| 1883.83 | 78.3  | 0.27 | 7.9... 8.5 | 6 $n$ | En         |
| 1886.34 | 266.9 | 0.35 | ...        | 2 $n$ | H $\Sigma$ |
| 1888.69 | 272.7 | 0.59 | 8.3... 9.5 | 2 $n$ | Com        |
| 1896.52 | 260.0 | 0.66 | ...        | 3 $n$ | A          |
| 1898.40 | 273.3 | 0.52 | 8.0... 8.1 | 3 $n$ | A          |

Discovered with the 15½-inch at the Washburn Observatory. There is apparently no change unless it is in distance. There seems to be some error, in printing or otherwise, in the angle of ENGELMANN. There is no other known close pair in this vicinity.

[ $\beta$  (XII)... $\beta^4$ ...Engelmann (2678)...Comstock (*Pub. Washburn Obsy.* vi)...Aitken (3395)...Aitken ( )...H $\Sigma$   
( )...]

**β 921. Corvi 22**

R.A. 12<sup>h</sup> 11<sup>m</sup> 42<sup>s</sup> }  
Decl. — 23° 21' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1880.55 | 218.5 | 3.10 | 7.5...11.6 | 5 <sup>n</sup> | β  |
| 1892.25 | 217.3 | 3.20 | 7.6...10.3 | 3 <sup>n</sup> | β  |
| 1892.31 | 218.5 | 2.95 | 7.0...12.0 | 4 <sup>n</sup> | Lv |
| 1899.16 | 215.7 | 3.39 | 7.2...9.7  | 3 <sup>n</sup> | β  |

Discovered with the 18½-inch. Lalande 23027.  
[β (xiii)...β<sup>3</sup>...β<sup>4</sup>...β (3142)...β (Pub. L. O. II)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...]

**β 27. Lalande 23106**

R.A. 12<sup>h</sup> 13<sup>m</sup> 59<sup>s</sup> }  
Decl. + 14° 31' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1874.30 | 105.0 | ...  | 7...12     | 1 <sup>n</sup> | WS |
| 1875.32 | 113.1 | 3.43 | 7.0...11.0 | 2 <sup>n</sup> | OΣ |
| 1875.53 | 106.5 | 3.39 | 7.1...11.0 | 4 <sup>n</sup> | Δ  |
| 1881.37 | 102.6 | 3.09 | ...        | 1 <sup>n</sup> | Pt |
| 1882.45 | 109.3 | 3.27 | 7.0...11.0 | 3 <sup>n</sup> | Ho |
| 1886.30 | 106.8 | 3.58 | ...        | 3 <sup>n</sup> | HΣ |
| 1898.22 | 104.1 | 3.54 | 7.0...11.0 | 3 <sup>n</sup> | D  |
| 1898.32 | 105.0 | 3.41 | 7.2...11.5 | 3 <sup>n</sup> | A  |

Discovered with the 6-inch. Evidently without change.

[β (1)...β (Mon. Not. xxxiii, 351)...Wilson and Seabroke (Mem. R. A. S. xliii)...Pritchett (Pub. Morrison Obsy. 1) ...Δ (1)...OΣ (Poulkova Obsns. x)...Hough (2978)...Doolittle (Pub. Flower Obsy. 1)...Aitken ( )...HΣ ( )...]

**β 605. Corvi 26. B.A.C. 4149**

R.A. 12<sup>h</sup> 13<sup>m</sup> 58<sup>s</sup> }  
Decl. — 21° 30' }

|         |       |      |           |                |     |
|---------|-------|------|-----------|----------------|-----|
| 1878.22 | 144.2 | 1.25 | 6.0...8.0 | 2 <sup>n</sup> | β   |
| 1878.43 | 136.3 | 1.01 | 6.2...8.3 | 2 <sup>n</sup> | Cin |
| 1882.40 | 141.7 | 0.53 | 6...8     | 2 <sup>n</sup> | Sp  |
| 1884.32 | 133.0 | ...  | 8.0...9.0 | 1 <sup>n</sup> | W   |
| 1888.25 | 157.1 | 0.8± | ...       | 1 <sup>n</sup> | Sp  |
| 1889.04 | 137.0 | 0.8± | 6.0...8.5 | 1 <sup>n</sup> | Lv  |
| 1891.32 | 143.8 | 1.03 | 6.2...8.4 | 3 <sup>n</sup> | β   |

Discovered with the 18½-inch. The measures are not accordant, but there is probably no sensible change. The magnitude in GOULD is 6.4, and 6½ in B.A.C. It is near ζ Corvi. Lalande 23119.

[β (x)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Cin<sup>5</sup>...Sp (II, III)...Wilson (Cin<sup>20</sup>)...Lv<sup>1</sup>...]

**β 1245. ζ Corvi**

R.A. 12<sup>h</sup> 14<sup>m</sup> 21<sup>s</sup> }  
Decl. — 21° 33' }

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1891.31 | 42.3 | 4.81 | 5.5...13.8 | 3 <sup>n</sup> | β |
| 1899.16 | 48.7 | 5.76 | 5.0...14.0 | 2 <sup>n</sup> | A |

The very minute companion was discovered with the 36-inch. The proper motion of the bright star is given by AUWERS as 0".130 in the direction of 254°.4. It is probably only an optical pair as the change in the position of the companion shown by the two sets of measures given above agrees very closely with the proper motion of A. The minimum distance of the companion was 2".6 about 1860.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Aitken ( )...]

**β 606. Corvi 35**

R.A. 12<sup>h</sup> 19<sup>m</sup> 48<sup>s</sup> }  
Decl. — 14° 17' }

|         |       |      |           |                |    |
|---------|-------|------|-----------|----------------|----|
| 1878.30 | 97.9  | 1.38 | 7.0...9.0 | 2 <sup>n</sup> | β  |
| 1882.41 | 134.5 | 0.40 | 7...9     | 2 <sup>n</sup> | Sp |
| 1889.04 | 93.5  | 1.20 | ...       | 3 <sup>n</sup> | Sp |
| 1891.26 | 99.1  | 1.25 | 7.2...8.2 | 3 <sup>n</sup> | β  |
| 1892.40 | 99.8  | 1.21 | ...       | 1 <sup>n</sup> | Sp |
| 1898.24 | 95.3  | 1.43 | 7.0...9.0 | 2 <sup>n</sup> | D  |

Discovered with the 18½-inch. The first measures of Sp appear to belong to some other pair. I could not find any other pair in the vicinity with the 36-inch. Lalande 23250.

[β (x)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Sp (II, III)...Doolittle (Pub. Flower Obsy. 1)...]

**β 922. Lalande 23254**

R.A. 12<sup>h</sup> 19<sup>m</sup> 58<sup>s</sup> }  
Decl. — 3° 49' }

|         |       |      |           |                |    |
|---------|-------|------|-----------|----------------|----|
| 1880.22 | 160±  | 0.5± | 8.0...8.5 |                | β  |
| 1889.99 | 167.4 | 0.6± | ...       | 3 <sup>n</sup> | Sp |
| 1891.27 | 165.3 | 0.74 | 8.1...8.9 | 3 <sup>n</sup> | β  |
| 1892.39 | 163.3 | 0.55 | ...       | 1 <sup>n</sup> | Sp |
| 1898.24 | 157.8 | 0.77 | 8...9     | 2 <sup>n</sup> | D  |

Discovered with the 18½-inch. The change, if any, is small.

[β (xiii)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Sp (III)...Doolittle (Pub. Flower Obsy. 1)...]

$\beta$  923. *Virginis* 168

R.A.  $12^{\text{h}} 22^{\text{m}} 12^{\text{s}}$  }  
Decl.  $+ 5^{\circ} 4'$  }

|         |      |      |            |       |         |
|---------|------|------|------------|-------|---------|
| 1879.33 | 59.6 | 2.16 | 6.8...13.5 | 3 $n$ | $\beta$ |
| 1892.13 | 61.8 | 2.66 | 6.8...11.7 | 3 $n$ | $\beta$ |
| 1898.50 | 59.1 | 2.65 | 7.0...12.2 | 3 $n$ | A       |

Discovered with the 18½-inch. In GOULD 6.9 m. W' XII. 344.

[ $\beta$  (XIII)... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 $\beta$  1080. 17 *Comae*

R.A.  $12^{\text{h}} 22^{\text{m}} 55^{\text{s}}$  }  
Decl.  $+ 26^{\circ} 35'$  }

B and C

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1889.11 | 156.8 | 1.79 | 6.0...13.7 | 3 $n$ | $\beta$ |
| 1898.48 | 156.0 | 1.83 | ...14.0    | 1 $n$ | A       |

A and B (=  $\Sigma$  21 App. 1)

|         |       |        |            |       |          |
|---------|-------|--------|------------|-------|----------|
| 1825.23 | 250.8 | 144.43 | 6 ... 7    | 2 $n$ | S        |
| 1836.43 | 250.7 | 145.35 | 4.8... 6.0 | 5 $n$ | $\Sigma$ |
| 1859.25 | 250.6 | 146.01 | ...        | 1 $n$ | Se       |
| 1870.35 | 250.6 | 145.35 | 5.1... 6.3 | 5 $n$ | $\Delta$ |
| 1877.77 | 250.4 | 145.37 | 4.8... 6.0 | 5 $n$ | Je       |
| 1889.11 | 250.3 | 145.05 | ...        | 2 $n$ | $\beta$  |
| 1899.29 | 250.4 | 145.27 | ...        | 1 $n$ | $\beta$  |

The close component was discovered with the 36-inch. There is obviously no change in the STRUVE wide stars (= S 638). According to AUWERS, the bright stars have different proper motions:

$$A = 0.015 \text{ in } 258.5$$

$$B = 0.018 \text{ in } 235.9$$

As the measures show no change, they must have the same proper motion.

[ $\beta$  (XV)... $\beta$  (2929)... $\beta$  (*Observatory* XII, 227) (*Pub. L. O.* II)...Aitken ( )...Secchi (*Cat. 1321 Stelle Doppie*)... $\Delta$  (II)...*Radcliffe Obsns.* 1868, 1880, 1881...Jedrzejewicz (2338)...]

 $\beta$  28. B.A.C. 4213

R.A.  $12^{\text{h}} 23^{\text{m}} 53^{\text{s}}$  }  
Decl.  $- 12^{\circ} 44'$  }

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1874.30 | 362.0 | ...  | ...        | 1 $n$ | WS       |
| 1875.29 | 353.7 | 1.81 | 6.4...10.2 | 5 $n$ | $\Delta$ |
| 1877.33 | 355.1 | 2.16 | 6.7...10.2 | 2 $n$ | Cin      |

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1880.36 | 356.3 | 2.01 | ...        | 1 $n$ | Pt      |
| 1885.34 | 361.1 | 2.16 | 6 ... 10   | 1 $n$ | LM      |
| 1889.24 | 362.4 | ...  | 6.0...11.0 | 2 $n$ | Lv      |
| 1889.32 | 357.0 | 2.23 | ...        | 3 $n$ | T       |
| 1891.26 | 368.6 | 1.81 | 6.6... 9.3 | 3 $n$ | $\beta$ |
| 1892.34 | 369.0 | 2.22 | 6.3...10.7 | 4 $n$ | T       |
| 1898.25 | 366.9 | 2.04 | 6.0...11.3 | 3 $n$ | A       |

Discovered with the 6-inch. PORTER gives for the principal star (Piazzi XII. 104) a proper motion of  $0''.282$  in the direction of  $261^{\circ}.7$ . It is plain that this is a physical system, as this motion is common to the components. There is also slow direct relative motion.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Cin<sup>4</sup>...Wilson and Seabroke (*Mem. R. A. S.* XLIII)...LM...Lv<sup>4</sup>...Pritchett (*Pub. Morrison Obsy.* 1)...Tarrant (3186)...Aitken ( )...]

 $\beta$  797. D.M. (6°) 2630

R.A.  $12^{\text{h}} 28^{\text{m}} 27^{\text{s}}$  }  
Decl.  $+ 6^{\circ} 38'$  }

A and B

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1881.31 | 171.2 | 0.73 | 8.5... 8.6 | 3 $n$ | $\beta$ |
| 1888.39 | 170.1 | 0.75 | 8.7... 8.7 | 3 $n$ | Com     |
| 1899.26 | 164.0 | 0.53 | ...        | 1 $n$ | $\beta$ |

AB and C

|         |     |       |         |       |         |
|---------|-----|-------|---------|-------|---------|
| 1881.31 | 3.2 | 77.29 | ... 9.0 | 3 $n$ | $\beta$ |
| 1899.07 | 3.1 | 77.08 | ... 8.5 | 2 $n$ | $\beta$ |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta$ ...Comstock (*Pub. Washburn Obsy.* VI)...]

 $\beta$  607. Schj. 4572

R.A.  $12^{\text{h}} 35^{\text{m}} 2^{\text{s}}$  }  
Decl.  $- 0^{\circ} 48'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1867.33 | 320.0 | 1.40 | ...        | 1 $n$ | Hd      |
| 1878.22 | 314.4 | 1.06 | 9.0...10.7 | 1 $n$ | Cin     |
| 1878.23 | 315.8 | 1.16 | 8.5...11.0 | 4 $n$ | $\beta$ |
| 1879.75 | 316.0 | 1.12 | 8.9... 9.5 | 2 $n$ | $\beta$ |
| 1880.34 | 314.5 | 1.08 | 9.0...11.0 | 2 $n$ | Cin     |
| 1889.31 | 316.3 | 1.20 | 9.0...10.0 | 3 $n$ | $\beta$ |

Discovered with the 18½-inch. It is  $32^{\circ}$  directly preceding  $\gamma$  *Virginis*. In D.M. 9.2 m. So far

there has been no change. Previously seen at Harvard, but not printed until after  $\beta$  (x).  $O\Sigma$  measures this star from  $\gamma$  *Virginis* for proper motion of the latter.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2930)... $\beta$  (*Pub. L. O. II*)...Cin<sup>5</sup>...  
Cin<sup>6</sup>...*Annals Harvard Obsy.* XIII... $O\Sigma$  (*Poulkova Obsns.*  
x, p. 89)...]

$\beta$  924. 31 *Virginis*

R.A. 12<sup>h</sup> 35<sup>m</sup> 52<sup>s</sup> }  
Decl. + 7° 28' }

|         |      |      |            |    |         |
|---------|------|------|------------|----|---------|
| 1880.14 | 29.0 | 3.66 | 5.8...11.6 | 5n | $\beta$ |
| 1883.26 | 36.0 | 3.9  | ...        | 1n | Perry   |
| 1891.24 | 29.0 | 3.94 | 5...11.5   | 3n | $\beta$ |
| 1899.06 | 31.8 | 3.79 | ...11.4    | 2n | $\beta$ |

Discovered with the 18½-inch. The proper motion of this star is 0".106 in the direction of 273°2 (AUWERS). With this movement and the measures of 1880, the small star, if fixed in space, should be at the date of the last measures, 50°7: 4".88.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta^4$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Perry  
(*Eng. Mech.* xxxviii, 192)...]

$\beta$  459. W<sup>1</sup> XII. 689

R.A. 12<sup>h</sup> 41<sup>m</sup> 58<sup>s</sup> }  
Decl. + 4° 7' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1877.93 | 289.5 | 3.80 | 8.2...11.5 | 2n | $\Delta$ |
| 1880.61 | 292.6 | 3.50 | ...        | 2n | Pt       |
| 1893.39 | 295.0 | 3.91 | 8.0...11.0 | 3n | W        |
| 1898.28 | 292.9 | 3.76 | 8.0...11.7 | 3n | A        |

Discovered with the 6-inch. Without change.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (1)...Pritchett (*Pub.*  
*Morrison Obsy.* 1)...Wilson ( )...Aitken ( )...]

$\beta$  925. Groombridge 1938

R.A. 12<sup>h</sup> 51<sup>m</sup> 6<sup>s</sup> }  
Decl. + 44° 12' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1879.82 | 211.3 | 7.11 | 6.5...12.0 | 2n | $\beta$ |
| 1882.41 | 209.5 | 6.48 | 6.5...13.0 | 2n | Ho      |
| 1892.13 | 211.9 | 6.90 | 6.3...11.4 | 3n | $\beta$ |
| 1899.08 | 211.6 | 6.77 | 6.8...12.5 | 1n | $\beta$ |

Discovered with the 18½-inch. KUSTNER gives the proper motion of this star 0".019 in the direction of 294°9. The measures do not cover a sufficient time to show whether or not the motion belongs to both stars. This is a naked-eye star in *Canes Venatici*.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Hough  
(2978)...]

$\beta$  926. Lalande 24147

R.A. 12<sup>h</sup> 52<sup>m</sup> 14<sup>s</sup> }  
Decl. - 5° 24' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1880.33 | 270.4 | 2.06 | 8.1...11.3 | 3n | $\beta$ |
| 1892.24 | 274.8 | 2.24 | 8.3...11.0 | 3n | $\beta$ |
| 1892.33 | 269.9 | 2.23 | 8.2...11.7 | 3n | Lv      |

Discovered with the 18½-inch. There is no indication of motion.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Lv (*A. J.* 278)  
(*Proc. Haverford Coll. Obsy.* 1892)...]

$\beta$  1081. 37 *Comae*

R.A. 12<sup>h</sup> 54<sup>m</sup> 32<sup>s</sup> }  
Decl. + 31° 26' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1889.13 | 351.3 | 5.15 | 4.5...13.8 | 3n | $\beta$ |
| 1898.52 | 348.7 | 5.24 | ...14.0    | 2n | A       |

Discovered with the 36-inch. AUWERS gives the proper motion of this star, 0".034 in the direction of 268°3. It is impossible to say with certainty from the two sets of measures whether the small star shares in this movement. If it does not, the angle should have increased 3°5 at the last date, the distance remaining substantially the same.

[ $\beta$  (XV)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

$\beta$  112. Piazzii XII. 243

R.A. 12<sup>h</sup> 54<sup>m</sup> 46<sup>s</sup> }  
Decl. + 19° 1' }

B and C

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1874.30 | 293.4 | ...  | 9...10     | 2n | WS       |
| 1875.08 | 292.4 | 1.75 | 9.6...10.0 | 3n | $\Delta$ |
| 1892.14 | 293.7 | 1.86 | 9.3...9.8  | 3n | $\beta$  |
| 1892.32 | 291.1 | 1.90 | 9.1...9.8  | 3n | Lv       |

|         |       |      |            |    |       |
|---------|-------|------|------------|----|-------|
| 1893.33 | 291.2 | 1.99 | 8.8... 9.0 | 2n | Gl    |
| 1895.40 | ...   | 2.57 | ...        | 1n | Dyson |
| 1895.40 | 297.5 | 2.34 | ...        | 1n | Lew   |
| 1897.41 | 293.1 | 1.96 | ...        | 2n | Lew   |
| 1897.81 | 293.4 | 2.12 | ...        | 4n | Doo   |
| 1898.29 | 293.1 | 2.40 | ...        | 1n | Bry   |
| 1898.28 | 292.9 | 2.12 | 8.8... 9.0 | 3n | A     |

## A and BC

|         |       |        |         |    |          |
|---------|-------|--------|---------|----|----------|
| 1874.30 | 347.3 | ...    | 6.5...  | 1n | WS       |
| 1875.38 | 347.4 | 153.39 | 6.2...  | 2n | $\Delta$ |
| 1892.13 | 348.9 | 150.70 | 6.0...  | 2n | $\beta$  |
| 1893.33 | 349.3 | 150.90 | 5.7...  | 2n | Gl       |
| 1894.25 | 348.8 | 150.11 | 6.8...  | 2n | W        |
| 1897.45 | 349.2 | 151.18 | 7 ... 9 | 4n | Doo      |
| 1898.15 | 349.3 | 150.77 | ...     | 2n | Doo      |
| 1898.28 | 348.9 | 151.05 | 6.3...  | 3n | A        |

Discovered with the 6-inch. There has been no sensible change. The *Berlin A. G. Catalogue* gives the proper motion of A  $0''.312$  in the direction of  $287^\circ.7$ . This probably explains the change in the position of the double companion star. It should be remarked that some of the measures give the distance of A and B, and others the distance of A and BC, and, therefore, the measures as given are more accordant with the proper motion than would at first appear.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (I)...Wilson and Seabroke (*Mem. R. A. S. XLIII*)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Glaserapp (II)...Lewis, Bryant and Dyson (*Mon. Not.* lvi, 359; lIX, 400) (*Greenwich Obsns.* 1895)...Wilson ( )...Aitken ( )...Doolittle (*Pub. Flower Obsy.* I)...]

 $\beta$  1082. 78 Ursae Majoris

R.A.  $12^h 55^m 35^s$  }  
Decl.  $+ 57^\circ 1'$  }

|         |      |      |            |    |         |
|---------|------|------|------------|----|---------|
| 1889.17 | 74.6 | 1.50 | 6.0... 9.6 | 6n | $\beta$ |
| 1890.26 | 76.9 | 1.46 | ...        | 3n | $\beta$ |
| 1898.29 | 85.4 | 1.26 | ...        | 3n | Lew     |
| 1898.51 | 86.5 | 1.42 | 6.0... 9.5 | 3n | A       |

Discovered with the 36-inch. KRUEGER gives the proper motion  $0''.062$  in the direction of  $108^\circ.8$ . It is evident from the measures that this is the movement of both components; otherwise, the position of B for 1898.5 would be  $56^\circ.9 : 1''.07$ .

[ $\beta$  (xv)... $\beta$  (2929,2979,3048)... $\beta$  (*Pub. L. O. II*)...Lewis (*Mon. Not.* lIX, 400)...Aitken ( )...]

 $\beta$  927. Lalande 24257

R.A.  $12^h 56^m 34^s$  }  
Decl.  $- 5^\circ 53'$  }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1880.31 | 291.3 | 4.17 | 8.3... 10.3 | 3n | $\beta$ |
| 1892.26 | 291.5 | 4.20 | 8.2... 10.2 | 3n | $\beta$ |
| 1892.31 | 290.5 | 4.42 | 8.2... 10.0 | 3n | Lv      |
| 1899.20 | 292.8 | 4.73 | ...         | 2n | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch. Unchanged.

[ $\beta$  (xIII)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

 $\beta$  928. Lalande 24274

R.A.  $12^h 57^m 10^s$  }  
Decl.  $- 5^\circ 47'$  }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1880.31 | 313.2 | 1.83 | 7.8... 8.7 | 3n | $\beta$ |
| 1888.70 | 312.5 | 1.98 | 8.2... 9.6 | 3n | Lv      |
| 1892.25 | 312.8 | 2.01 | 8.0... 9.0 | 3n | $\beta$ |
| 1892.37 | 305.8 | ...  | 8.0... 9.0 | 1n | C       |
| 1893.37 | 313.8 | 2.01 | 8.2... 9.2 | 2n | J       |

Discovered with the  $18\frac{1}{2}$ -inch. No relative motion.

[ $\beta$  (xIII)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Collins and Jones (*A. J.* 378, 312) (*Proc. Haverford Coll. Obsy.* 1892)...]

 $\beta$  341. Hydrae 348

R.A.  $12^h 57^m 20^s$  }  
Decl.  $- 19^\circ 56'$  }

|         |       |           |            |    |          |
|---------|-------|-----------|------------|----|----------|
| 1876.39 | 313.6 | 0.85      | 6.0... 6.1 | 2n | Cin      |
| 1877.00 | 136.2 | 0.83      | 6.2... 6.7 | 3n | $\Delta$ |
| 1877.37 | 134.4 | 1.00      | 6.0... 6.1 | 2n | Cin      |
| 1879.27 | 312.0 | ...       | 6.5... 7.0 | 1n | Cin      |
| 1881.38 | 312.9 | 0.62      | 6.5... 7.0 | 3n | Sp       |
| 1881.46 | 313.4 | 0.71      | 6.2... 6.2 | 2n | $\beta$  |
| 1884.35 | 317.1 | 0.96      | 8.0... 8.0 | 1n | W        |
| 1889.26 | 306.8 | 0.66      | ...        | 1n | Sp       |
| 1894.46 | 310.5 | 0.3 $\pm$ | 6 ... 6    | 2n | Sel      |
| 1896.54 | 307.9 | 0.78      | ...        | 2n | A        |
| 1898.26 | 315.5 | 0.66      | 6.5... 6.5 | 3n | A        |

Discovered with the 6-inch. Change is doubtful. This is a naked-eye star; GOULD 5.9 m (*Virgo*). Lalande 24275.

[ $\beta$  (vi)... $\beta$  (2062)... $\beta^4$ ... $\Delta$  (I)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>20</sup>)...Sp (II, III)...Sellors (3303)...Aitken (3395, )...]

**β 929.** 48 *Virginis*

R.A. 12<sup>h</sup> 57<sup>m</sup> 43<sup>s</sup> }  
Decl. — 3° 1' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1879.40 | 229.4 | 0.48 | 6.2... | 6.2 | 3 <sup>n</sup> | β   |
| 1879.40 | 233.2 | ...  | 7.0... | 8.0 | 1 <sup>n</sup> | Cin |
| 1880.35 | 227.3 | ...  | ...    | ... | 1 <sup>n</sup> | Cin |
| 1881.42 | 222.1 | 0.33 | ...    | ... | 1 <sup>n</sup> | Big |
| 1881.46 | 223.6 | 0.48 | 6.0... | 6.0 | 3 <sup>n</sup> | β   |
| 1885.86 | 42.2  | 0.38 | ...    | ... | 6 <sup>n</sup> | En  |
| 1887.54 | 222.7 | 0.36 | ...    | ... | 2 <sup>n</sup> | Sp  |
| 1888.25 | 219.1 | 0.54 | 6.3... | 6.3 | 5 <sup>n</sup> | T   |
| 1888.32 | 220.1 | 0.64 | 6.0... | 6.5 | 2 <sup>n</sup> | Lv  |
| 1889.33 | 217.1 | 0.66 | 6.2... | 6.2 | 5 <sup>n</sup> | T   |
| 1891.26 | 221.2 | 0.50 | 6.0... | 6.3 | 3 <sup>n</sup> | β   |
| 1892.40 | 223.7 | 0.5± | ...    | ... | 1 <sup>n</sup> | Sp  |
| 1897.32 | 220.8 | 0.67 | 6      | 6+  | 3 <sup>n</sup> | A   |
| 1898.32 | 212.3 | 0.60 | ...    | ... | 1 <sup>n</sup> | Bow |
| 1899.35 | 219.2 | 0.58 | 6.2... | 6.6 | 2 <sup>n</sup> | A   |

Discovered with the 18½-inch. There may be some retrograde motion, but it is very slow. The components have a common proper motion, and it is therefore a physical system. The proper motion from AUWERS is 0.091 in the direction of 258°.7.

[β (XIII)...β³...β⁴...β (3114)...β (*Pub. L. O. II*)...Cin⁵... Cin⁶...Engelmann (2786)...Lv¹...Lv (*Sid. Mess.* VIII, 77)...Tarrant (2991,3186)...Sp (III)...Bigourdan (*Annals Paris Obsy.* 1883)...Aitken (3465)...Bowyer (*Mon. Not.* LIX, 400)...Aitken ( )...]

**β 798.** Lalande 24307

R.A. 12<sup>h</sup> 58<sup>m</sup> 40<sup>s</sup> }  
Decl. — 17° 2' }

|         |       |      |        |     |                |   |
|---------|-------|------|--------|-----|----------------|---|
| 1881.38 | 174.3 | 0.54 | 8.1... | 8.5 | 5 <sup>n</sup> | β |
| 1892.40 | 172.6 | 0.44 | 8.1... | 8.5 | 2 <sup>n</sup> | β |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β⁴...β (3142)...β (*Pub. L. O. II*)...]

**β 1083.** Piazzii XII. 268

R.A. 13<sup>h</sup> 0<sup>m</sup> 27<sup>s</sup> }  
Decl. + 29° 40' }

B and C

|         |       |      |         |      |                |     |
|---------|-------|------|---------|------|----------------|-----|
| 1889.11 | 237.3 | 0.49 | 11.5... | 11.7 | 3 <sup>n</sup> | β   |
| 1897.38 | 243.6 | 0.42 | ...     | ...  | 1 <sup>n</sup> | Lew |
| 1898.30 | 234.7 | 0.40 | ...     | ...  | 1 <sup>n</sup> | Lew |
| 1898.31 | 226.6 | 0.38 | 11.2... | 11.7 | 2 <sup>n</sup> | β   |
| 1898.52 | 238.2 | 0.47 | 12.5... | 12.5 | 2 <sup>n</sup> | A   |

A and BC (= H 2638)

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1831    | 209.6 | 6±   | 6      | ... | 1 <sup>n</sup> | H   |
| 1878.42 | 218.9 | 6.54 | 6      | ... | 1 <sup>n</sup> | β   |
| 1889.11 | 219.9 | 6.23 | 6.5... | ... | 3 <sup>n</sup> | β   |
| 1898.03 | 219.1 | 6.35 | ...    | ... | 3 <sup>n</sup> | Lew |
| 1898.31 | 218.4 | 6.25 | 6.2... | ... | 2 <sup>n</sup> | β   |
| 1898.52 | 219.1 | 6.40 | ...    | ... | 2 <sup>n</sup> | A   |
| 1898.94 | 217.8 | 6.16 | ...    | ... | 1 <sup>n</sup> | Bar |

A and D

|         |     |       |     |      |                |   |
|---------|-----|-------|-----|------|----------------|---|
| 1831    | 6.0 | 20±   | ... | 15   | 1 <sup>n</sup> | H |
| 1878.42 | 7.2 | 40.28 | ... | ...  | 1 <sup>n</sup> | β |
| 1898.31 | 9.5 | 39.24 | ... | 10.8 | 2 <sup>n</sup> | β |
| 1898.52 | 8.8 | 39.34 | ... | 12.5 | 2 <sup>n</sup> | A |

The duplicity of Herschel's nearest companion was discovered with the 36-inch. This is a naked-eye star in *Coma Berenices*. It is probable that B and D are only optical companions. There is a faint nebula in the field (Dreyer 4966), 149.1 distant, in the direction of 36°.1.

On the occasion of my second measure of these stars with the 40-inch in 1898, I saw as I supposed a very minute star near A, at a distance of perhaps 2" in the second quadrant. When the measure then being made was finished, the conditions had changed, and the new star could not be seen. It was looked for several times subsequently with the 40-inch without success. I think it is a real star.

[β (XV)...β (2929)...β¹...β (Pub. L. O. II)...Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...Barnard ( )...]

**β 930.** B.A.C. 4389

R.A. 13<sup>h</sup> 0<sup>m</sup> 28<sup>s</sup> }  
Decl. + 45° 55' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1879.28 | 109.2 | 2.68 | 6.0... | 12.3 | 3 <sup>n</sup> | β   |
| 1891.24 | 113.3 | 2.67 | 6.2... | 11.3 | 3 <sup>n</sup> | β   |
| 1898.43 | 116.7 | 2.75 | ...    | ...  | 1 <sup>n</sup> | Lew |
| 1898.63 | 119.0 | 3.07 | ...    | ...  | 1 <sup>n</sup> | Bry |
| 1899.29 | 116.0 | 2.70 | ...    | ...  | 1 <sup>n</sup> | β   |

Discovered with the 6-inch. A naked-eye star in *Canes Venatici*.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...Lewis and Bryant (*Mon. Not.* LIX, 400)...]

**$\beta$  799.** Groombridge 1960

R.A.  $13^h 1^m 7^s$  }  
Decl.  $+73^\circ 40'$  }

|         |       |      |            |            |            |
|---------|-------|------|------------|------------|------------|
| 1881.34 | 238.7 | 0.57 | 6.5... 8.5 | 5 <i>n</i> | $\beta$    |
| 1885.61 | 238.3 | 0.57 | ...        | 1 <i>n</i> | H $\Sigma$ |
| 1888.63 | 244.4 | 0.65 | 6.7... 8.5 | 3 <i>n</i> | Com        |
| 1891.30 | 245.3 | 0.71 | 7.1... 9.2 | 3 <i>n</i> | $\beta$    |
| 1896.71 | 245.3 | 0.83 | 7 ... 8+   | 3 <i>n</i> | A          |

Discovered with the 15-inch at the Washburn Observatory. A naked-eye star in *Draco*.

[ $\beta$  (XII)... $\beta^4$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Comstock (*Pub. Washburn Obsy.* VI)...Aitken (3395)...H $\Sigma$  ( )...]

 **$\beta$  609.** W<sup>1</sup> XIII. 27

R.A.  $13^h 4^m 30^s$  }  
Decl.  $-4^\circ 18'$  }

|         |       |      |             |            |         |
|---------|-------|------|-------------|------------|---------|
| 1878.32 | 356.1 | 0.89 | 7.0... 11.0 | 1 <i>n</i> | $\beta$ |
| 1879.40 | 351.9 | ...  | 8.0... 11.0 | 1 <i>n</i> | Cin     |
| 1880.34 | 356.2 | ...  | 7.0... 10.0 | 2 <i>n</i> | Cin     |
| 1889.31 | 349.1 | 0.91 | 6.8... 9.8  | 3 <i>n</i> | $\beta$ |

Discovered with the 18½-inch. Probably unchanged.

[ $\beta$  (X)... $\beta^3$ ... $\beta$  (2930)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>5</sup>...Cin<sup>6</sup>...]

 **$\beta$  608.** 17 *Canum Venaticorum*

R.A.  $13^h 4^m 33^s$  }  
Decl.  $+39^\circ 8'$  }

A and B

|         |       |      |             |            |            |
|---------|-------|------|-------------|------------|------------|
| 1878.32 | 284.9 | 1.22 | 5.5... 10.5 | 2 <i>n</i> | $\beta$    |
| 1885.54 | 272.4 | 1.36 | ...         | 2 <i>n</i> | H $\Sigma$ |
| 1889.51 | 285.0 | 1.04 | ...         | 1 <i>n</i> | Sp         |
| 1899.08 | 284.7 | 1.12 | ... 10.0    | 1 <i>n</i> | $\beta$    |

A and C (=  $\Sigma$  24 App. I.)

|         |       |        |            |            |          |
|---------|-------|--------|------------|------------|----------|
| 1835.69 | 297.5 | 289.98 | 5.5... 5.9 | 5 <i>n</i> | $\Sigma$ |
| 1867.71 | 297.3 | 287.92 | 5.6... 6.1 | 6 <i>n</i> | $\Delta$ |
| 1877.42 | 297.3 | 288.25 | 5.5... 5.9 | 4 <i>n</i> | Je       |

The close star was discovered with the 18½-inch. C is 15 *Canum Ven.* AUWERS gives the proper motions of the large stars:

|   |   |   |   |       |          |
|---|---|---|---|-------|----------|
| A | - | - | - | 0.107 | in 295.5 |
| C | - | - | - | 0.029 | in 284.1 |

It is evident that the new star has the same proper motion as A.

[ $\beta$  (X)... $\beta^1$ ...Sp (11)... $\Delta$  (11)... $\Delta$  (1574)...Jedrzejewicz (2338)...*Radcliffe Obsns.* XXVI...Secchi (*Catalogo di 1321 Stelle Doppie, Appendix*)...Maiebeckato (*Measures* 1892)...]

 **$\beta$  931.** *Virginis* 454

R.A.  $13^h 4^m 51^s$  }  
Decl.  $+13^\circ 57'$  }

|         |       |      |             |            |         |
|---------|-------|------|-------------|------------|---------|
| 1879.25 | 204.9 | 4.89 | 6.7... 11.8 | 4 <i>n</i> | $\beta$ |
| 1883.26 | 208.5 | 5.1  | ...         | 1 <i>n</i> | Perry   |
| 1883.44 | 204.0 | 4.71 | 7 ... 12    | 3 <i>n</i> | Ho      |
| 1898.20 | 200.4 | 5.23 | 7 ... 12    | 3 <i>n</i> | D       |
| 1898.32 | 202.6 | 5.02 | 7 ... 11.5  | 3 <i>n</i> | A       |

Discovered with the 18½-inch. No material change. Lalande 24489.

[ $\beta$  (XII)... $\beta^3$ ...J. J. M. Perry (*Eng. Mech.* XXXVIII, 192)...Hough (2978)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken ( )...]

 **$\beta$  221.** Lalande 24532

R.A.  $13^h 6^m 54^s$  }  
Decl.  $-14^\circ 49'$  }

|         |      |      |             |            |          |
|---------|------|------|-------------|------------|----------|
| 1875.35 | 48.6 | 1.68 | 8.1... 9.6  | 3 <i>n</i> | $\Delta$ |
| 1878.43 | 46.2 | 1.42 | 8.0... 9.5  | 1 <i>n</i> | Cin      |
| 1880.36 | 46.4 | 1.52 | 8.0... 10.0 | 2 <i>n</i> | Cin      |
| 1886.30 | 43.5 | 1.62 | 8 ... 9     | 1 <i>n</i> | LM       |
| 1896.49 | 45.6 | 1.34 | 8.0... 9.0  | 3 <i>n</i> | A        |

Discovered with the 6-inch.

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* XXXIV, 382)... $\Delta$  (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...LM...Aitken (3395)...]

 **$\beta$  342.** O. Arg. S. 12741

R.A.  $13^h 8^m 49^s$  }  
Decl.  $-18^\circ 17'$  }

|         |      |      |            |            |          |
|---------|------|------|------------|------------|----------|
| 1876.33 | 36.3 | 3.89 | 8.0... 8.6 | 2 <i>n</i> | $\Delta$ |
| 1877.11 | 33.3 | 4.03 | 8.0... 8.5 | 1 <i>n</i> | Cin      |
| 1878.84 | 34.9 | 3.98 | 7.5... 7.7 | 2 <i>n</i> | Cin      |
| 1880.38 | 33.8 | 3.96 | 8.0... 8.5 | 4 <i>n</i> | Cin      |
| 1881.38 | 33.8 | 5.32 | 8.0... 8.5 | 3 <i>n</i> | Sp       |
| 1882.33 | 35.2 | 4.29 | 7.7... 8.5 | 1 <i>n</i> | W        |
| 1888.32 | 34.2 | 3.80 | 8.4... 8.7 | 2 <i>n</i> | Lv       |

|         |      |      |            |    |       |
|---------|------|------|------------|----|-------|
| 1892.40 | 35.5 | 3.96 | ...        | 1n | Sp    |
| 1893.37 | 33.0 | 4.84 | 8.1... 8.4 | 2n | J     |
| 1896.40 | 34.4 | 5.20 | 8 ... 8½   | 3n | Scott |
| 1898.37 | 34.8 | 3.95 | 8.0... 8.6 | 3n | A     |
| 1899.09 | 37.2 | 4.00 | 9.0... 9.1 | 1n | β     |

Discovered with the 6-inch. In S.D. 8.2 m. Probably unchanged. 54 *Virginis* (=Sh 151) is 1<sup>m</sup> 46<sup>s</sup> p and 6' n. These two pairs are curiously similar in all respects except brightness. They have practically the same position angle, the same relative magnitudes, and differ in distance only a little more than 1". The measure given above of 1896.40 certainly belongs to 54 *Virginis*, and this may be true of some of the others.

[β (VI)...β (2062)...Δ (1)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Sp (II, III)...Wilson (Cin<sup>10</sup>)...Lv<sup>1</sup>...Jones (*A. J.* 312)...Scott (*Brit. Ast. Asso.* VIII, 66)...Aitken ( )...]

β 800. *Comae* 201

R.A. 13<sup>h</sup> 10<sup>m</sup> 52<sup>s</sup> }  
Decl. + 17° 40' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1881.36 | 121.5 | 1.27 | 7.1... 10.2 | 4n | β   |
| 1886.34 | 118.9 | 1.94 | ...         | 2n | HΣ  |
| 1889.12 | 117.1 | 2.17 | 6.9... 9.7  | 4n | Com |
| 1890.33 | 115.5 | 2.02 | 7.5... 10.2 | 3n | β   |
| 1891.25 | 115.0 | 2.23 | 7.2... 10.7 | 3n | β   |
| 1892.60 | 117.8 | 2.12 | ...         | 5n | Sp  |
| 1894.39 | 114.7 | 2.29 | ...         | 1n | Com |
| 1895.39 | 115.6 | 2.56 | ...         | 2n | Com |
| 1896.39 | 113.1 | 2.50 | ...         | 3n | Com |
| 1896.40 | 115.0 | 2.60 | ...         | 2n | Lew |
| 1897.39 | 112.1 | 2.44 | ...         | 1n | Lew |
| 1898.14 | 110.1 | 2.88 | ...         | 3n | D   |
| 1898.32 | 111.9 | 2.57 | 6.8... 10.3 | 3n | A   |
| 1898.37 | 113.5 | 2.33 | ...         | 1n | Bow |
| 1898.39 | 117.0 | 2.53 | ...         | 3n | Lew |
| 1898.54 | 116.4 | 2.54 | ...         | 1n | β   |

Discovered with the 15½-inch at the Washburn Observatory. This is a very interesting physical system. The change so far has been principally in distance, indicating that the plane of the orbit is nearly in the line of sight. The system has a large proper motion, according to KRUEGER, of 0".697 in the direction of 113°.6. Lalande 24652.

[β (XII)...β<sup>4</sup>...β (*Sid. Mess.* IX, 299)...β (3048,3114)...β (*Pub. L. O.* II)...Comstock (*Pub. Washburn Obsy.* VI, X) (*Sid. Mess.* IX, 78)...Sp (III)...Doolittle (*Pub. Flower Obsy.* I)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Aitken ( )...HΣ ( )...]

β 222. Lalande 24636

R.A. 13<sup>h</sup> 10<sup>m</sup> 55<sup>s</sup> }  
Decl. — 20° 54' }

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1867.38 | 12.1 | 1.46 | 8 ... 9    | 1n | Hd  |
| 1877.11 | 7.7  | 1.89 | 8.0... 9.0 | 1n | Cin |
| 1894.44 | 14.7 | 1.50 | 8 ... 10   | 2n | Sel |
| 1896.48 | 14.8 | 1.51 | ...        | 3n | A   |

Discovered with the 6-inch, but it had been previously seen by the Harvard observers, and is included in a list of new stars first published in 1882. The components seem to be fixed.

[β (IV)...β (*Mon. Not.* XXXIV, 382)...Cin<sup>4</sup>...*Annals Harvard Obsy.* XIII...Sellors (3303...Aitken (3395)...)]

β 1084. W<sup>1</sup> XIII. 235

R.A. 13<sup>h</sup> 15<sup>m</sup> 59<sup>s</sup> }  
Decl. — 4° 2' }

|         |      |      |             |    |   |
|---------|------|------|-------------|----|---|
| 1889.31 | 89.8 | 2.69 | 7.1... 12.7 | 3n | β |
| 1898.26 | 88.7 | 2.78 | 7.2... 13.5 | 3n | A |

Discovered with the 36-inch. The two sets of measures show no change.

[β (XV)...β (2929)...β (*Pub. L. O.* II)...Aitken ( )...]

β 610. *Virginis* 504

R.A. 13<sup>h</sup> 17<sup>m</sup> 28<sup>s</sup> }  
Decl. — 20° 18' }

|         |      |      |             |    |    |
|---------|------|------|-------------|----|----|
| 1878.24 | 18.3 | 4.02 | 6.8... 10.5 | 1n | β  |
| 1878.41 | 17.4 | 3.77 | 7.0... 10.5 | 1n | Δ  |
| 1892.25 | 20.3 | 3.69 | 7.5... 10.3 | 3n | β  |
| 1892.38 | 18.5 | 3.82 | 7.1... 11.8 | 3n | Lv |

Discovered with the 18½-inch. Apparently without change. In GOULD 6.9 m. Lalande 24812.

[β (X)...β<sup>1</sup>...β (3142)...β (*Pub. L. O.* II)...Glazenapp (I)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

β 460. W<sup>1</sup> XIII. 273

R.A. 13<sup>h</sup> 18<sup>m</sup> 40<sup>s</sup> }  
Decl. — 15° 0' }

|         |      |      |             |    |    |
|---------|------|------|-------------|----|----|
| 1877.90 | 36.4 | 2.19 | 8.2... 10.5 | 2n | Δ  |
| 1878.28 | 33.6 | 1.99 | 8.0... 10.5 | 1n | β  |
| 1892.38 | 34.8 | 2.26 | 8.0... 10.4 | 3n | Lv |
| 1892.39 | 33.9 | 2.13 | 8.1... 10.0 | 3n | β  |

Discovered with the 6-inch. There is no indication of motion.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\beta^1$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

$\beta$  1107. O. Arg. S. 12884

R.A. 13<sup>h</sup> 20<sup>m</sup> 37<sup>s</sup> }  
Decl. - 21° 44' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1889.37 | 133.8 | 1.17 | 8.5... 8.5 | 3 <sup>n</sup> | $\beta$ |
| 1897.37 | 132.4 | 1.05 | 8.0... 8.0 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...]

$\beta$  237. Lalande 24896

R.A. 13<sup>h</sup> 20<sup>m</sup> 59<sup>s</sup> }  
Decl. + 15° 0' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.27 | 202.3 | 2.95 | 8.3... 10.3 | 3 <sup>n</sup> | $\Delta$ |
| 1883.44 | 204.2 | 2.91 | 8.5... 11.0 | 3 <sup>n</sup> | Ho       |
| 1883.64 | 207.7 | 2.95 | 8.2... 10.2 | 7 <sup>n</sup> | En       |
| 1899.07 | 200.1 | 3.12 | 8.3... 11.5 | 1 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. This system has a proper motion of 0".189 in the direction of 152°.1 (PORTER). It is obviously a physical pair, but the relative change is slow.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\Delta$  (I)...Engelmann (2678)...Hough (2978)...]

$\beta$  113. D.M. (12°) 2597

R.A. 13<sup>h</sup> 23<sup>m</sup> 10<sup>s</sup> }  
Decl. + 12° 6' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.32 | 188.8 | 1.57 | 8.5... 11.0 | 4 <sup>n</sup> | $\Delta$ |
| 1891.25 | 197.2 | 1.45 | 8.0... 10.2 | 3 <sup>n</sup> | $\beta$  |
| 1896.50 | 203.8 | 1.32 | ...         | 3 <sup>n</sup> | A        |
| 1898.32 | 204.2 | 1.39 | 8.2... 11.3 | 3 <sup>n</sup> | A        |

Discovered with the 6-inch. Slow angular motion, and probably binary.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Aitken (3395) ( )...]

$\beta$  114. W' XIII 438

R.A. 13<sup>h</sup> 28<sup>m</sup> 0<sup>s</sup> }  
Decl. - 8° 0' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1874.30 | 133.5 | 1.38 | 8 ... 8    | 1 <sup>n</sup> | WS       |
| 1875.30 | 137.1 | 1.49 | 7.6... 8.0 | 4 <sup>n</sup> | $\Delta$ |
| 1876.38 | 134.5 | 1.60 | 8.0... 8.0 | 1 <sup>n</sup> | Cin      |
| 1876.91 | 134.6 | 1.43 | 7.6... 8.0 | 4 <sup>n</sup> | Sp       |
| 1877.29 | 132.9 | 1.39 | 8.0... 8.0 | 1 <sup>n</sup> | Cin      |
| 1878.43 | 135.4 | 1.40 | 8.2... 8.5 | 2 <sup>n</sup> | Cin      |
| 1880.33 | 137.0 | 1.50 | 7.9... 8.0 | 2 <sup>n</sup> | Cin      |
| 1885.32 | 139.4 | 1.50 | 8.7... 9.0 | 4 <sup>n</sup> | W        |
| 1885.34 | 135.4 | 1.60 | 8.0... 8.0 | 1 <sup>n</sup> | LM       |
| 1888.36 | 138.8 | 1.34 | 7.5... 8.0 | 3 <sup>n</sup> | T        |
| 1888.49 | 137.2 | 1.44 | 8.1... 8.3 | 2 <sup>n</sup> | Lv       |
| 1890.07 | 138.0 | 1.58 | ...        | 3 <sup>n</sup> | Maw      |
| 1890.40 | 133.5 | 1.98 | 8.1... 8.2 | 2 <sup>n</sup> | Gl       |
| 1893.37 | 140.7 | 1.41 | 8.1... 8.3 | 3 <sup>n</sup> | J        |

Discovered with the 6-inch. Probably without change.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (I)... $\Delta$  (2086)... Wilson and Seabroke (*Mem. R. A. S.* XLIII)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Sp (II)...LM...Lv<sup>1</sup>...Tarrant (2991)...Glasenapp (I)...Maw (*Mem. R. A. S. L.*)...Jones (*A. J.* 312)...]

$\beta$  932. *Virginis* 550

R.A. 13<sup>h</sup> 28<sup>m</sup> 18<sup>s</sup> }  
Decl. - 12° 36' }

A and B

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1879.39 | 81.2 | 0.47 | 6.1... 6.6 | 4 <sup>n</sup> | $\beta$ |
| 1881.37 | 84.9 | 0.51 | 6.0... 6.8 | 3 <sup>n</sup> | $\beta$ |
| 1884.42 | 83.8 | 0.34 | ...        | 3 <sup>n</sup> | HI      |
| 1888.26 | 81.6 | 0.51 | 6.0... 6.5 | 3 <sup>n</sup> | T       |
| 1898.32 | 84.3 | 0.44 | 6.4... 6.4 | 4 <sup>n</sup> | A       |

AB and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1879.68 | 155.2 | 23.82 | ...12.4 | 3 <sup>n</sup> | $\beta$ |
| 1898.32 | 153.5 | 25.15 | ...12.4 | 5 <sup>n</sup> | A       |
| 1899.30 | 153.6 | 25.10 | ...12.7 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. The measures of the distant star indicate a proper motion of A of 0".08 in the direction of 305°.7. Evidently this belongs to both components, but there has been no sensible relative motion.

This is a naked-eye star in *Virgo* (B. A. C. 4531) and said to be variable, 5 to 8 m, by SCHMIDT in

1866. It seems to have been neglected since that time by variable star observers. It would be specially interesting to know in which, if only one, of the close stars the variability occurs. This is Z *Virginis* of some of the variable star catalogues.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta^4$ ... $\beta$  (*Observatory* III, 92)...Hall (II)...Tarrant (2991)...*Nature*, xxvii, 617; xxx, 325...Aitken ( )...]

$\beta$  933. W<sup>2</sup> XIII. 555

R.A. 13<sup>h</sup> 29<sup>m</sup> 7<sup>s</sup> }  
Decl. + 33° 45' }

A and B

|         |      |      |        |     |                |         |
|---------|------|------|--------|-----|----------------|---------|
| 1879.80 | 30.7 | 1.88 | 8.4... | 8.8 | 4 <sup>n</sup> | $\beta$ |
| 1881.41 | 32.8 | 2.46 | ...    |     | 1 <sup>n</sup> | Big     |
| 1888.68 | 29.0 | 2.09 | 8.2... | 9.2 | 2 <sup>n</sup> | Lv      |
| 1891.11 | 31.6 | 2.29 | ...    |     | 3 <sup>n</sup> | Sp      |
| 1892.40 | 29.7 | 2.23 | ...    |     | 1 <sup>n</sup> | Sp      |
| 1895.41 | 31.0 | 2.20 | ...    |     | 2 <sup>n</sup> | Sp      |
| 1897.47 | 31.1 | 2.52 | 8+...  | 9.0 | 1 <sup>n</sup> | D       |
| 1898.27 | 29.0 | 2.44 | ...    |     | 3 <sup>n</sup> | D       |
| 1898.37 | 29.5 | 2.32 | 8.3... | 8.7 | 3 <sup>n</sup> | A       |

A and C (= H 2661)

|         |      |          |        |       |                |         |
|---------|------|----------|--------|-------|----------------|---------|
| 1830.   | 28.0 | 30 $\pm$ | 8.9... | 12-13 | 1 <sup>n</sup> | H       |
| 1879.68 | 21.8 | 34.48    | ...    | 12.5  | 3 <sup>n</sup> | $\beta$ |
| 1898.27 | 17.6 | 34.46    | ...    | 12.0  | 3 <sup>n</sup> | D       |
| 1898.37 | 16.5 | 34.71    | ...    | 12.5  | 3 <sup>n</sup> | A       |

The close companion to the principal star of H 2661 was discovered with the 18½-inch. The foregoing are all the measures of AC. There seems to be some change in the angle, probably from proper motion.

[ $\beta$  (XIII)... $\beta^3$ ...Bigourdan (*Paris Obsns.* 1883)...Lv<sup>1</sup>...Sp (III)...Aitken ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  611. Lalande 25159

R.A. 13<sup>h</sup> 31<sup>m</sup> 15<sup>s</sup> }  
Decl. - 14° 7' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1878.35 | 259.4 | 4.63 | 8.5... | 12.0 | 2 <sup>n</sup> | $\beta$ |
| 1882.31 | 260.1 | ...  | 8.7... | 10.0 | 1 <sup>n</sup> | W       |
| 1886.35 | 266.0 | ...  | 8.5... | 11.5 | 1 <sup>n</sup> | W       |
| 1893.37 | 263.2 | 4.68 | 9.0... | 12.0 | 2 <sup>n</sup> | W       |
| 1898.44 | 258.8 | 4.86 | 8.8... | 12.2 | 2 <sup>n</sup> | A       |

Discovered with the 18½-inch. Unchanged.

[ $\beta$  (x)... $\beta^1$ ...Wilson (Cin<sup>10</sup>)...Wilson ( )...Aitken ( )...]

$\beta$  934. D.M. (51°) 1855

R.A. 13<sup>h</sup> 32<sup>m</sup> 50<sup>s</sup> }  
Decl. + 51° 4' }

|         |       |      |        |     |                |         |
|---------|-------|------|--------|-----|----------------|---------|
| 1879.28 | 264.1 | 1.04 | 9.0... | 9.2 | 3 <sup>n</sup> | $\beta$ |
| 1891.31 | 266.5 | 1.26 | 9.1... | 9.1 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. In D.M. 9.4 m. It is 2<sup>m</sup> 39<sup>s</sup> p  $\Sigma$  1774 rej.

$\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...]

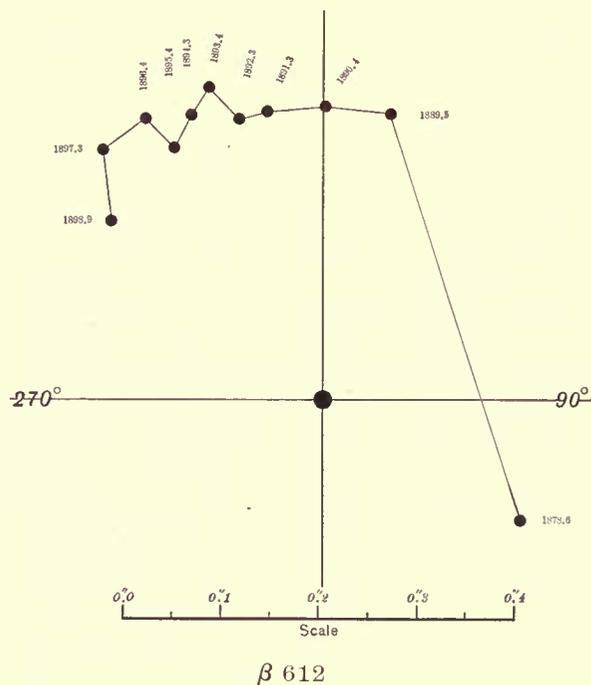
$\beta$  612. B.A.C 4559

R.A. 13<sup>h</sup> 33<sup>m</sup> 40<sup>s</sup> }  
Decl. + 11° 21' }

|         |       |            |        |     |                  |            |
|---------|-------|------------|--------|-----|------------------|------------|
| 1878.33 | 56.1  | 0.23       | 6.0... | 6.0 | 3 <sup>n</sup>   | $\beta$    |
| 1878.96 | 60.5  | 0.24       | 6 ...  | 6   | 4 <sup>n</sup>   | HI         |
| 1884.02 | 52.4  | 0.28       | ...    |     | 5 <sup>n</sup>   | En         |
| 1886.44 | 196.6 | ...        | ...    |     | 1 <sup>n</sup>   | H $\Sigma$ |
| 1889.46 | 166.8 | 0.3 $\pm$  | ...    |     | 3 <sup>n</sup>   | Sp         |
| 1890.39 | 179.7 | 0.3 $\pm$  | ...    |     | 2 <sup>n</sup>   | Sp         |
| 1891.28 | 191.1 | 0.28       | 6.4... | 6.5 | 3 <sup>n</sup>   | $\beta$    |
| 1891.44 | 191.1 | 0.32       | 6 ...  | 6   | 3 <sup>n</sup>   | HI         |
| 1891.49 | 186.1 | 0.2 $\pm$  | ...    |     | 1 <sup>n</sup>   | Sp         |
| 1892.14 | 198.7 | 0.31       | 6.3... | 6.5 | 3 <sup>n</sup>   | $\beta$    |
| 1892.37 | 196.9 | 0.35       | ...    |     | 2 <sup>n</sup>   | H $\Sigma$ |
| 1892.40 | 194.6 | 0.25       | ...    |     | 3 <sup>n</sup>   | Sp         |
| 1893.42 | 207.4 | 0.36       | 6.1... | 6.2 | 5-1 <sup>n</sup> | W          |
| 1893.45 | 199.9 | 0.28       | ...    |     | 4 <sup>n</sup>   | Sp         |
| 1893.47 | 193.1 | 0.39       | ...    |     | 1 <sup>n</sup>   | Lew        |
| 1893.58 |       | Single     | ...    |     | 1 <sup>n</sup>   | Com        |
| 1894.12 | 207.4 | 0.32       | ...    |     | 4 <sup>n</sup>   | Bar        |
| 1894.28 | 203.7 | 0.3 $\pm$  | ...    |     | 2 <sup>n</sup>   | Com        |
| 1894.48 | 203.7 | 0.29       | ...    |     | 4 <sup>n</sup>   | Sp         |
| 1895.32 | 210.6 | 0.52       | 6.4... | 6.5 | 2 <sup>n</sup>   | Lew        |
| 1895.40 | 209.3 | 0.30       | ...    |     | 2 <sup>n</sup>   | Sp         |
| 1895.42 | 212.1 | 0.25 $\pm$ | ...    |     | 4 <sup>n</sup>   | Com        |
| 1896.37 | 212.5 | 0.4 $\pm$  | ...    |     | 2 <sup>n</sup>   | Com        |
| 1896.41 | 212.1 | 0.34       | ...    |     | 2 <sup>n</sup>   | Lew        |
| 1897.21 | 222.6 | 0.38       | ...    |     | 3 <sup>n</sup>   | A          |
| 1897.36 | 223.9 | 0.33       | ...    |     | 2 <sup>n</sup>   | Lew        |
| 1897.42 | 217.3 | 0.30       | ...    |     | 6 <sup>n</sup>   | Sp         |
| 1898.32 | 210.9 | 0.48       | ...    |     | 1 <sup>n</sup>   | Bow        |
| 1898.40 | 221.0 | 0.39       | ...    |     | 2 <sup>n</sup>   | Lew        |
| 1898.47 | 225.1 | 0.36       | ...    |     | 2 <sup>n</sup>   | Sp         |
| 1898.61 | 231.5 | 0.28       | 6.2... | 6.2 | 3 <sup>n</sup>   | A          |
| 1899.25 | 227.7 | 0.29       | 6.5... | 6.5 | 4 <sup>n</sup>   | A          |

Discovered with the 18½-inch. It was very soon apparent from the measures that this was a binary

system in rapid motion. In the twenty years covered by the measures, the companion has passed over an arc of  $175^\circ$ . GLASENAPP, from the measures down to and including 1892, has computed an orbit from which he finds a period of 30.00 years (*Astronomy and Astro-Physics*, June 1892). This represents the observations as well as could be desired, but evidently the arc was too short for any very accurate determination, and even now widely differing apparent orbits will satisfy the observed positions equally. It is probable that the measures of the next ten years will furnish sufficient data for an orbit which shall be substantially correct. The principal measured positions are shown on the accompanying diagram:



$\beta$  612

This is a naked-eye star in *Virgo*. It has no sensible proper motion.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114,3142)... $\beta$  (*Pub. L. O. II*)... $\beta$  (*Sid. Mess. X*, 323) (*Astronomy & A.-P.* XI, 268)...Hall (I, II)...Engelmann (2678)...Sp (III)...Wilson (...)  
Comstock (*Pub. Washburn Obsy. X*)...Lewis (*Mon. Not. LIV*, 316; LIX, 400) (*Greenwich Obsns.* 1895)...Everett (*Mon. Not. LVI*, 464)...Glasenapp (*Astronomy & A.-P.* XI, 466)...Barnard (*A. J.* 447)...H $\Sigma$  (...)  
Lewis (...)  
Aitken (...)]

$\beta$  223. Lalande 25350

R.A.  $13^h 38^m 58^s$  }  
Decl.  $- 2^\circ 43'$  }

|         |       |       |            |    |          |
|---------|-------|-------|------------|----|----------|
| 1875.65 | 343.7 | 18.73 | 7.9...11.1 | 3n | $\Delta$ |
| 1879.40 | 343.1 | 18.93 | 8.0...10.5 | 1n | Cin      |
| 1880.33 | 344.7 | 18.75 | 8.0...10.0 | 1n | $\beta$  |
| 1889.37 | 344.7 | 18.56 | 7.8...11.3 | 2n | T        |
| 1899.07 | 344.3 | 18.98 | 8.0...11.0 | 1n | $\beta$  |

Discovered with the 6-inch.

[ $\beta$  (IV)... $\beta$  (*Mon. Not. XXXIV*, 382)... $\beta^3$ ... $\Delta$  (1)...Cin<sup>5</sup>...  
Tarrant (3186)...]

$\beta$  115. Lalande 25365

R.A.  $13^h 39^m 24^s$  }  
Decl.  $+ 9^\circ 40'$  }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1877.40 | 224.4 | 1.42 | 8.0...11.5 | 2n | $\Delta$ |
| 1891.25 | 223.6 | 1.64 | 8.0...10.4 | 3n | $\beta$  |

Discovered with the 6-inch. There is an error in the declination given in  $\beta$  (III).

[ $\beta$  (III)... $\beta$  (*Mon. Not. XXXIV*, 59)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...]

$\beta$  935. 86 *Virginis*

R.A.  $13^h 39^m 33^s$  }  
Decl.  $- 11^\circ 49'$  }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1879.37 | 298.4 | 1.61 | 5.5...10.5 | 5n | $\beta$ |
| 1879.50 | 293.5 | 1.61 | 6...11     | 5n | H1      |
| 1880.42 | 299.9 | 1.63 | ...        | 2n | Cin     |
| 1881.44 | 296.1 | 1.33 | 6.0...9.7  | 2n | $\beta$ |
| 1885.38 | 290.3 | 1.70 | ...        | 2n | H1      |
| 1889.30 | 299.6 | 1.66 | 5.8...10.0 | 3n | $\beta$ |
| 1897.40 | 293.8 | 1.52 | 6.0...10.0 | 3n | A       |
| 1899.20 | 297.9 | 1.63 | ...9.8     | 3n | $\beta$ |

C and D

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1879.40 | 274.2 | 1.72 | 11.6...12.8 | 4n | $\beta$ |
| 1879.50 | 276.1 | 1.80 | 12...13     | 2n | H1      |
| 1889.30 | 275.9 | 2.24 | 10.5...11.2 | 3n | $\beta$ |
| 1897.40 | 270.6 | 2.09 | 11...12     | 3n | A       |
| 1899.20 | 273.7 | 2.03 | 11.5...12.4 | 2n | $\beta$ |

A and C (=  $\Sigma$  1780 rej.)

|         |       |       |     |                |         |
|---------|-------|-------|-----|----------------|---------|
| 1836.40 | 160.3 | "     | ... | 1 <sup>n</sup> | H       |
| 1879.33 | 164.7 | 26.94 | ... | 2 <sup>n</sup> | $\beta$ |
| 1889.30 | 164.6 | 27.17 | ... | 3 <sup>n</sup> | $\beta$ |
| 1899.20 | 164.3 | 27.07 | ... | 3 <sup>n</sup> | $\beta$ |

Both components of STRUVE'S rejected pair were found to be double with the 18½-inch. With a large aperture it is one of the finest of the quadruple groups.

According to AUWERS, 86 *Virginis* has a proper motion of 0".043 in the direction of 287°.5. The measures of AB show conclusively that this movement belongs to both stars. With this proper motion and the position of B in 1879, the latter star, if fixed in space, for 1897 should be 308°.2 : 0".86. It is evident that no such relative change has taken place. The measures are insufficient in point of time to show whether or not the double companion is moving with the principal star. All the measures of AC are given above.

In making the measures of 1889 with the 36-inch, two new nebulae were discovered in the field. One is 4½"  $\rho$  and 136".8  $\sigma$ , and the other 19½"  $\rho$  and 101".6  $\sigma$ .

[ $\beta$  (XIII)... $\beta^3$ ... $\beta^4$ ... $\beta$  (2930)...Cin<sup>6</sup>...Hall (I, II)...Aitken (3465)...]

$\beta$  801. Lalande 25399

R.A. 13<sup>h</sup> 40<sup>m</sup> 43<sup>s</sup> }  
Decl. + 11° 26'

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.31 | 328.0 | 2.76 | 8.1...10.9 | 3 <sup>n</sup> | $\beta$ |
| 1888.39 | 326.5 | 2.66 | 8.5...10.5 | 3 <sup>n</sup> | Com     |
| 1898.37 | 324.3 | 2.62 | 8.1... 9.7 | 3 <sup>n</sup> | D       |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* VI)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  413. Lacaille 5686

R.A. 13<sup>h</sup> 42<sup>m</sup> 16<sup>s</sup> }  
Decl. - 27° 46'

|         |       |       |            |                |         |
|---------|-------|-------|------------|----------------|---------|
| 1877.37 | 109.1 | 78.68 | 7.5... 9.0 | 1 <sup>n</sup> | Cin     |
| 1879.33 | 108.8 | 78.00 | 6.2... 8.5 | 1 <sup>n</sup> | $\beta$ |
| 1885.32 | 108.7 | 77.77 | 7.0... 8.0 | 1 <sup>n</sup> | W       |
| 1889.39 | 109.5 | 77.66 | 7.7... 9.2 | 2 <sup>n</sup> | $\beta$ |
| 1899.27 | 108.6 | 76.88 | 8.0... 9.0 | 2 <sup>n</sup> | $\beta$ |

The distant companion to this blood-red star was noted with the 6-inch. It is not likely to be of any interest as a double star. The color of the principal star is very striking. It is not given in any of the catalogues of red stars. The measures indicate a proper motion of 0".07 nearly in the line of the components.

[ $\beta$  (VII)... $\beta$  (2103,2957)... $\beta^3$ ... $\beta$  (*Pub. L. O.* II)...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...]

$\beta$  802. D.M. (49°) 2245

R.A. 13<sup>h</sup> 43<sup>m</sup> 48<sup>s</sup> }  
Decl. + 48° 57'

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1881.33 | 223.9 | 3.43 | 7.8...11.0 | 3 <sup>n</sup> | $\beta$    |
| 1885.54 | 220.8 | 3.73 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1888.44 | 221.3 | 3.65 | 8.0...11.7 | 3 <sup>n</sup> | Com        |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* VI)...H $\Sigma$  ( )...]

$\beta$  343. Centauri 219

R.A. 13<sup>h</sup> 45<sup>m</sup> 8<sup>s</sup> }  
Decl. - 31° 1'

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.41 | 130.2 | 1.44 | 6.0... 8.5 | 1 <sup>n</sup> | Cin     |
| 1889.37 | 129.7 | 1.70 | 6.2... 7.1 | 4 <sup>n</sup> | $\beta$ |
| 1894.45 | 122.0 | 0.93 | 6 ... 8    | 2 <sup>n</sup> | Sel     |
| 1897.22 | 123.0 | 1.05 | 6.4... 8.0 | 3 <sup>n</sup> | See     |
| 1898.32 | 118.7 | 1.28 | 6.5... 7.4 | 3 <sup>n</sup> | A       |

Discovered with the 6-inch. Apparently slow retrograde motion. In GOULD 6.7 m. B.A.C. 4624.

[ $\beta$  (VI)... $\beta$  (2062,2957)... $\beta$  (*Pub. L. O.* II)...Cin<sup>4</sup>...Sellors (3303)...See (3496)...Aitken ( )...]

$\beta$  613. D.M. (35°) 2494

R.A. 13<sup>h</sup> 46<sup>m</sup> 3<sup>s</sup> }  
Decl. + 35° 16'

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.42 | 146.2 | 0.78 | 9.0... 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1880.37 | 149.3 | 0.92 | 9.0... 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1892.13 | 149.7 | 0.73 | 9.1... 9.1 | 3 <sup>n</sup> | $\beta$ |
| 1898.43 | 153.6 | 0.48 | ...        | 1 <sup>n</sup> | Lew     |
| 1898.44 | 153.5 | 0.87 | 9.0... 9.9 | 4 <sup>n</sup> | D       |

AB and C

|         |      |       |     |     |                |   |
|---------|------|-------|-----|-----|----------------|---|
| 1880.37 | 83.4 | 49.21 | ... | 8.8 | 1 <sup>n</sup> | β |
| 1892.15 | 83.2 | 48.75 | ... | 9.0 | 2 <sup>n</sup> | β |
| 1898.44 | 82.1 | 48.73 | ... | 8.9 | 4 <sup>n</sup> | D |

Discovered with the 18½-inch. It is 12<sup>s</sup>.4 *f* the 6 m star, B.A.C. 4628. Some change in the close pair is probable.

[β (x)...β<sup>1</sup>...β (3142)...β (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX, 400*)...Doolittle (*Pub. Flower Obsy. 1*)...]

β 1108. B.A.C. 4631

R.A. 13<sup>h</sup> 46<sup>m</sup> 32<sup>s</sup> }  
Decl. - 35° 4' }

A and B

|         |      |      |        |     |                |                    |
|---------|------|------|--------|-----|----------------|--------------------|
| 1889.38 | 84.0 | 1.28 | 6.0... | 6.0 | 3 <sup>n</sup> | β                  |
| 1893.47 | 86.3 | 0.83 | 6      | ... | 6              | 2 <sup>n</sup> Sel |
| 1897.37 | 86.5 | 0.99 | 6.0... | 6.0 | 3 <sup>n</sup> | A                  |

AB and C

|         |       |       |     |    |                |   |
|---------|-------|-------|-----|----|----------------|---|
| 1889.38 | 168.2 | 27.52 | ... | 12 | 1 <sup>n</sup> | β |
|---------|-------|-------|-----|----|----------------|---|

AB and D (= H<sup>1</sup> V. 124)

|         |       |       |     |     |                |                |
|---------|-------|-------|-----|-----|----------------|----------------|
| 1783.08 | ...   | 54.02 | ... | ... | 1 <sup>n</sup> | H <sup>1</sup> |
| 1889.38 | 359.0 | 65.21 | ... | 8.5 | 3 <sup>n</sup> | β              |

Discovered with the 12-inch, but it had been previously seen and recorded by HOWE. Lacaille 5726.

[β (xvi)...β (2956)...β (*Pub. L. O. II*)...Howe (*Cin<sup>1</sup>*)... Sellors (3240)...Aitken (3465)...]

β 614. Lalande 25573

R.A. 13<sup>h</sup> 48<sup>m</sup> 2<sup>s</sup> }  
Decl. + 10° 44' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1878.37 | 268.3 | 0.60 | 8.0... | 11.7 | 2 <sup>n</sup> | β |
| 1889.40 | 271 I | 0.44 | 7.8... | 11.2 | 3 <sup>n</sup> | β |

This very difficult pair was discovered with the 18½-inch. The principal star is identical with that of OΣ 271, which was marked "oblonga?" in the *Poulkowa Catalogue* of 1843, but rejected as single in the revised edition of 1850. It is not certain that the very minute star now measured has any connection with the suspected elongation previously noticed. At the time of making the meas-

ures given above, the principal star was perfectly round, with the 18½ and 36-inch refractors. It is the southern star of three in the field.

[β (x)...β<sup>1</sup>...β (2199,2957)...β (*Pub. L. O. II*)...]

β 461. W<sup>1</sup> XIII. 850

R.A. 13<sup>h</sup> 50<sup>m</sup> 36<sup>s</sup> }  
Decl. + 3° 34' }

A and B

|         |       |       |        |      |                |                  |
|---------|-------|-------|--------|------|----------------|------------------|
| 1879.38 | 234.9 | 33.33 | 7.5... | 12.5 | 1 <sup>n</sup> | β                |
| 1893.36 | 235.1 | 33.33 | 7.7... | 12.2 | 3 <sup>n</sup> | W                |
| 1899.37 | 235.9 | 33.12 | 7      | ...  | 12.2           | 2 <sup>n</sup> β |

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1879.38 | 216.3 | 40.55 | ... | 11.8 | 1 <sup>n</sup> | β |
| 1893.36 | 216.6 | 40.50 | ... | 11.3 | 3 <sup>n</sup> | W |
| 1899.37 | 216.6 | 40.84 | ... | 12.3 | 2 <sup>n</sup> | β |

Noted with the 6-inch. Of no particular interest as a double star.

[β (ix)...β (*Mon. Not. xxxviii, 78*)...β<sup>3</sup>...Wilson ( )...]

β 936. D.M. (35°) 2505

R.A. 13<sup>h</sup> 51<sup>m</sup> 3<sup>s</sup> }  
Decl. + 35° 13' }

|         |      |      |        |      |                |   |
|---------|------|------|--------|------|----------------|---|
| 1880.37 | 97.8 | 3.94 | 8.4... | 12.2 | 2 <sup>n</sup> | β |
| 1892.13 | 95.8 | 4.58 | 8.5... | 11.3 | 3 <sup>n</sup> | β |
| 1898.51 | 95.9 | 4.66 | 8.7... | 12.0 | 3 <sup>n</sup> | A |

Discovered with the 18½-inch. Probably fixed.

[β (xiii)...β<sup>3</sup>...β (3142)...β (*Pub. L. O. II*)...Aitken ( )...]

β 937. W<sup>2</sup> XIII. 1122

R.A. 13<sup>h</sup> 51<sup>m</sup> 52<sup>s</sup> }  
Decl. + 35° 1' }

|         |       |      |        |     |                |                  |
|---------|-------|------|--------|-----|----------------|------------------|
| 1880.37 | 104.8 | 0.94 | 8.1... | 8.3 | 3 <sup>n</sup> | β                |
| 1890.48 | 108.8 | 0.77 | ...    | ... | 2 <sup>n</sup> | Sp               |
| 1896.49 | 102.8 | 0.88 | 8      | ... | 8+             | 3 <sup>n</sup> A |

Discovered with the 18½-inch. Very little, if any, change.

[β (xiii)...β<sup>3</sup>...Sp (iii)...Aitken (3395)...]

**β 344.** O. Arg. S. 13285

R.A. 13<sup>h</sup> 52<sup>m</sup> 22<sup>s</sup> }  
Decl. — 24° 57' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1877.29 | 121.1 | 3.32 | 9.0... | 9.0 | 1n | Cin |
| 1879.27 | 125.7 | ...  | 9.0... | 9.5 | 1n | Cin |
| 1880.33 | 124.4 | 3.31 | 8.0... | 9.0 | 2n | Cin |
| 1898.32 | 123.8 | 3.44 | 8.7... | 8.8 | 3n | A   |

Discovered with the 6-inch. There is no evidence of change.

[β (VI)...β (2062)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Aitken ( )...]

**β 30.** D.M. (20°) 2904

R.A. 13<sup>h</sup> 52<sup>m</sup> 26<sup>s</sup> }  
Decl. + 20° 3' }

|         |       |      |        |      |    |     |
|---------|-------|------|--------|------|----|-----|
| 1875.25 | 199.8 | 7.82 | 8.2... | 11.5 | 2n | Δ   |
| 1892.24 | 200.0 | 8.05 | 8.0... | 10.4 | 3n | β   |
| 1892.29 | 199.6 | 8.29 | 8.0... | 11.0 | 4n | Lv  |
| 1898.36 | 198.8 | 8.27 | 8.1... | 11.0 | 2n | Gl  |
| 1898.37 | 197.2 | 8.18 | 8.0... | 9.7  | 2n | D   |
| 1898.46 | 201.3 | 8.75 | ...    |      | 1n | Lew |

Discovered with the 6-inch.

[β (I)...β (Mon. Not. XXXIII, 351)...β (3142)...β (Pub. L. O. II)...Δ (I)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Glasenapp (V)...Doolittle (Pub. Flower Obsy. I)...Lewis (Mon. Not. LIX, 400)...]

**β 1197.** Lacaille 5791

R.A. 13<sup>h</sup> 56<sup>m</sup> 4<sup>s</sup> }  
Decl. — 31° 6' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1890.41 | 178.9 | 0.86 | 6.8... | 8.1 | 3n | β   |
| 1897.37 | 187.9 | 0.93 | 6+...  | 8+  | 3n | A   |
| 1897.42 | 185.2 | 1.18 | 6.9... | 9.2 | 1n | See |

Discovered with the 12-inch. There may be some change in the angle.

[β (XVII)...β (3047)...β (Pub. L. O. II)...Aitken (3465)... See (3496)...]

**β 1270.** Lalande 25825

R.A. 13<sup>h</sup> 57<sup>m</sup> 46<sup>s</sup> }  
Decl. + 9° 4' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1892.27 | 329.7 | 0.27 | 8.2... | 8.3 | 3n | β   |
| 1896.40 | 356.2 | 0.43 | ...    |     | 1n | Lew |
| 1897.41 | 346.0 | 0.27 | ...    |     | 1n | Lew |

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1898.44 | 341.8 | 0.36 | ...    |     | 2n | Lew |
| 1898.44 | 344.9 | 0.45 | ...    |     | 1n | Bow |
| 1899.24 | 361.5 | 0.24 | 8.2... | 8.5 | 3n | A   |

Discovered with the 36-inch. In D.M. 7.9 m. Change in angle appears certain, but further measures are needed.

[β (XIX)...β (3141)...β (Pub. L. O. II)...Lewis and Bowyer (Mon. Not. LIX, 400)...Aitken ( )...]

**β 938.** O. Arg. S. 13375

R.A. 13<sup>h</sup> 59<sup>m</sup> 29<sup>s</sup> }  
Decl. — 26° 0' }

|         |       |      |        |     |    |    |
|---------|-------|------|--------|-----|----|----|
| 1879.39 | 117.6 | 0.89 | 7.5... | 7.5 | 2n | β  |
| 1892.40 | 117.1 | 0.65 | 7.9... | 8.2 | 3n | β  |
| 1892.41 | 299.1 | 0.62 | 7.5... | 7.7 | 3n | Lv |
| 1897.42 | 111.5 | 0.72 | 8 ...  | 8   | 1n | A  |

Discovered with the 18½-inch. Probably unchanged. It is 6' n of π *Hydrae*.

[β (XIII)...β<sup>3</sup>...β (3142)...β (Pub. L. O. II)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Aitken (3465)...]

**β 1109.** D.M. (5°) 2846

R.A. 14<sup>h</sup> 3<sup>m</sup> 18<sup>s</sup> }  
Decl. + 5° 14' }

A and B

|         |       |      |        |      |    |   |
|---------|-------|------|--------|------|----|---|
| 1889.39 | 321.9 | 1.78 | 9.0... | 13.7 | 3n | β |
| 1899.24 | 314.8 | 1.85 | 9.0... | 13.0 | 2n | A |

A and C

|         |       |       |     |     |    |   |
|---------|-------|-------|-----|-----|----|---|
| 1889.39 | 356.3 | 53.04 | ... | 9.0 | 3n | β |
| 1899.18 | 355.3 | 53.30 | ... | 9.0 | 1n | A |

Discovered with the 36-inch.

[β (XVI)...β (2956)...β (Pub. L. O. II)...Aitken ( )...]

**β 803.** Lalande 25991

R.A. 14<sup>h</sup> 4<sup>m</sup> 46<sup>s</sup> }  
Decl. — 2° 6' }

|         |       |      |        |      |    |   |
|---------|-------|------|--------|------|----|---|
| 1881.45 | 227.9 | 5.27 | 7.8... | 12.0 | 1n | β |
| 1892.40 | 226.5 | 5.54 | 7.4... | 11.3 | 3n | β |
| 1899.27 | 224.6 | 5.67 | 7.5... | 11.7 | 2n | β |

Discovered with the 15½-inch at the Washburn Observatory. Another pair found at the same place is 30<sup>s</sup> *p*.

|         |       |      |        |     |                |         |
|---------|-------|------|--------|-----|----------------|---------|
| 1881.37 | 243.6 | 4.33 | 8.8... | 9.5 | 3 <sup>n</sup> | $\beta$ |
| 1899.27 | 243.5 | 4.70 | 9.0... | 9.2 | 2 <sup>n</sup> | $\beta$ |

[ $\beta$  (xii)... $\beta^4$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...]

$\beta$  224. W<sup>1</sup> XIV. 95

R.A. 14<sup>h</sup> 7<sup>m</sup> 38<sup>s</sup> }  
Decl. +13° 8' }

|         |      |      |        |     |                |          |
|---------|------|------|--------|-----|----------------|----------|
| 1875.64 | 71.0 | 0.71 | 8.9... | 9.3 | 3 <sup>n</sup> | $\Delta$ |
| 1879.47 | 61.7 | 0.95 | 9.0... | 9.5 | 2 <sup>n</sup> | Sp       |
| 1884.98 | 68.6 | 0.78 | 8.2... | 8.5 | 5 <sup>n</sup> | En       |
| 1893.36 | 65.0 | 0.88 | 7.8... | 8.3 | 3 <sup>n</sup> | W        |
| 1898.20 | 63.7 | 0.86 | ...    |     | 5 <sup>n</sup> | D        |
| 1898.32 | 65.6 | 0.69 | 8.3... | 8.5 | 3 <sup>n</sup> | A        |

Discovered with the 6-inch. Change uncertain.

[ $\beta$  (iv)... $\beta$  (*Mon. Not. xxxiv*, 382)... $\Delta$  (i)...Sp (ii)...  
Engelmann (2678)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...Aitken ( )...]

$\beta$  939. Lalande 26065

R.A. 14<sup>h</sup> 7<sup>m</sup> 48<sup>s</sup> }  
Decl. -7° 57' }

A and B

|         |       |       |        |     |                |         |
|---------|-------|-------|--------|-----|----------------|---------|
| 1879.92 | 156.1 | 0.65  | 8.0... | 8.1 | 2 <sup>n</sup> | $\beta$ |
| 1887.46 | 147.9 | 0.45  | ...    |     | 2 <sup>n</sup> | Sp      |
| 1888.34 | 147.5 | 0.68  | 8.0... | 8.4 | 2 <sup>n</sup> | Lv      |
| 1892.39 | 149.3 | 0.6±  | ...    |     | 2 <sup>n</sup> | Sp      |
| 1895.40 | 150.9 | 0.35± | ...    |     | 1 <sup>n</sup> | Sp      |
| 1898.27 | 147.5 | 0.71  | 8      | 8   | 3 <sup>n</sup> | D       |

AB and C

|         |       |       |     |     |                |         |
|---------|-------|-------|-----|-----|----------------|---------|
| 1879.37 | 280.9 | 87.25 | ... | 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1898.27 | 280.0 | 87.63 | ... | 9   | 3 <sup>n</sup> | D       |

Discovered with the 18½-inch. Apparently without change.

[ $\beta$  (xiii)... $\beta^3$ ...Sp (iii)...Lv<sup>1</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  1246. B.A.C. 4740

R.A. 14<sup>h</sup> 12<sup>m</sup> 12<sup>s</sup> }  
Decl. -25° 16' }

A and B

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1891.43 | 187.1 | 2.99 | 5.5... | 13.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.52 | 189.2 | 3.30 | 5.5... | 13.8 | 2 <sup>n</sup> | A       |

A and C

|         |      |       |     |      |                |         |
|---------|------|-------|-----|------|----------------|---------|
| 1891.42 | 88.8 | 36.35 | ... | 11   | 1 <sup>n</sup> | $\beta$ |
| 1898.44 | 92.0 | 39.09 | ... |      | 1 <sup>n</sup> | $\beta$ |
| 1898.52 | 93.0 | 39.05 | ... | 13.5 | 2 <sup>n</sup> | A       |

Discovered with the 36-inch. The principal star has a large proper motion, 0".458, in the direction of 307°0 (PORTER). The change in the position of C is explained by this motion of A. The companion to A evidently has the same proper motion, and the two doubtless form a physical system. LACAILLE 5892.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

$\beta$  1110. Taylor 6665

R.A. 14<sup>h</sup> 12<sup>m</sup> 29<sup>s</sup> }  
Decl. -36° 18' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1889.39 | 130.7 | 3.95 | 7.0... | 12.3 | 3 <sup>n</sup> | $\beta$ |
| 1897.37 | 133.4 | 3.52 | 6.9... | 14.2 | 1 <sup>n</sup> | See     |
| 1898.52 | 131.2 | 3.78 | 7.2... | 11.7 | 3 <sup>n</sup> | A       |

Discovered with the 12-inch. So far unchanged.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...See (3496)...  
Aitken ( )...]

$\beta$  116. Lalande 26177

R.A. 14<sup>h</sup> 13<sup>m</sup> 3<sup>s</sup> }  
Decl. -13° 9' }

|         |       |      |        |     |                |          |
|---------|-------|------|--------|-----|----------------|----------|
| 1875.69 | 279.0 | 2.90 | 7.7... | 8.2 | 3 <sup>n</sup> | $\Delta$ |
| 1876.38 | 278.7 | 3.21 | 8.0... | 8.5 | 2 <sup>n</sup> | Cin      |
| 1877.41 | 278.2 | 3.08 | 8.0... | 8.5 | 1 <sup>n</sup> | Cin      |
| 1878.42 | 277.4 | 2.98 | 7.7... | 8.2 | 2 <sup>n</sup> | Cin      |
| 1880.37 | 278.3 | 3.08 | ...    |     | 1 <sup>n</sup> | Cin      |
| 1885.28 | 278.7 | 3.12 | 8.0... | 8.5 | 1 <sup>n</sup> | W        |
| 1886.30 | 279.2 | 3.06 | 8      | 8   | 1 <sup>n</sup> | LM       |
| 1888.36 | 98.6  | 3.16 | 7.7... | 8.5 | 3 <sup>n</sup> | T        |
| 1888.36 | 277.7 | 3.01 | 8.2... | 8.2 | 2 <sup>n</sup> | Lv       |
| 1890.41 | 279.1 | 3.32 | 7.8... | 8.1 | 2 <sup>n</sup> | Gl       |
| 1893.38 | 276.5 | 3.08 | 7.8... | 8.0 | 1 <sup>n</sup> | J        |

Discovered with the 6-inch. No material change.  
It is 20' n of  $\lambda$  *Virginis*.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (I)...Cin<sup>3</sup>...Cin<sup>4</sup>...  
Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>20</sup>)...LM...Lv<sup>1</sup>...Tarrant  
(2991)...Glaseapp (1)...Jones (*A.J.* 312)...]

$\beta$  1271. Radcliffe 3181

R.A. 14<sup>h</sup> 13<sup>m</sup> 4<sup>s</sup> }  
Decl. + 55° 6' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1892.36 | 355.2 | 2.81 | 6.8...12.0 | 3n | $\beta$ |
| 1897.58 | 351.0 | 2.31 | 7.0...12.0 | 3n | A       |

Discovered with the 36-inch. In D.M. 7.0m.  
[ $\beta$  (XIX)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...]

$\beta$  1272. O. Arg. N. 14451

R.A. 14<sup>h</sup> 13<sup>m</sup> 22<sup>s</sup> }  
Decl. + 49° 18' }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1892.17 | 132.5 | 1.25 | 8.4... 9.5 | 4n | $\beta$ |
| 1897.52 | 132.8 | 1.32 | ...        | 2n | Lew     |
| 1897.56 | 126.5 | 1.14 | 8+... 9+   | 3n | A       |
| 1898.53 | 129.3 | 1.18 | ...        | 1n | Lew     |
| 1898.63 | 134.2 | 1.44 | ...        | 1n | Bry     |

A and C (= H 2710)

|         |       |       |          |    |         |
|---------|-------|-------|----------|----|---------|
| 1830    | 324.0 | 2.5 ± | 9 ... 10 | 1n | H       |
| 1892.17 | 321.8 | 23.67 | ... 8.6  | 4n | $\beta$ |
| 1898.63 | 321.4 | 23.60 | ...      | 1n | Bry     |

The duplicity of the principal star of H 2710 was discovered with the 36-inch. Thus far there appears to be no certain change, and the same is true of the distant star. All the measures of this are given above. C is O. Arg. N. 14448.

[ $\beta$  (XIX)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...  
Lewis and Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  1273. O. Arg. N. 14457

R.A. 14<sup>h</sup> 14<sup>m</sup> 2<sup>s</sup> }  
Decl. + 48° 28' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1892.17 | 193.0 | 1.08 | 8.6... 9.8 | 3n | $\beta$ |
| 1897.52 | 193.3 | 0.94 | ...        | 2n | Lew     |
| 1897.56 | 187.1 | 1.08 | 9 ... 11   | 3n | A       |
| 1898.53 | 199.4 | 0.80 | ...        | 1n | Lew     |
| 1898.63 | 193.6 | ...  | ...        | 1n | Bry     |

Discovered with the 36-inch.

[ $\beta$  (XIX)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* II)...Aitken (3465)...  
Lewis and Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  IIII. Piazzì XIV. 69

R.A. 14<sup>h</sup> 17<sup>m</sup> 29<sup>s</sup> }  
Decl. + 9° 0' }

B and C

|         |       |        |            |    |         |
|---------|-------|--------|------------|----|---------|
| 1889.40 | 315.3 | 0.19   | 8.4... 8.4 | 3n | $\beta$ |
| 1890.43 | 321.2 | 0.25 ± | ...        | 2n | Sp      |
| 1892.17 | 336.1 | 0.21   | 8.2... 8.6 | 4n | $\beta$ |
| 1898.44 | 336.6 | 0.30   | ...        | 2n | Lew     |
| 1898.48 | 18.4  | 0.22   | ...        | 3n | $\beta$ |
| 1898.57 | 19.0  | 0.28   | 8.2... 8.2 | 4n | A       |

A and BC (=  $\Sigma$  1835)

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1832.08 | 186.5 | 6.06 | 5.5... 6.8 | 3n | $\Sigma$ |
| 1853.98 | 189.5 | 6.27 | 4.8... 6.8 | 6n | $\Delta$ |
| 1866.72 | 188.4 | 6.24 | 5.7... 7.0 | 3n | $\Delta$ |
| 1885.41 | 187.9 | 6.33 | 4.5... 6.5 | 3n | Per      |
| 1889.40 | 189.6 | 6.36 | 5.4... 6.5 | 3n | $\beta$  |
| 1889.80 | 188.4 | 6.29 | ...        | 6n | Sp       |
| 1892.17 | 189.3 | 6.25 | 5.0... 6.5 | 2n | $\beta$  |
| 1898.48 | 189.5 | 6.38 | ...        | 3n | $\beta$  |
| 1898.56 | 189.9 | 6.47 | 5.2... 8.0 | 3n | A        |

The duplicity of the smaller component of  $\Sigma$  1835 was discovered with the 36-inch. The measures of only nine years are sufficient to show that this is a binary in rapid motion. It will probably take a place with the short period systems. Thus far the motion has been about 7° per year, with little or no change in the distance. It is not improbable that the distance now is about maximum, and that the mean angular motion is much more rapid.

There has been no change in the position of this star with reference to A. A few of the measures are given. The principal star is B.A.C. 4766.

[ $\beta$  (XVI)... $\beta$  (2956,3142)... $\beta$  (*Pub. L. O.* II)...Sp (III)...  
Lewis (*Mon. Not.* LIX, 400)...Aitken (...)]

The wide pair,  $\Sigma$  1835, is also H<sup>2</sup> II. 38 = Sh 177. These original catalogues, and the following include all the measures:

[Madler (*Fixstern-Systeme* 1, II) (*Dorpat Obsns.* X, XII, XIII xv)...Madler (324)...Dawes (*Measures at Bishop's Obsy.*)... Herschel (*Fourth Catalogue*)...Secchi (*Catalogo di 1321 Stelle*)...]

*Doppie*)...Wrottesley (*Mem. R. A. S.* XXIX)...*Obsns. at Barclay's Obsy.* II, III...*Radcliffe Obsns.* XXII...Duner (*Measures Mic. d'Etoiles Doubles*, Lund, 1876)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII)... $\Delta$  (I, II)... $\Delta$  (103I, 1036)...Perrotin (2684,2748) (*Measures Mic. d'Etoiles Doubles*)...See and Wellman (*Beob. Stern.* Berlin, No. 6, 1892)...Glasenapp (I, III)...]

 **$\beta$  615.** O. Arg. N. 14509

R.A.  $14^{\text{h}} 17^{\text{m}} 52^{\text{s}}$  }  
Decl.  $+ 49^{\circ} 4'$  }

|         |       |      |        |        |       |         |         |
|---------|-------|------|--------|--------|-------|---------|---------|
| 1878.30 | 237.1 | "    | 2.35   | 8.5... | 9.5   | 1 $n$   | $\beta$ |
| 892.17  | 236.6 | 2.84 | 8.5... | 9.8    | 3 $n$ | $\beta$ |         |
| 1892.37 | 235.0 | 2.52 | 8.4... | 9.8    | 3 $n$ | Lv      |         |
| 1898.28 | 233.1 | 2.82 | 8.4... | 9.9    | 5 $n$ | D       |         |

Discovered with the  $18\frac{1}{2}$ -inch. Motion in angle is probable.  $\Sigma$  1834 is 2 $^{\text{m}}$  exactly preceding.

[ $\beta$  (x)...B $^{\text{t}}$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  225.** Lalande 26320

R.A.  $14^{\text{h}} 18^{\text{m}} 48^{\text{s}}$  }  
Decl.  $- 19^{\circ} 26'$  }

## B and C

|         |       |      |                     |     |       |          |       |    |
|---------|-------|------|---------------------|-----|-------|----------|-------|----|
| 1867.39 | 102.5 | "    | 1.06                | 7   | ...   | 9        | 1 $n$ | Hd |
| 1875.71 | 101.9 | 1.40 | 7.3...              | 8.2 | 3 $n$ | $\Delta$ |       |    |
| 1877.39 | 101.8 | 1.34 | 7.5...              | 8.5 | 2 $n$ | Cin      |       |    |
| 1880.38 | 101.0 | 1.36 | 8.0...              | 9.2 | 2 $n$ | Cin      |       |    |
| 1890.39 | 101.5 | 1.66 | 7.2...              | 7.9 | 2 $n$ | Gl       |       |    |
| 1893.49 | 98.7  | 1.24 | 7 $\frac{1}{2}$ ... | 9   | 1 $n$ | Sel      |       |    |
| 1897.38 | 101.3 | 1.58 | ...                 |     | 3 $n$ | D        |       |    |
| 1898.34 | 96.5  | 1.37 | 7.0...              | 8.2 | 4 $n$ | A        |       |    |

A and B (= H $^{\text{t}}$  N. 80 = Sh 179)

|         |       |       |        |     |     |       |       |          |
|---------|-------|-------|--------|-----|-----|-------|-------|----------|
| 1822.60 | 295.8 | "     | 35.12  | 7   | ... | 7     | 3 $n$ | Sh       |
| 1847.70 | 295.7 | 35.23 | ...    |     |     |       |       | Jacob    |
| 1875.70 | 295.5 | 35.03 | 6.0... |     |     |       | 3 $n$ | $\Delta$ |
| 1890.39 | 295.3 | 35.56 | 6.8... |     |     |       | 2 $n$ | Gl       |
| 1897.34 | 295.4 | 35.24 | 6      | ... | 7   | 3 $n$ | D     |          |

The close pair was discovered with the 6-inch. It is found, however, in the subsequently published observations of the Harvard Observatory.

There is no change in AB, and very little, if any, in the close pair. This is a naked-eye star in *Virgo*, according to HEIS, but GOULD places it in *Libra*. All the measures of the wide pair are given above.

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* XXXIV, 382)... $\Delta$  (I)...Cin $^4$ ...Cin $^6$ ...*Annals Harvard Obsy.* XIII...Glasenapp (I)...Jacob (*Mem. R. A. S.* XVII)...Sellors (3240)...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  940.** 52 *Hydrae*

R.A.  $14^{\text{h}} 21^{\text{m}} 9^{\text{s}}$  }  
Decl.  $- 28^{\circ} 57'$  }

|         |       |      |      |        |       |         |         |
|---------|-------|------|------|--------|-------|---------|---------|
| 1879.42 | 276.8 | "    | 4.00 | 5.0... | 11.3  | 3 $n$   | $\beta$ |
| 1889.38 | 278.7 | 4.27 | ...  | 10.8   | 3 $n$ | $\beta$ |         |
| 1897.44 | 278.7 | 5.37 | ...  | 13     | 2 $n$ | See     |         |
| 1899.27 | 277.5 | 4.37 | ...  | 11.0   | 2 $n$ | $\beta$ |         |

Discovered with the  $18\frac{1}{2}$ -inch. The principal star has a proper motion of  $0''.063$  in the direction of  $228^{\circ}.4$ . It is probable that the companion is moving with it, as otherwise the distance would be less at the date of the last measures, and the angle nearly  $15^{\circ}$  more than it was in 1879.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)...See (3496)...]

 **$\beta$  462.** S.D. (3 $^{\circ}$ ) 3635

R.A.  $14^{\text{h}} 23^{\text{m}} 46^{\text{s}}$  }  
Decl.  $- 3^{\circ} 11'$  }

## A and B

|         |       |      |        |        |       |         |          |
|---------|-------|------|--------|--------|-------|---------|----------|
| 1877.48 | 324.4 | "    | 2.01   | 9.5... | 9.7   | 2 $n$   | $\Delta$ |
| 1880.32 | 328.9 | 1.96 | 9.0... | 9.3    | 1 $n$ | $\beta$ |          |
| 1891.30 | 325.1 | 2.16 | 9.1... | 9.1    | 3 $n$ | $\beta$ |          |
| 1898.36 | 325.4 | 2.22 | 9.0... | 9.2    | 1 $n$ | D       |          |

## A and C

|         |      |       |       |     |       |       |         |
|---------|------|-------|-------|-----|-------|-------|---------|
| 1880.32 | 65.4 | "     | 14.81 | ... | 12.0  | 1 $n$ | $\beta$ |
| 1898.36 | 66.5 | 15.38 | ...   | 9.8 | 1 $n$ | D     |         |

Discovered with the  $18\frac{1}{2}$ -inch.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* XXXVIII, 78)... $\beta^3$ ... $\beta$ ... (3114)... $\beta$  (*Pub. L. O.* II)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 1117.** Lalande 26481

R.A. 14<sup>h</sup> 24<sup>m</sup> 43<sup>s</sup> }  
Decl. - 15° 4' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1867.37 | 96.7 | 2.16 | ...        | 1 <sup>n</sup> | Hd  |
| 1876.64 | 95.8 | 2.44 | 8.3... 9.2 | 3 <sup>n</sup> | Δ   |
| 1877.11 | 93.8 | 2.05 | 8.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1879.39 | 96.0 | ...  | 8.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1880.33 | 91.4 | 2.18 | 7.8... 8.5 | 1 <sup>n</sup> | β   |
| 1880.38 | 92.0 | 2.41 | 7.5... 8.5 | 1 <sup>n</sup> | Cin |
| 1883.42 | 95.4 | 2.36 | ...        | 2 <sup>n</sup> | Hl  |
| 1883.46 | 92.9 | 2.17 | ...        | 1 <sup>n</sup> | β   |
| 1884.41 | 95.3 | 2.36 | ...        | 3 <sup>n</sup> | Hl  |
| 1886.35 | 93.7 | 2.58 | 7.5... 8.5 | 1 <sup>n</sup> | W   |
| 1888.35 | 92.9 | 2.26 | 8.0... 9.0 | 2 <sup>n</sup> | T   |
| 1888.39 | 90.4 | 2.29 | 8.2... 8.9 | 2 <sup>n</sup> | Lv  |
| 1890.44 | 96.6 | 2.53 | 8.1... 8.8 | 2 <sup>n</sup> | Gl  |
| 1898.43 | 93.0 | 2.24 | 7.4... 8.8 | 4 <sup>n</sup> | D   |

Discovered with the 6-inch. There is no relative motion, but it is undoubtedly a physical system, as the components have same large proper motion of 0".424 in the position-angle of 153°.2 (PORTER). This pair had been previously seen by the Harvard observers, but not published until long after β (III).

[β (III)...β (Mon. Not. xxxiv, 59)...β<sup>3</sup>...Annals Harvard Obsy. XIII ... Cin<sup>4</sup>... Cin<sup>5</sup>... Cin<sup>6</sup>... Hall (II)... Wilson (Cin<sup>6</sup>)... Tarrant (2991)... Lv<sup>1</sup>... Glasenapp (I)... Doolittle (Pub. Flower Obsy. 1)...]

**β 1112.** Lacaille 5893

R.A. 14<sup>h</sup> 26<sup>m</sup> 3<sup>s</sup> }  
Decl. - 30° 11' }

|         |     |      |             |                |     |
|---------|-----|------|-------------|----------------|-----|
| 1889.41 | 7.6 | 2.44 | 6.3... 11.1 | 6 <sup>n</sup> | β   |
| 1897.37 | 3.1 | 2.46 | ...         | 3 <sup>n</sup> | A   |
| 1897.41 | 7.7 | 2.66 | 5.8... 12.4 | 2 <sup>n</sup> | See |

Discovered with the 12-inch. In GOULD 6.4 m.  
[β (xvi)...β (2956)...β (Pub. L. O. II)...Aitken (3465)... See (3496)...]

**β 238.** Lalande 26529

R.A. 14<sup>h</sup> 27<sup>m</sup> 1<sup>s</sup> }  
Decl. - 20° 30' }

|         |      |      |             |                |     |
|---------|------|------|-------------|----------------|-----|
| 1877.39 | 90.3 | 6.96 | 8.2... 10.2 | 2 <sup>n</sup> | Cin |
| 1893.42 | 91.1 | 6.94 | 8.4... 10.5 | 2 <sup>n</sup> | W   |
| 1893.47 | 90.6 | 6.94 | ...         | 1 <sup>n</sup> | Lv  |

Discovered with the 6-inch. Unchanged.

[β (v)...β (Mon. Not. xxxv, 31)...Cin<sup>4</sup>...Lv...Wilson ( )...]

**β 616.** γ Bootis

R.A. 14<sup>h</sup> 27<sup>m</sup> 15<sup>s</sup> }  
Decl. + 38° 50' }

|         |       |       |             |                |   |
|---------|-------|-------|-------------|----------------|---|
| 1878.25 | 98.6  | 26.18 | 2.8... 12.5 | 2 <sup>n</sup> | β |
| 1891.24 | 103.6 | 28.23 | ... 13.8    | 3 <sup>n</sup> | β |
| 1898.27 | 105.5 | 29.38 | ... 13.0    | 2 <sup>n</sup> | β |
| 1898.28 | 102.2 | 29.37 | ...         | 1 <sup>n</sup> | D |

The faint companion was detected with the 18½-inch. AUWERS gives the proper motion of γ Bootis 0".198 in the direction of 320°.5. This movement and the position of the companion given by the measures of 1878 give for the date of the measures in 1898, 103°.8 : 29".33. It is therefore evident that this is only an optical companion. The minimum distance of 19".5 occurred in about 1780.

[β (x)...β<sup>1</sup>...β (3114)...β (Pub. L. O. II)...Doolittle (Pub. Flower Obsy. 1)...]

**β 941.** Lalande 26605

R.A. 14<sup>h</sup> 29<sup>m</sup> 40<sup>s</sup> }  
Decl. + 0° 46' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1879.28 | 218.3 | 0.80 | 8.2... 8.2 | 1 <sup>n</sup> | β  |
| 1888.31 | 40.2  | 0.80 | 8.4... 8.5 | 2 <sup>n</sup> | Lv |
| 1888.80 | 222.1 | 0.6± | ...        | 3 <sup>n</sup> | Sp |
| 1893.40 | 216.8 | 0.83 | 8.7... 8.8 | 3 <sup>n</sup> | W  |
| 1893.96 | 215.5 | 0.7± | ...        | 2 <sup>n</sup> | Sp |
| 1897.41 | 223.0 | 0.5± | ...        | 1 <sup>n</sup> | Sp |

Discovered with the 18½-inch. Evidently unchanged.

[β (xiii)...β<sup>3</sup>...Lv<sup>1</sup>...Sp (III)...Wilson ( )...]

**β 804.** W<sup>r</sup> XIV. 558

R.A. 14<sup>h</sup> 31<sup>m</sup> 42<sup>s</sup> }  
Decl. - 8° 9' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1881.46 | 166.2 | 1.40 | 8.1... 10.7 | 2 <sup>n</sup> | β   |
| 1888.74 | 159.5 | 1.39 | 8.5... 10.8 | 2 <sup>n</sup> | Com |
| 1891.26 | 160.9 | 1.29 | 8.4... 11.5 | 3 <sup>n</sup> | β   |
| 1898.39 | 161.6 | 1.37 | 7.8... 9.7  | 3 <sup>n</sup> | D   |

Discovered with the 15½-inch at the Washburn Observatory. No sensible change.

[β (xii)...β<sup>4</sup>...β (3114)...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy. vi)...Doolittle (Pub. Flower Obsy. 1)...]

**$\beta$  226.** Lalande 26665

R.A.  $14^h 32^m 5^s$  }  
Decl.  $-21^\circ 49'$  }

|         |      |           |            |       |         |
|---------|------|-----------|------------|-------|---------|
| 1876.09 | 81.6 | 0.80      | 7.5... 7.5 | 3 $n$ | Sp      |
| 1878.37 | 80.4 | 1.05      | 7.7... 8.2 | 2 $n$ | Cin     |
| 1879.44 | 82.7 | 0.95      | 7.8... 8.0 | 1 $n$ | $\beta$ |
| 1880.34 | 83.1 | 0.99      | 8.0... 8.0 | 1 $n$ | Cin     |
| 1884.35 | 84.7 | 1.01      | 8.5... 8.7 | 2 $n$ | W       |
| 1890.46 | 87.6 | 0.9 $\pm$ | 7.7... 8.0 | 4 $n$ | Gl      |

Discovered with the 6-inch. There may be a slow advance in the angle.

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* xxxiv, 382)... $\beta^3$ ...Sp (II)...Cin<sup>4</sup>...  
Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Glaserapp (I)...]

 **$\beta$  805.** O. Arg. S. 13799

R.A.  $14^h 32^m 58^s$  }  
Decl.  $-26^\circ 37'$  }

## A and B

|         |       |       |             |       |         |
|---------|-------|-------|-------------|-------|---------|
| 1881.41 | 135.4 | 24.12 | 7.2... 13.0 | 2 $n$ | $\beta$ |
| 1888.93 | 133.8 | 23.46 | 7.0... 11.5 | 2 $n$ | Com     |
| 1899.29 | 133.8 | 23.47 | ...         | 2 $n$ | $\beta$ |

## C and D

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1881.44 | 239.7 | 1.99 | 9.2... 11.7 | 3 $n$ | $\beta$ |
| 1888.93 | 243.1 | 1.99 | 9.0... 11.2 | 1 $n$ | Com     |

## A and C

|         |      |        |     |       |         |
|---------|------|--------|-----|-------|---------|
| 1881.42 | 42.0 | 123.98 | ... | 3 $n$ | $\beta$ |
| 1888.41 | 42.0 | 123.45 | ... | 1 $n$ | Com     |
| 1899.29 | 41.4 | 124.38 | ... | 2 $n$ | $\beta$ |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* VI)...]

 **$\beta$  806.** O. Arg. S. 13813

R.A.  $14^h 33^m 27^s$  }  
Decl.  $-25^\circ 44'$  }

## A and B

|         |      |      |            |       |         |
|---------|------|------|------------|-------|---------|
| 1890.39 | 96.3 | 0.67 | 7.3... 9.3 | 3 $n$ | $\beta$ |
| 1899.45 | 97.1 | 0.69 | 7.2... 9.8 | 3 $n$ | A       |

## C and D

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1881.44 | 347.8 | 1.22 | 8.5... 9.6  | 3 $n$ | $\beta$ |
| 1890.39 | 344.9 | 1.20 | 8.3... 9.2  | 3 $n$ | $\beta$ |
| 1899.41 | 341.6 | 1.21 | 8.5... 10.2 | 3 $n$ | A       |

## A and C

|         |      |       |     |       |         |
|---------|------|-------|-----|-------|---------|
| 1881.42 | 67.4 | 71.50 | ... | 3 $n$ | $\beta$ |
| 1890.39 | 67.3 | 71.48 | ... | 3 $n$ | $\beta$ |
| 1899.32 | 66.7 | 71.75 | ... | 1 $n$ | $\beta$ |
| 1899.38 | 67.2 | 71.97 | ... | 1 $n$ | A       |

## A and a

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1890.38 | 329.6 | 17.78 | ... 13.5 | 2 $n$ | $\beta$ |
| 1899.34 | 327.2 | 16.91 | ... 14.5 | 3 $n$ | A       |

The duplicity of the smaller member of the wide pair was discovered with the 15½-inch at the Washburn Observatory; and in measuring that with the 36-inch the other star was found to be a still closer pair, thus forming an apparently interesting quadruple group.

[ $\beta$  (XII)... $\beta^4$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)...Aitken ( )...]

 **$\beta$  345.** Lacaille 6051

R.A.  $14^h 34^m 40^s$  }  
Decl.  $-29^\circ 11'$  }

|         |             |         |            |       |         |
|---------|-------------|---------|------------|-------|---------|
| 1875.41 | 330.0 $\pm$ | 1 $\pm$ | 7.0... 7.0 | 1 $n$ | $\beta$ |
| 1877.41 | 128.2       | 0.94    | 7.0... 7.3 | 1 $n$ | Cin     |
| 1880.42 | 299.4       | 0.90    | 7.8... 8.5 | 1 $n$ | Cin     |
| 1892.37 | 303.5       | 0.94    | 7.5... 8.2 | 3 $n$ | $\beta$ |
| 1897.45 | 301.9       | 0.98    | 7+... 8    | 3 $n$ | A       |
| 1897.50 | 303.7       | 0.92    | 7.2... 8.1 | 2 $n$ | See     |

Discovered with the 6-inch. Change is doubtful.

[ $\beta$  (VI)... $\beta$  (2062,3142)... $\beta$  (*Pub. L. O.* II)...Cin<sup>4</sup>...Cin<sup>6</sup>...  
Aitken (3465)...See (3496)...]

 **$\beta$  414.** Centauri 315

R.A.  $14^h 34^m 42^s$  }  
Decl.  $-30^\circ 25'$  }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1889.43 | 345.6 | 1.01 | 6.5... 7.9 | 3 $n$ | $\beta$ |
| 1896.49 | 346.5 | 0.90 | 6.7... 8.0 | 4 $n$ | A       |
| 1897.39 | 342.5 | 0.86 | 6.0... 8.2 | 1 $n$ | See     |
| 1897.45 | 344.9 | 0.89 | 6+... 8    | 3 $n$ | A       |

Discovered with the 6-inch. So far without change. In GOULD 6.6 m. LACAILLE 6052.

[ $\beta$  (VII)... $\beta$  (2103,2957)... $\beta$  (*Pub. L. O.* II)...Glaserapp (I)  
...Aitken (3395,3465)...See (3496)...]

**β 807.** Schj. 5216

R.A. 14<sup>h</sup> 36<sup>m</sup> 37<sup>s</sup> }  
Decl. — 6° 18' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.41 | 239.0 | 1.24 | 8.0... 9.1 | 3 <sup>n</sup> | β   |
| 1888.46 | 241.0 | 1.15 | 8.0... 9.0 | 1 <sup>n</sup> | Lv  |
| 1888.46 | 237.2 | 1.19 | 8.5... 9.7 | 3 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...Lv<sup>1</sup>...Comstock (*Pub. Washburn Obsy.* vi)...]

**β 1113.** B.A.C. 4886

R.A. 14<sup>h</sup> 41<sup>m</sup> 21<sup>s</sup> }  
Decl. + 2° 32' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1889.40 | 137.1 | 4.54 | 6.2... 11.8 | 3 <sup>n</sup> | β |
| 1898.39 | 136.0 | 4.37 | 7.0... 12.0 | 2 <sup>n</sup> | β |
| 1898.40 | 136.4 | 4.14 | 6.0... 12.0 | 3 <sup>n</sup> | A |

Discovered with the 36-inch. The magnitude in D.M. is 7.7.

[β (xvi)...β (2956)...β (*Pub. L. O.* 11)...Aitken ( )...]

**β 346.** *Librae* 23

R.A. 14<sup>h</sup> 41<sup>m</sup> 50<sup>s</sup> }  
Decl. — 16° 50' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1877.41 | 236.2 | 1.23 | 7.2... 7.9 | 2 <sup>n</sup> | Cin |
| 1877.44 | 236.1 | 1.27 | 7.2... 8.0 | 2 <sup>n</sup> | Δ   |
| 1879.34 | 233.2 | 1.27 | 7.0... 8.0 | 1 <sup>n</sup> | Cin |
| 1890.98 | 239.2 | 1.18 | 7.0... 8.0 | 2 <sup>n</sup> | Sp  |
| 1888.35 | 233.4 | 1.27 | 7.0... 8.0 | 3 <sup>n</sup> | T   |

Discovered with the 6-inch. No material change. Lalande 26940.

[β (vi)...β (2062)...Δ (1)...Cin<sup>4</sup>...Cin<sup>5</sup>...Sp (11)...Tarrant (2991)...]

**β 617.** Lalande 26952

R.A. 14<sup>h</sup> 42<sup>m</sup> 23<sup>s</sup> }  
Decl. — 23° 45' }

B and C

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1878.34 | 336.6 | 2.73 | 8.5... 11.5 | 2 <sup>n</sup> | β   |
| 1880.38 | 337.2 | 2.14 | 8.8... 11.5 | 2 <sup>n</sup> | Cin |
| 1897.50 | 335.3 | 2.57 | 8... 11.2   | 1 <sup>n</sup> | See |
| 1898.39 | 334.5 | 2.52 | 8.3... 11.2 | 3 <sup>n</sup> | A   |

A and B (= H<sup>1</sup> VI. 117 = S 663)

|         |       |       |           |                |   |
|---------|-------|-------|-----------|----------------|---|
| 1825.35 | 219.1 | 56.69 | 7.5... 10 | 2 <sup>n</sup> | S |
| 1878.34 | 219.5 | 59.44 | 6.5...    | 2 <sup>n</sup> | β |
| 1898.39 | 219.8 | 60.44 | 6.2...    | 3 <sup>n</sup> | A |

The smaller star of HERSCHEL's wide pair was found to be double with the 18½-inch. The measures show no change in the last twenty years. All the measures of AB are given above. There would seem to be an increase in the distance, implying a proper motion of about 0".05 in a direction nearly opposite B. There is an error of 16' in the declination of this star in H<sup>1</sup>.

[β (x)...β<sup>1</sup>...Cin<sup>6</sup>...See (3496)...Aitken ( )...]

**β 106.** *μ Librae*

R.A. 14<sup>h</sup> 42<sup>m</sup> 45<sup>s</sup> }  
Decl. — 13° 39' }

A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1874.29 | 345.0 | 1.54 | ...        | 1 <sup>n</sup> | WS  |
| 1875.60 | 335.0 | 1.38 | 5.4... 6.3 | 5 <sup>n</sup> | Δ   |
| 1876.99 | 335.1 | 1.53 | 5.5... 6.2 | 7 <sup>n</sup> | Sp  |
| 1877.40 | 334.7 | 1.69 | 5.0... 7.0 | 2 <sup>n</sup> | Cin |
| 1878.32 | 333.2 | 1.50 | 5.5... 6.3 | 1 <sup>n</sup> | β   |
| 1879.35 | 335.0 | 2.02 | 5.5... 7.0 | 2 <sup>n</sup> | Cin |
| 1883.43 | 337.4 | 1.51 | 5.4... 6.6 | 6 <sup>n</sup> | En  |
| 1885.28 | 337.0 | 1.56 | 5.0... 7.0 | 1 <sup>n</sup> | W   |
| 1886.39 | 337.2 | 1.52 | 5.0... 6.3 | 4 <sup>n</sup> | T   |
| 1888.35 | 339.2 | 1.63 | 6.0... 7.2 | 3 <sup>n</sup> | Lv  |
| 1889.38 | 340.6 | 1.61 | 5... 6     | 3 <sup>n</sup> | β   |
| 1889.46 | 339.6 | 1.84 | 5.5... 6.5 | 4 <sup>n</sup> | T   |
| 1890.41 | 339.0 | 2.01 | 6.0... 8.0 | 2 <sup>n</sup> | Gl  |
| 1897.29 | 343.5 | 1.84 | 5.4... 6.3 | 2 <sup>n</sup> | D   |
| 1897.41 | 340.2 | 1.57 | 5+... 6    | 3 <sup>n</sup> | A   |
| 1898.42 | 344.8 | 1.58 | 5½... 6½   | 2 <sup>n</sup> | Sc  |
| 1898.55 | 339.6 | 1.59 | 5.5... 6.0 | 3 <sup>n</sup> | A   |

A and C

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1889.38 | 283.7 | 18.33 | ... 14.5 | 2 <sup>n</sup> | β |
| 1898.52 | 281.6 | 17.98 | ... 15.0 | 2 <sup>n</sup> | A |

A and D

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1889.38 | 185.5 | 25.96 | ... 13.9 | 3 <sup>n</sup> | β |
| 1898.52 | 184.8 | 26.20 | ... 14.0 | 2 <sup>n</sup> | A |

A and E

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1878.32 | 229.2 | 27.35 | ... 12.5 | 1 <sup>n</sup> | β |
| 1889.38 | 232.5 | 27.19 | ... 12.8 | 3 <sup>n</sup> | β |
| 1898.51 | 232.8 | 27.46 | ... 13.5 | 2 <sup>n</sup> | A |

The close pair was discovered with the 6-inch, the distant star E with the 18½-inch, and the faint companions, C and D, added with the 36-inch. The large star has a proper motion of 0.097 in the direction of 260°6 (AUWERS), and it is obvious that this belongs to both components. It is probable that the distant companions are not attached to the binary.

[ $\beta$  (II)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta^1$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)... Wilson and Seabroke (*Mem. R. A. S.* XLIII)... $\Delta$  (1)... $\Delta$  (2081)...Sp (II)...Cin<sup>4</sup>...Cin<sup>5</sup>...Engelmann (2678)...Wilson (Cin<sup>10</sup>)...Tarrant (2866,3186)...Lv<sup>1</sup>...Lv (*Sid. Mess.* VIII, 77)...Glasesnapp (I)...Doolittle (*Pub. Flower Obsy.* I)...Aitken (3465)...Scott (*Mon. Not.* LIX, 427)...Aitken ( )...]

$\beta$  31. Lalande 27106

R.A. 14<sup>h</sup> 46<sup>m</sup> 59<sup>s</sup> }  
Decl. + 19° 13' }

A and B

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1874.94 | 181.5 | 1.11 | 8.5...10.2 | 2n | $\Delta$ |
| 1878.24 | 187.8 | 1.29 | ...        | 1n | $\beta$  |
| 1879.43 | 188.4 | 1.40 | 8.5... 9.8 | 1n | $\beta$  |
| 1883.71 | 193.2 | 1.51 | 8.0...10.2 | 5n | En       |
| 1890.35 | 190.3 | 1.40 | 8.4... 9.7 | 3n | $\beta$  |
| 1893.26 | 192.7 | 1.35 | ...        | 5n | Sp       |
| 1893.46 | 196.3 | 1.87 | ...        | 4n | Lew      |
| 1896.46 | 192.1 | 1.57 | ...        | 4n | A        |
| 1896.91 | 194.3 | 1.48 | ...        | 4n | Lew      |
| 1897.44 | 193.7 | 1.52 | ...        | 1n | Bow      |
| 1898.45 | 196.2 | 1.45 | ...        | 1n | Lew      |

A and C

|         |       |      |         |    |         |
|---------|-------|------|---------|----|---------|
| 1878.25 | 161.4 | 9.04 | ...12.5 | 1n | $\beta$ |
| 1890.35 | 162.7 | 9.03 | ...12.2 | 3n | $\beta$ |
| 1896.37 | 167.3 | 9.76 | ...     | 2n | Lew     |
| 1898.46 | 166.0 | 9.05 | ...     | 1n | Lew     |

The close pair was discovered with the 6-inch, and C subsequently added with the 18½-inch. The *Berlin A. G. Catalogue* gives the principal star a proper motion of 0.230 in the direction of 347°9 (PORTER 0.223 in 343°0). The measures show conclusively that the movement is common to the three components, and there can be no doubt that they constitute a physical system. There is slow direct angular motion in the close pair, and, perhaps, some

change in the direction of C. This triple is about 31' *sf*  $\xi$  Bootis.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Engelmann (2678)...Sp (III)... Lewis (*Mon. Not.* LIV, 317; LIX, 400)...Aitken (3395)...]

$\beta$  118. O. Arg. S. 14034

R.A. 14<sup>h</sup> 47<sup>m</sup> 1<sup>s</sup> }  
Decl. — 16° 1' }

|         |       |      |             |    |          |
|---------|-------|------|-------------|----|----------|
| 1875.90 | 307.4 | 1.83 | 9.8...10.7  | 2n | $\Delta$ |
| 1879.87 | 306.1 | 1.86 | 8.5...10.0  | 2n | Cin      |
| 1886.30 | 308.6 | 1.95 | 8.0... 9.0  | 1n | LM       |
| 1888.35 | 306.4 | 1.59 | 10.0...10.5 | 2n | T        |

Discovered with the 6-inch. Without change. It is 2½<sup>m</sup> *f* and 28' *s* of  $\alpha$  Librae.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Cin<sup>5</sup>...Cin<sup>6</sup>... LM...Tarrant (2991)...]

$\beta$  347. Centauri 330

R.A. 14<sup>h</sup> 47<sup>m</sup> 18<sup>s</sup> }  
Decl. — 32° 49' }

A and B

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1889.45 | 320.6 | 13.01 | 6.5...10.5 | 3n | $\beta$ |
| 1890.43 | 319.9 | 13.47 | 6.0...10.2 | 1n | Gl      |
| 1897.39 | 318.1 | 12.94 | 6+...10    | 2n | A       |

A and C

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1889.45 | 243.1 | 58.46 | ... 9.8 | 3n | $\beta$ |
| 1890.43 | 243.1 | 58.34 | ... 9.2 | 2n | Gl      |
| 1897.39 | 242.8 | 58.04 | ...10   | 2n | A       |

Discovered with the 6-inch. B.A.C. 4912. The measures of C indicate a small proper motion.

[ $\beta$  (VI)... $\beta$  (2062)... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)...Glasesnapp (I) (*A. J.* 241)...Aitken (3465)...]

$\beta$  942

R.A. 14<sup>h</sup> 47<sup>m</sup> 29<sup>s</sup> }  
Decl. + 0° 2' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1879.44 | 189.9 | 1.24 | 9.2... 9.2 | 2n | $\beta$ |
| 1892.30 | 191.2 | 1.26 | 9.2... 9.3 | 3n | $\beta$ |
| 1892.38 | 189.8 | 1.02 | 9.1... 9.2 | 4n | Lv      |
| 1897.44 | 200.1 | 0.94 | ...        | 1n | Lew     |

Discovered with the 18½-inch. Not in the D.M. It is 187" from the wide pair, OΣ (app.) 131, in the direction of 221°.5. This wide pair is

$$210^{\circ}.5 : 89^{\circ}.69 : 6.5 \dots 7.2 \quad (1873.44) \quad 2n \quad \Delta$$

[β (xiii)...β³...β (3142)...β (Pub. L. O. II)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Lewis (Mon. Not. LIX, 400)...]

β 239. 59 *Hydrae*

R.A. 14<sup>h</sup> 51<sup>m</sup> 33<sup>s</sup> }  
Decl. — 27° 10' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1874.50 | 303.7 | 0.8± | 6.0... | 6.0 | 5n | β   |
| 1878.36 | 309.5 | 0.93 | 6.0... | 6.0 | 1n | β   |
| 1878.96 | 312.6 | 0.77 | 6.0... | 6.0 | 2n | Sp  |
| 1879.40 | 310.1 | 0.89 | ...    |     | 2n | Cin |
| 1879.92 | 311.8 | 0.83 | 6.0... | 6.2 | 2n | β   |
| 1880.38 | 307.4 | 0.90 | 6.2... | 6.7 | 4n | Cin |
| 1881.40 | 312.0 | 1.07 | 6.0... | 6.0 | 4n | β   |
| 1884.39 | 313.8 | 1.20 | 7.0... | 7.5 | 1n | W   |
| 1888.43 | 308.3 | 0.96 | 6.0... | 6.0 | 1n | Lv  |
| 1889.44 | 311.4 | 0.86 | 5.8... | 5.9 | 3n | β   |
| 1897.51 | 315.8 | 0.92 | 6.8... | 7.9 | 2n | See |
| 1898.28 | 316.5 | 0.99 | 5.5... | 6.0 | 3n | A   |

Discovered with the 6-inch. The angle is probably increasing, but the motion is very slow. The distance seems to have remained practically constant. AUWERS gives the proper motion of this star, 0.085 in the direction of 234°.8. It is evident from the measures that this movement is common to the components, and that they must form a physical system. If one component was fixed in space, the relation in 1898 should be 31°.5 : 1.89.

[β (v)...β (Mon. Not. xxxv, 31)...β¹...β³...β⁴...β(2957) ...β (Pub. L. O. II)...Sp (II)...Cin⁵...Cin⁶...Wilson (Cin<sup>10</sup>)...Lv¹...Lv (Sid. Mess. VIII, 77)...See (3496)... Aitken ( )...]

β 808. S.D. (8°) 3872

R.A. 14<sup>h</sup> 51<sup>m</sup> 53<sup>s</sup> }  
Decl. — 8° 13' }

A and B

|         |       |      |        |     |    |   |
|---------|-------|------|--------|-----|----|---|
| 1881.44 | 201.5 | 0.63 | 9.0... | 9.0 | 2n | β |
| 1893.49 | 200.6 | 0.64 | 9.0... | 9.0 | 1n | W |

AB and C

|         |       |       |        |     |    |     |
|---------|-------|-------|--------|-----|----|-----|
| 1881.41 | 305.1 | 94.60 | ...    | 8.9 | 2n | β   |
| 1888.51 | 305.6 | 93.86 | 8.7... | 8.4 | 3n | Com |
| 1893.40 | 305.6 | 93.21 | 9.0... | 8.5 | 3n | W   |
| 1899.26 | 305.7 | 93.47 | 9.0... | 9.2 | 3n | β   |

Discovered with the 15½-inch at the Washburn Observatory. C is S.D. (8°) 3871. The measures indicate a proper motion of one of the wide stars of 0.06, nearly in the direction of the other. This is confirmed by the meridian positions in S.D., which give a distance of 101" for 1855.

[β (xii)...β⁴...Comstock (Pub. Washburn Observatory VI)... Wilson ( )...]

β 1085. Piazzì XIV. 229

R.A. 14<sup>h</sup> 52<sup>m</sup> 37<sup>s</sup> }  
Decl. — 4° 30' }

|         |      |      |        |      |    |   |
|---------|------|------|--------|------|----|---|
| 1889.30 | 19.5 | 9.34 | 6.0... | 13.2 | 3n | β |
| 1898.31 | 21.0 | 9.44 | 6.0... | 13.5 | 2n | A |
| 1899.27 | 20.7 | 9.30 | 6.5... | 13.1 | 1n | β |

Discovered with the 36-inch. This star has a proper motion, according to PORTER, of 0.413 in the direction of 254°.7. The short interval covered by the measures is sufficient to show that the new star is moving with the other. If fixed in space, the position of the companion at the date of the second measures would be 34°.4 : 11.87. This is a naked-eye star in *Libra*.

[β (xv)...β (2929)...β (Pub. L. O. II)...Aitken ( )...]

β 348. 2 *Serpentis*

R.A. 14<sup>h</sup> 55<sup>m</sup> 40<sup>s</sup> }  
Decl. + 0° 20' }

|         |       |      |        |     |    |    |
|---------|-------|------|--------|-----|----|----|
| 1875.75 | 114.6 | 0.47 | 5.1... | 7.4 | 4n | Δ  |
| 1876.44 | 118.3 | 0.67 | 6.0... | 6.8 | 2n | OΣ |
| 1876.50 | 119.0 | 0.52 | 5.0... | 7.5 | 4n | Sp |
| 1877.51 | 123.3 | 0.42 | ...    |     | 2n | Sp |
| 1878.36 | 121.4 | 0.51 | ...    |     | 1n | β  |
| 1879.92 | 114.5 | 0.47 | 6.0... | 7.2 | 2n | β  |
| 1881.41 | 119.7 | 0.45 | 6.0... | 7.8 | 3n | β  |
| 1884.40 | 119.2 | ...  | 7.0... | 8.0 | 2n | W  |
| 1885.53 | 119.7 | 0.50 | ...    |     | 2n | HΣ |
| 1887.45 | 118.3 | 0.48 | 5.0... | 7.5 | 3n | T  |

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1887.57 | 120.7 | 0.44 | ...        | 3 <sup>n</sup> | H1      |
| 1887.60 | 116.7 | 0.53 | ...        | 7 <sup>n</sup> | Sp      |
| 1888.53 | 120.0 | 0.52 | 5.0... 8.0 | 3 <sup>n</sup> | T       |
| 1889.31 | 119.0 | 0.76 | 6.0... 6.7 | 2 <sup>n</sup> | $\beta$ |
| 1897.49 | 111.7 | 0.70 | 6 ... 7    | 3 <sup>n</sup> | A       |

Discovered with the 6-inch. There has been but little change in either angle or distance. AUWERS gives this star a proper motion of  $0''.010$  in the direction of  $188^\circ.5$ . The annual change is very small, and, perhaps, somewhat uncertain. If substantially correct, and it belongs to the larger star only, it would produce a diminution in the position-angle of  $27^\circ$  in the interval between the measures of 1875 and 1897, the distance remaining practically unchanged. There can be no doubt of the physical relation of these stars, but the period will certainly be long. There is a 13.5 m star,  $215^\circ.9 : 32''.86$  (1899.26) 1<sup>n</sup>.

One of HERSCHEL'S wide pairs, H<sup>r</sup> VI. 51, is erroneously called 2 *Serpentis*. It is 1 *Serpentis*, a 4 m star  $4^m 17^s p$  and  $77'' s$ .

[ $\beta$  (vi)... $\beta$  (2062,2930)... $\beta^1$ ... $\beta^3$ ... $\beta^4$ ... $\beta$  (*Pub. L. O.* 11)  
... $\Delta$  (1)... $\Delta$  (2086)... $\text{O}\Sigma$  (*Poulkowa Obsns.* x)...Sp (11)  
...Wilson (*Cin<sup>10</sup>*)...Hall (1, 11)...Tarrant (2899,2991)  
...Aitken (3465)...H $\Sigma$  ( )...]

### $\beta$ 119. Lalande 27454

R.A.  $14^h 59^m 10^s$  }  
Decl.  $- 6^\circ 33'$  }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.90 | 313.0 | 1.51 | 8.0... 8.5 | 4 <sup>n</sup> | $\Delta$ |
| 1878.60 | 311.1 | 1.41 | 8.0... 9.0 | 3 <sup>n</sup> | Cin      |
| 1887.45 | 309.1 | 1.56 | 8.0... 8.5 | 3 <sup>n</sup> | T        |
| 1888.33 | 307.6 | 1.59 | 8.0... 8.5 | 4 <sup>n</sup> | T        |
| 1888.45 | 306.4 | 1.61 | 7.9... 8.4 | 2 <sup>n</sup> | Lv       |
| 1890.39 | 304.9 | 1.78 | 8.1... 8.6 | 2 <sup>n</sup> | Gl       |
| 1892.35 | 307.1 | 1.47 | 8.0... 8.5 | 3 <sup>n</sup> | Lv       |
| 1894.48 | 304.4 | 1.61 | ...        | 2 <sup>n</sup> | Sp       |
| 1897.92 | 304.6 | 1.69 | 8.0... 8.7 | 7 <sup>n</sup> | D        |
| 1897.95 | 305.2 | 1.48 | ...        | 2 <sup>n</sup> | Sp       |

Discovered with the 6-inch. The measures indicate some motion in angle.

[ $\beta$  (111)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Cin<sup>5</sup>...Lv<sup>4</sup>...Lv (*Sid. Mess.* viii, 77)...Tarrant (2899,2991)...Glase-napp (1)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Doolittle (*Pub. Flower Obsy.* 1)...Sp (111)...]

### $\beta$ 1086. 47 Bootis

R.A.  $15^h 1^m 27^s$  }  
Decl.  $+ 48^\circ 37'$  }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1889.21 | 256.6 | 6.03 | 5.5... 13.2 | 3 <sup>n</sup> | $\beta$ |
| 1898.49 | 254.1 | 6.31 | ...         | 3 <sup>n</sup> | $\beta$ |

Discovered with the 36-inch. It is practically certain from the measures already made that this is a physical system. The bright star has a proper motion of  $0''.080$  in the direction  $277^\circ.2$ . If the small star was fixed, this movement with the position of the companion in 1889 would give  $253^\circ.8 : 5''.33$  for 1898. It is obvious from the measures that there has been no such change in the distance.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* 11)...]

### $\beta$ 349. Lalande 27579

R.A.  $15^h 2^m 52^s$  }  
Decl.  $+ 2^\circ 9'$  }

|         |      |      |             |                |                  |
|---------|------|------|-------------|----------------|------------------|
| 1876.43 | 39.3 | 4.17 | 7.0... 10.0 | 1 <sup>n</sup> | $\text{O}\Sigma$ |
| 1876.51 | 39.6 | 4.06 | 7.5... 11.8 | 1 <sup>n</sup> | $\Delta$         |
| 1876.51 | 36.7 | 3.96 | 8 ... 12    | 3 <sup>n</sup> | H1               |
| 1884.42 | 40.9 | 3.83 | ...         | 3 <sup>n</sup> | H1               |
| 1886.44 | 36.3 | 4.04 | ...         | 1 <sup>n</sup> | H $\Sigma$       |
| 1892.39 | 36.2 | 3.80 | 8.0... 11.9 | 2 <sup>n</sup> | Lv               |
| 1899.27 | 39.2 | 3.62 | 8.0... 10.0 | 1 <sup>n</sup> | $\beta$          |

Discovered with the 6-inch.

[ $\beta$  (v1)... $\beta$  (2062)... $\Delta$  (1)...Hall (1, 11)... $\text{O}\Sigma$  (*Poulkowa Obsns.* x)...H $\Sigma$  ( )...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

### $\beta$ 809. S.D. (22°) 3908

R.A.  $15^h 3^m 3^s$  }  
Decl.  $- 22^\circ 16'$  }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1881.36 | 120.1 | 1.47 | 8.0... 9.3  | 4 <sup>n</sup> | $\beta$ |
| 1888.51 | 123.5 | 1.75 | 8.2... 10.0 | 3 <sup>n</sup> | Com     |
| 1892.40 | 119.2 | 1.64 | 8.1... 10.1 | 2 <sup>n</sup> | Lv      |
| 1898.47 | 122.5 | 1.68 | 8.0... 9.8  | 2 <sup>n</sup> | D       |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. No material change. The magnitude in S.D. is 8.3.

[ $\beta$  (x11)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 618.** 24 (1<sup>1</sup>) *Librae*

R.A. 15<sup>h</sup> 5<sup>m</sup> 23<sup>s</sup> }  
Decl. — 19° 20' }

B and C

|         |      |      |               |                |   |
|---------|------|------|---------------|----------------|---|
| 1878.34 | 24.3 | 1.86 | 10 ... 10     | 3 <sup>n</sup> | β |
| 1879.96 | 23.4 | 1.74 | 10.0 ... 10.7 | 2 <sup>n</sup> | β |
| 1885.33 | 19.8 | 1.40 | 10.5 ... 11.2 | 1 <sup>n</sup> | W |
| 1896.46 | 19.1 | 1.68 | 10 ... 10     | 5 <sup>n</sup> | A |
| 1899.30 | 17.4 | 1.70 | ...           | 2 <sup>n</sup> | β |

A and B (= H<sup>1</sup> VI. 44 = Sh 376)

|         |       |       |          |                |                |
|---------|-------|-------|----------|----------------|----------------|
| 1782.39 | 112.5 | 59.07 | ...      | 1 <sup>n</sup> | H <sup>1</sup> |
| 1822.84 | 111.6 | 66.50 | 6 ... 11 | 1 <sup>n</sup> | Sh             |
| 1878.33 | 110.5 | 57.46 | ...      | 3 <sup>n</sup> | β              |
| 1879.96 | 110.8 | 57.26 | ...      | 2 <sup>n</sup> | β              |
| 1885.33 | 110.3 | 57.78 | 4.5 ...  | 2 <sup>n</sup> | W              |
| 1896.44 | 111.0 | 58.23 | ...      | 2 <sup>n</sup> | A              |
| 1899.30 | 111.0 | 57.48 | ...      | 2 <sup>n</sup> | β              |

The duplicity of the Herschel companion was discovered with the 18½-inch. There may be a slow diminution in the angle.

All the measures of the wide pair are given above. According to AUWERS the principal star has a proper motion of 0.067 in the direction of 231° 3. This does not fully explain the change in B. The distance in the early measures would represent not B, but BC. The distance in Sh is printed 50".63, but SADLER has shown (*Eng. Mech.* XXXVIII, 65) that the micrometer readings were wrongly reduced, and that the distance should be 66".50. The principal star was found to be variable by the Harvard observers.

[β (x)...β<sup>1</sup>...β<sup>3</sup>...Wilson (Cin<sup>10</sup>)...Aitken (3395)...]

**β 350.** B.A.C. 5020

R.A. 15<sup>h</sup> 8<sup>m</sup> 29<sup>s</sup> }  
Decl. — 27° 9' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1876.52 | 163.2 | 1.31 | 6.5 ... 8.0 | 2 <sup>n</sup> | H1  |
| 1879.46 | 158.1 | 1.15 | 7.0 ... 8.0 | 2 <sup>n</sup> | Cin |
| 1883.40 | 160.3 | 1.34 | 6.5 ... 8.2 | 2 <sup>n</sup> | W   |
| 1886.49 | 157.7 | 1.28 | ...         | 3 <sup>n</sup> | H1  |
| 1892.41 | 160.2 | 1.15 | 7.2 ... 8.4 | 2 <sup>n</sup> | Lv  |
| 1897.48 | 154.1 | 0.95 | 7.1 ... 8.5 | 1 <sup>n</sup> | See |
| 1898.49 | 155.9 | 1.24 | 6½ ... 8    | 3 <sup>n</sup> | Sc  |

Discovered with the 6-inch. Change is uncertain. In GOULD 6.9 m.

[β (v1)...β (2062)...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Hall (I, II)...Glasenapp (I)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...See (3496)...Scott (*Mon. Not.* LIX, 427)...]

**β 351.** O. Arg. S. 14417

R.A. 15<sup>h</sup> 10<sup>m</sup> 20<sup>s</sup> }  
Decl. — 15° 8' }

A and B

|         |       |       |              |                |    |
|---------|-------|-------|--------------|----------------|----|
| 1876.56 | 303.3 | 10.36 | 9.5 ... 12   | 1 <sup>n</sup> | H1 |
| 1884.46 | 302.9 | 10.91 | 9.5 ... 12   | 3 <sup>n</sup> | H1 |
| 1896.49 | 302.0 | 10.75 | 8.5 ... 12   | 2 <sup>n</sup> | Lv |
| 1899.27 | 303.3 | 10.53 | 8.1 ... 10.7 | 3 <sup>n</sup> | β  |

A and C

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1899.26 | 235.0 | 33.36 | ... 12.0 | 1 <sup>n</sup> | β |
|---------|-------|-------|----------|----------------|---|

Discovered with the 6-inch. Apparently fixed.

[β (v1)...β (2062)...Hall (I, II)...Lv (*A. J.* 407)...]

**β 352.** O. Arg. S. 14427

R.A. 15<sup>h</sup> 10<sup>m</sup> 42<sup>s</sup> }  
Decl. — 26° 33' }

|         |      |       |             |                |     |
|---------|------|-------|-------------|----------------|-----|
| 1879.40 | 66.9 | 14.10 | 7.7 ... 9.7 | 2 <sup>n</sup> | Cin |
| 1880.36 | 65.1 | 14.37 | 7.8 ... 9.0 | 3 <sup>n</sup> | Cin |
| 1890.42 | 68.1 | 13.17 | 8.2 ... 9.6 | 2 <sup>n</sup> | Gl  |
| 1892.41 | 68.3 | 13.95 | 8.1 ... 9.2 | 2 <sup>n</sup> | Lv  |

Discovered with the 6-inch. Apparently fixed.

[β (v1)...β (2062)...Cin<sup>5</sup>...Cin<sup>6</sup>...Glasenapp (I)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

**β 227.** B.A.C. 5039

R.A. 15<sup>h</sup> 12<sup>m</sup> 7<sup>s</sup> }  
Decl. — 23° 50' }

|         |       |       |              |                |     |
|---------|-------|-------|--------------|----------------|-----|
| 1874.40 | 184.1 | 1.7 ± | 7.0 ... 10.5 |                | β   |
| 1876.47 | 180.9 | 1.98  | 7.0 ... 9.0  | 1 <sup>n</sup> | Cin |
| 1878.44 | 179.2 | 1.96  | 7.5 ... 9.0  | 2 <sup>n</sup> | Cin |
| 1880.42 | 180.2 | 1.90  | 7.0 ... 9.5  | 1 <sup>n</sup> | Cin |
| 1886.30 | 177.5 | 2.28  | 8 ... 9      | 1 <sup>n</sup> | LM  |
| 1890.40 | 179.7 | 2.31  | 7.7 ... 8.6  | 2 <sup>n</sup> | Gl  |
| 1896.44 | 176.8 | 1.89  | ...          | 2 <sup>n</sup> | Sc  |
| 1898.05 | 177.8 | 1.97  | 7.1 ... 8.4  | 8 <sup>n</sup> | D   |

Discovered with the 6-inch. No certain change. In the field with β 228.

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* xxxiv, 382)...Cin<sup>3</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...  
LM...Glazenapp (1)...Scott (*Brit. Ast. Assn.* VIII, 66)  
...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  943. Lalande 27885

R.A. 15<sup>h</sup> 12<sup>m</sup> 16<sup>s</sup> }  
Decl. + 1° 23' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1879.70 | 92.5 | 2.30 | 6.6...12.2 | 4 <sup>n</sup> | $\beta$ |
| 1889.30 | 92.7 | 2.63 | 6.2...12.3 | 3 <sup>n</sup> | $\beta$ |
| 1899.27 | 94.1 | 3.01 | 6.7...10.5 | 1 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. Near 6 *Serpentis*.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (2930)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  228. B.A.C. 5041

R.A. 15<sup>h</sup> 12<sup>m</sup> 38<sup>s</sup> }  
Decl. - 23° 50' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.95 | 329.6 | 1.16 | 7.5... 7.9 | 2 <sup>n</sup> | Cin |
| 1884.41 | 329.4 | 1.14 | 9.0... 9.3 | 1 <sup>n</sup> | W   |
| 1886.30 | 328.4 | ...  | 7 ... 8    | 1 <sup>n</sup> | LM  |
| 1892.40 | 327.6 | 0.98 | 7.2... 8.1 | 2 <sup>n</sup> | Lv  |
| 1898.48 | 321.3 | 1.02 | 8.1... 8.7 | 2 <sup>n</sup> | D   |

Discovered with the 6-inch in looking for H 4756, which is given by HERSCHEL (*Cape Observations*), 180° ± 2/3" : 9...9½, with the note, "requires verification." His place is substantially the same as that given here, but the magnitude is very different from that of B.A.C. 5041, which is at least 7½, and his estimated angle and distance do not correspond with the star measured. The measures of the new pair do not so far show any material change.  $\beta$  227 is in the field  $\rho$ .

[ $\beta$  (IV)... $\beta$  (*Mon. Not.* xxxiv, 382)...Cin<sup>3</sup>...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...LM...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  353. Redhill 2307

R.A. 15<sup>h</sup> 13<sup>m</sup> 55<sup>s</sup> }  
Decl. + 85° 57' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1881.48 | 297.0 | 3.60 | 9.3... 9.4  | 3 <sup>n</sup> | $\beta$ |
| 1892.42 | 295.5 | 3.62 | 9.4... 9.8  | 1 <sup>n</sup> | Lv      |
| 1892.42 | 295.7 | 3.74 | 9.5... 10.0 | 1 <sup>n</sup> | Col     |

Discovered with the 6-inch. One of a wide pair.

[ $\beta$  (VI)... $\beta$  (2062)... $\beta^4$ ...Lv and Collins (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

$\beta$  32. 6 *Serpentis*

R.A. 15<sup>h</sup> 14<sup>m</sup> 55<sup>s</sup> }  
Decl. + 1° 9' }

|         |      |      |             |                |            |
|---------|------|------|-------------|----------------|------------|
| 1875.40 | 14.8 | 3.11 | 4.5... 10   | 1 <sup>n</sup> | H1         |
| 1875.43 | 13.2 | 2.28 | 4.7... 9.3  | 4 <sup>n</sup> | J          |
| 1876.43 | 9.3  | 2.81 | 6.0... 9.5  | 1 <sup>n</sup> | O $\Sigma$ |
| 1879.40 | 13.6 | 2.37 | 5.7... 10.9 | 2 <sup>n</sup> | $\beta$    |
| 1885.49 | 14.1 | 2.27 | 4.7... 9.6  | 3 <sup>n</sup> | T          |
| 1886.44 | 12.7 | ...  | ...         | 1 <sup>n</sup> | H $\Sigma$ |
| 1887.34 | 15.6 | 2.39 | 5.0... 9.5  | 2 <sup>n</sup> | T          |
| 1888.44 | 13.8 | 2.78 | 4.5... 9.5  | 1 <sup>n</sup> | Lv         |
| 1888.52 | 16.2 | 2.68 | 4.5... 9.5  | 2 <sup>n</sup> | T          |
| 1889.30 | 17.9 | 2.44 | 5.8... 10.0 | 3 <sup>n</sup> | $\beta$    |
| 1897.48 | 11.6 | 2.38 | 6.0... 10.0 | 3 <sup>n</sup> | A          |
| 1898.20 | 14.5 | 2.63 | ... 10      | 3 <sup>n</sup> | D          |

Discovered with the 6-inch. Relative change is not entirely certain, but it is a physical system, as the components have a common proper motion. The principal star has an annual movement of 0.126 in the direction of 219° (AUWERS). If the small star was fixed in space, the position-angle should increase 12° and the distance 2.5 in the interval covered by the measures.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^3$ ... $\beta$  (2930)... $\beta$  (*Pub. L. O.* II)...A (I)...A (2081)...Hall (I)...Tarrant (2866, 2899, 2991)...O $\Sigma$  (*Poulkowa Obsns.* x)...Lv<sup>1</sup>...Aitken (3465)...Doolittle (*Pub. Flower Obsy.* 1)...H $\Sigma$  ( )...]

$\beta$  III4. B.A.C. 5090

R.A. 15<sup>h</sup> 21<sup>m</sup> 42<sup>s</sup> }  
Decl. - 28° 27' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1889.38 | 325.7 | 0.65 | 7.0... 7.3 | 3 <sup>n</sup> | $\beta$ |
| 1897.41 | 323.1 | 0.81 | 7 ... 7+   | 3 <sup>n</sup> | A       |
| 1897.48 | 319.2 | 0.60 | 6.9... 8   | 1 <sup>n</sup> | See     |

AB and C (= H 4774)

|         |     |      |             |                |                |
|---------|-----|------|-------------|----------------|----------------|
| 1834.30 | 8.5 | 10 ± | 7 ... 10    | 1 <sup>n</sup> | H <sup>2</sup> |
| 1877.41 | 7.5 | 8.95 | 7.0... 10.0 | 1 <sup>n</sup> | Cin            |
| 1880.39 | 6.5 | 9.17 | 6.8... 10.0 | 1 <sup>n</sup> | Cin            |
| 1889.38 | 5.8 | 9.21 | 7.0... 9.8  | 3 <sup>n</sup> | $\beta$        |
| 1890.43 | 2.3 | 9.71 | 7.2... 10.0 | 1 <sup>n</sup> | Gl             |
| 1897.39 | 5.4 | 8.90 | ... 10.0    | 2 <sup>n</sup> | A              |
| 1897.48 | 4.2 | 9.25 | ... 10.5    | 1 <sup>n</sup> | See            |

The close pair was discovered with the 36-inch. So far there is no sensible change.

The above are all the measures of the Herschel companion, which seems to be fixed. The magnitude of A in GOULD is 6.8.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Aitken (3465)...See (3496)...Cin<sup>4</sup>...Cin<sup>6</sup>...Glaserapp (1)...]

$\beta$  33, 34. Lalande 28246

R.A. 15<sup>h</sup> 24<sup>m</sup> 43<sup>s</sup> }  
Decl. - 12° 35' }

A and B (=  $\beta$  33)

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.36 | 47.5 | 2.75 | 8.0...10.3 | 3 <sup>n</sup> | $\Delta$ |
| 1878.49 | 43.0 | 2.94 | 8.0...10.0 | 2 <sup>n</sup> | Cin      |
| 1886.41 | 41.0 | 3.14 | 8.2...10.5 | 1 <sup>n</sup> | LM       |
| 1892.40 | 42.1 | 3.08 | 7.8...10.4 | 2 <sup>n</sup> | Lv       |
| 1898.04 | 41.4 | 2.74 | 8 ...10    | 5 <sup>n</sup> | D        |
| 1898.44 | 41.8 | 2.95 | 8.0...10.0 | 3 <sup>n</sup> | A        |

C and D (=  $\beta$  34)

|         |                       |                |             |                |         |
|---------|-----------------------|----------------|-------------|----------------|---------|
| 1872.43 | 55 <sup>o</sup> $\pm$ | 3 <sup>#</sup> | 10 ...10    |                | $\beta$ |
| 1898.04 | 55.2                  | 6.54           | ...         | 5 <sup>n</sup> | D       |
| 1898.44 | 56.2                  | 6.58           | 10.8...10.8 | 3 <sup>n</sup> | A       |

A and C

|         |                     |                     |     |                |   |
|---------|---------------------|---------------------|-----|----------------|---|
| 1898.45 | 138 <sup>o</sup> .7 | 246 <sup>#</sup> .5 | ... | 1 <sup>n</sup> | A |
|---------|---------------------|---------------------|-----|----------------|---|

A and E

|         |                     |                    |         |                |   |
|---------|---------------------|--------------------|---------|----------------|---|
| 1898.27 | 132 <sup>o</sup> .2 | 31.52 <sup>#</sup> | ...12.3 | 4 <sup>n</sup> | D |
|---------|---------------------|--------------------|---------|----------------|---|

Discovered with the 6-inch.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (1)...Cin<sup>5</sup>...LM...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Aitken ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  944. Lalande 28326

R.A. 15<sup>h</sup> 25<sup>m</sup> 34<sup>s</sup> }  
Decl. + 48° 8' }

|         |       |       |            |                |         |
|---------|-------|-------|------------|----------------|---------|
| 1879.28 | 128.5 | 10.74 | 6.5...12.5 | 2 <sup>n</sup> | $\beta$ |
| 1891.26 | 126.7 | 10.98 | 6.7...11.9 | 3 <sup>n</sup> | $\beta$ |
| 1899.08 | 126.6 | 10.53 | 7.0...11.5 | 1 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. Apparently fixed. Magnitude in D.M. 6.7; Lalande 6.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

$\beta$  945. Lalande 28358

R.A. 15<sup>h</sup> 26<sup>m</sup> 6<sup>s</sup> }  
Decl. + 57° 51' }

|         |      |       |            |                |         |
|---------|------|-------|------------|----------------|---------|
| 1879.28 | 13.1 | 16.37 | 6.8...12.7 | 3 <sup>n</sup> | $\beta$ |
| 1891.42 | 25.5 | 15.89 | 6.3...11.7 | 2 <sup>n</sup> | $\beta$ |
| 1896.49 | 30.8 | 15.68 | ...        | 3 <sup>n</sup> | A       |
| 1896.51 | 31.8 | 16.03 | 6.6...12.0 | 2 <sup>n</sup> | Lv      |
| 1898.57 | 34.3 | 16.09 | 6.0...12.0 | 3 <sup>n</sup> | A       |

Discovered with the 18½-inch. The large star has a considerable proper motion:

|         |   |   |   |       |          |
|---------|---|---|---|-------|----------|
| Stumpe  | - | - | - | 0.304 | in 297.4 |
| Krueger | - | - | - | 0.295 | in 298.5 |
| Porter  | - | - | - | 0.308 | in 299.1 |

With PORTER'S proper motion and the position given by the measures of 1879, the small star, at the date of the last measures in 1898, should be 34° 3' : 15' 80". It is evident that this is only an optical pair.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Aitken (3395)...Lv (*A. J.* 407)...Aitken ( )...]

$\beta$  121. B.A.C. 5163

R.A. 15<sup>h</sup> 32<sup>m</sup> 20<sup>s</sup> }  
Decl. - 27° 15' }

|         |       |      |           |                |         |
|---------|-------|------|-----------|----------------|---------|
| 1877.72 | 278.3 | 1.68 | 7.7...7.9 | 3 <sup>n</sup> | Cin     |
| 1888.50 | 274.0 | ...  | ...       | 1 <sup>n</sup> | Lv      |
| 1889.47 | 277.5 | 1.45 | 8.2...8.2 | 3 <sup>n</sup> | $\beta$ |
| 1890.45 | 101.8 | 1.65 | 7.2...7.3 | 2 <sup>n</sup> | Gl      |
| 1898.48 | 275.1 | 1.66 | 8.3...8.4 | 2 <sup>n</sup> | D       |

Discovered with the 6-inch. Unchanged.

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (2957)... $\beta$  (*Pub. L. O. II*)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Lv...Glaserapp (1)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  122. Lalande 28495

R.A. 15<sup>h</sup> 32<sup>m</sup> 59<sup>s</sup> }  
Decl. - 19° 23' }

|         |       |      |           |                |          |
|---------|-------|------|-----------|----------------|----------|
| 1868.51 | 22.5  | 2.01 | ...       | 1 <sup>n</sup> | Hd       |
| 1875.45 | 204.0 | 1.76 | 7.1...7.3 | 4 <sup>n</sup> | $\Delta$ |
| 1877.39 | 203.6 | 1.96 | 7.6...7.7 | 2 <sup>n</sup> | Cin      |
| 1881.03 | 26.7  | 1.99 | 7.0...7.5 | 2 <sup>n</sup> | Sp       |

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1885.36 | 202.8 | "    | 8 ... 8    | 1 <sup>n</sup> | LM  |
| 1887.45 | 25.8  | 1.75 | 7.0... 7.3 | 2 <sup>n</sup> | T   |
| 1888.35 | 24.9  | 1.74 | 7.0... 7.5 | 2 <sup>n</sup> | T   |
| 1888.39 | 206.9 | 1.96 | 7.5... 7.7 | 3 <sup>n</sup> | Lv  |
| 1890.40 | 26.1  | 2.03 | 7.5... 7.7 | 2 <sup>n</sup> | Gl  |
| 1894.54 | 207.9 | 1.67 | 7.5... 7.5 | 2 <sup>n</sup> | Sel |
| 1897.49 | 208.0 | 1.84 | 7 ... 7½   | 2 <sup>n</sup> | Sc  |

Discovered with the 6-inch. Probably without change. The small difference in the magnitudes is probably the explanation of the quadrants assigned by the several observers. This pair is 2<sup>m</sup> 3<sup>s</sup>  $\rho$   $\kappa$  *Librae* and 5' s. It is found in the subsequently published Harvard observations.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (I)... $\Delta$  (2086)...Cin<sup>4</sup>  
...LM...Lv<sup>1</sup>...*Annals Harvard Obsy.* XIII...Tarrant  
(2899,2991)...Sp (II)...Glaserapp (I)...Sellors (3303)  
...Scott (*Mon. Not.* LIX, 427)...]

### $\beta$ 354. O. Arg. S. 14797

R.A. 15<sup>h</sup> 36<sup>m</sup> 0<sup>s</sup> }  
Decl. — 25° 2' }

|         |       |      |            |                |                |     |
|---------|-------|------|------------|----------------|----------------|-----|
| 1876.44 | 285.7 | "    | 5.17       | 7.0... 9.0     | 1 <sup>n</sup> | Cin |
| 1877.41 | 285.6 | 5.37 | 7.9... 8.7 | 2 <sup>n</sup> | Cin            |     |
| 1890.42 | 287.7 | 5.32 | 7.4... 9.2 | 2 <sup>n</sup> | Gl             |     |

Discovered with the 6-inch. Relatively fixed.

[ $\beta$  (VI)... $\beta$  (2062)...Cin<sup>3</sup>...Cin<sup>4</sup>...Glaserapp (I)...]

### $\beta$ 35. B.A.C. 5184

R.A. 15<sup>h</sup> 36<sup>m</sup> 1<sup>s</sup> }  
Decl. — 15° 38' }

|         |       |      |             |                |                |          |
|---------|-------|------|-------------|----------------|----------------|----------|
| 1875.41 | 99.2  | "    | 2.40        | 7.1... 8.2     | 4 <sup>n</sup> | $\Delta$ |
| 1877.42 | 97.4  | 2.53 | 6.7... 8.7  | 2 <sup>n</sup> | Cin            |          |
| 1886.47 | 100.5 | ...  | 8.0... 11.0 | 1 <sup>n</sup> | LM             |          |
| 1887.44 | 98.0  | 2.28 | 7.0... 8.0  | 2 <sup>n</sup> | T              |          |
| 1888.35 | 100.5 | 2.39 | 7.0... 8.0  | 2 <sup>n</sup> | T              |          |
| 1890.41 | 102.4 | 2.64 | 7.2... 8.4  | 2 <sup>n</sup> | Gl             |          |

Discovered with the 6-inch. Without sensible change, but the components have a common proper motion of 0".185 in the direction of 250°.5 (PORTER), and hence it is a physical pair. Lalande 28591 = PIAZZI XV. 150.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (I)... $\Delta$  (2081)...Cin<sup>4</sup>  
...LM...Tarrant (2899,2991)...Glaserapp (I)...]

### $\beta$ 619. *Serpentis* 55

R.A. 15<sup>h</sup> 37<sup>m</sup> 34<sup>s</sup> }  
Decl. + 14° 3' }

|         |       |      |            |                |                |         |
|---------|-------|------|------------|----------------|----------------|---------|
| 1878.35 | 359.7 | "    | 0.58       | 6.5... 7.0     | 2 <sup>n</sup> | $\beta$ |
| 1878.46 | 354.0 | 0.38 | 6.2... 6.2 | 2 <sup>n</sup> | $\Delta$       |         |
| 1883.49 | 353.7 | 0.45 | 6.5... 6.5 | 3 <sup>n</sup> | Sp             |         |
| 1884.17 | 364.9 | 0.33 | 6.0... 6.4 | 6 <sup>n</sup> | En             |         |
| 1885.52 | 361.8 | 0.45 | ...        | 2 <sup>n</sup> | H $\Sigma$     |         |
| 1887.61 | 358.4 | 0.47 | ...        | 6 <sup>n</sup> | Sp             |         |
| 1888.39 | 360.6 | 0.63 | 6.0... 7.0 | 2 <sup>n</sup> | Lv             |         |
| 1888.66 | 358.1 | 0.54 | 6.5... 7.0 | 3 <sup>n</sup> | T              |         |
| 1891.29 | 359.8 | 0.59 | 6.9... 7.7 | 3 <sup>n</sup> | $\beta$        |         |
| 1894.50 | 363.1 | 0.55 | ...        | 1 <sup>n</sup> | Sp             |         |

Discovered with the 18½-inch. A fine, close pair, but so far without change. Lalande 28656.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Sp (II,  
III)...H $\Sigma$  ( )...Engelmann (2678)...Lv<sup>1</sup>...Tarrant  
(2991)...]

### $\beta$ 620. O. Arg. S. 14842

R.A. 15<sup>h</sup> 38<sup>m</sup> 54<sup>s</sup> }  
Decl. — 27° 41' }

A and B

|         |       |      |            |                |                |         |
|---------|-------|------|------------|----------------|----------------|---------|
| 1878.38 | 166.8 | "    | 0.86       | 7.5... 7.5     | 1 <sup>n</sup> | $\beta$ |
| 1892.41 | 154.4 | 0.50 | 7.7... 7.9 | 3 <sup>n</sup> | $\beta$        |         |
| 1892.41 | 165.5 | 0.65 | 7.0... 7.6 | 1 <sup>n</sup> | Lv             |         |
| 1896.49 | 170.2 | 0.72 | ...        | 1 <sup>n</sup> | A              |         |
| 1896.52 | 174.5 | 0.63 | ...        | 3 <sup>n</sup> | Lv             |         |

AB and C (= H 4803)

|         |       |       |            |                |                |   |
|---------|-------|-------|------------|----------------|----------------|---|
| 1836.7  | 214.8 | "     | 40±        | 8 ... 9        | 1 <sup>n</sup> | H |
| 1878.38 | 214.1 | 50.25 | 7.5... 9.0 | 1 <sup>n</sup> | $\beta$        |   |
| 1879.46 | 213.4 | 51.15 | 7.5... 9.0 | 1 <sup>n</sup> | Cin            |   |
| 1890.45 | 213.9 | 50.75 | 7.1... 8.5 | 2 <sup>n</sup> | Gl             |   |
| 1891.49 | 214.2 | 50.80 | 7.2... 9.0 | 3 <sup>n</sup> | $\beta$        |   |
| 1892.41 | 214.5 | 50.74 | ... 8.6    | 3 <sup>n</sup> | $\beta$        |   |
| 1892.41 | 215.4 | 50.53 | ... 10.0   | 1 <sup>n</sup> | Lv             |   |

The duplicity of the principal star of the wide pair, H 4803, was discovered with the 18½-inch. Change is probable. All the measures of C are given. LACAILLE 6516.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114,3142)... $\beta$  (*Pub. L. O.* II)...Lv (*A. J.*  
278, 407) (*Proc. Haverford Coll. Obsy.* 1892)...Aitken  
(3395)...Glaserapp (I)...]

**β 240.** W<sup>2</sup>XV. 731

R.A. 15<sup>h</sup> 39<sup>m</sup> 32<sup>s</sup> }  
Decl. + 4° 24' }

A and B

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.90 | 135.4 | 2.35 | 8.5...10.0 | 4 <sup>n</sup> | Δ  |
| 1880.46 | 135.9 | 2.49 | 8.5... 9.0 | 1 <sup>n</sup> | β  |
| 1892.70 | 135.0 | 2.27 | 8.4... 9.8 | 3 <sup>n</sup> | Lv |
| 1899.26 | 134.0 | 2.33 | 8.5... 9.3 | 1 <sup>n</sup> | β  |

A and C

|         |      |       |         |                |    |
|---------|------|-------|---------|----------------|----|
| 1880.46 | 42.1 | 27.88 | ...11.5 | 1 <sup>n</sup> | β  |
| 1892.36 | 40.2 | 28.33 | ...12.0 | 2 <sup>n</sup> | Lv |
| 1899.26 | 39.7 | 28.73 | ...11.8 | 1 <sup>n</sup> | β  |

Discovered with the 6-inch. Fixed. By an error in the reduction, the distance in β<sup>3</sup> is printed 31'.60.

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>3</sup>...Δ (1)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

**β 946.** B.A.C. 5248

R.A. 15<sup>h</sup> 44<sup>m</sup> 44<sup>s</sup> }  
Decl. + 55° 45' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1879.28 | 152.0 | 1.31 | 5.2...10.9 | 3 <sup>n</sup> | β |
| 1891.28 | 148.9 | 1.43 | 5.7...11.5 | 3 <sup>n</sup> | β |

Discovered with the 18½-inch. A fine unequal pair in *Draco*. In HEIS 5<sup>m</sup>; D.M. 6.0.

[β (xiii)...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* 11)...]

**β 415.** O. Arg. N. 15675

R.A. 15<sup>h</sup> 44<sup>m</sup> 50<sup>s</sup> }  
Decl. + 65° 57' }

A and B

|         |       |       |            |                |      |
|---------|-------|-------|------------|----------------|------|
| 1876.39 | 336.8 | 12.72 | 8.5...11.5 | 1 <sup>n</sup> | Δ    |
| 1892.42 | 335.4 | 12.77 | 8.2...10.5 | 2 <sup>n</sup> | Lv.C |
| 1899.08 | 334.5 | 12.86 | 8.2...11.6 | 2 <sup>n</sup> | β    |

A and C

|         |       |       |         |                |      |
|---------|-------|-------|---------|----------------|------|
| 1876.39 | 357.6 | 30.82 | ...12.0 | 1 <sup>n</sup> | Δ    |
| 1892.42 | 358.3 | 29.22 | ...10.6 | 2 <sup>n</sup> | Lv.C |
| 1899.08 | 358.7 | 28.39 | ...11.7 | 2 <sup>n</sup> | β    |

Discovered with the 6-inch. The measures of AC indicate a proper motion of 0".1 in one

of the stars. There appears to be no change in AB.

[β (vii)...β (2103)...Δ (1)...Lv and Collins (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...]

**β 621.** W<sup>2</sup>XV. 1130

R.A. 15<sup>h</sup> 45<sup>m</sup> 55<sup>s</sup> }  
Decl. + 44° 53' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1878.48 | 75.1 | 0.5± | 7.5... 8.0 | 1 <sup>n</sup> | β   |
| 1884.61 | 65.5 | 0.40 | ...        | 4 <sup>n</sup> | HΣ  |
| 1891.32 | 62.2 | 0.57 | 8.1... 9.3 | 3 <sup>n</sup> | β   |
| 1898.47 | 58.8 | 0.62 | 8 ... 8    | 2 <sup>n</sup> | D   |
| 1898.53 | 57.0 | 0.54 | ...        | 1 <sup>n</sup> | Lew |
| 1898.57 | 57.0 | 0.63 | 7.5... 8.5 | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. My single measure in 1877 was noted as somewhat uncertain, and therefore the apparent change in the angle may not be real.

[β (x)...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* 11)...Lewis (*Mon. Not.* LIX, 400)...HΣ ( )...Aitken ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 36.** 2 *Scorpii*

R.A. 15<sup>h</sup> 46<sup>m</sup> 24<sup>s</sup> }  
Decl. - 24° 58' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1877.37 | 277.6 | 2.47 | 6.0... 8.0 | 1 <sup>n</sup> | Cin |
| 1878.46 | 279.0 | 2.58 | 5.5... 8.0 | 1 <sup>n</sup> | Cin |
| 1880.38 | 275.4 | 2.80 | 5.0... 7.5 | 1 <sup>n</sup> | Cin |
| 1884.14 | 274.7 | 2.89 | 5.7... 7.7 | 4 <sup>n</sup> | W   |
| 1888.57 | 277.1 | 2.63 | 5.8... 7.6 | 1 <sup>n</sup> | Lv  |
| 1889.47 | 276.3 | 2.84 | 5.5...10.2 | 2 <sup>n</sup> | T   |
| 1892.38 | 277.8 | 2.86 | 5.8... 7.6 | 2 <sup>n</sup> | Lv  |
| 1894.58 | 276.6 | 1.94 | 6 ... 9.5  | 2 <sup>n</sup> | Sel |
| 1896.32 | 279.7 | 2.83 | 4.5... 7   | 3 <sup>n</sup> | Teb |
| 1897.47 | 274.4 | 2.93 | 5.9... 9   | 1 <sup>n</sup> | See |
| 1898.49 | 275.5 | 2.88 | 5 ... 9    | 3 <sup>n</sup> | Sc  |

Discovered with the 6-inch. There has been no sensible relative change, but it is without doubt a physical system, as the components have the same proper motion of 0".049 in the direction of 253°.6 (AUWERS).

[β (1)...β (*Mon. Not.* xxxiii, 351)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Lv<sup>1</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Tarrant (3186)...Sellors (3303)...Tebbutt (*Mon. Not.* LVII, 584)...See (3496)...Scott (*Mon. Not.* LIX, 427)...]



**$\beta$  810.** W<sup>2</sup> XV. 1156

R.A. 15<sup>h</sup> 46<sup>m</sup> 55<sup>s</sup> }  
Decl. + 42° 50' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1881.32 | 93.2 | 1.09 | 8.5...11.2 | 3 <sup>n</sup> | $\beta$ |
| 1888.51 | 91.5 | 1.35 | 8.9...12.2 | 3 <sup>n</sup> | Com     |
| 1893.37 | 89.1 | 1.15 | 8.8...11.2 | 3 <sup>n</sup> | W       |
| 1896.51 | 86.0 | 0.82 | 8.6...10.8 | 3 <sup>n</sup> | Lv      |
| 1898.61 | 89.4 | 0.99 | 8.6...11.7 | 3 <sup>n</sup> | A       |

Discovered with the 15½-inch at the Washburn Observatory. The motion, if any, is slow.

[ $\beta$  (XII)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...Lv (*A. J.* 407)...Wilson ( )...Aitken ( )...]

 **$\beta$  622.**  $\pi$  *Scorpii*

R.A. 15<sup>h</sup> 51<sup>m</sup> 36<sup>s</sup> }  
Decl. - 25° 46' }

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1878.40 | 132.6 | 49.99 | 6 ... 12 | 2 <sup>n</sup> | $\beta$ |
| 1892.39 | 132.2 | 50.41 | ... 12.3 | 3 <sup>n</sup> | $\beta$ |
| 1899.44 | 132.2 | 50.21 | ... 11.5 | 1 <sup>n</sup> | $\beta$ |

Distant companion noted with the 18½-inch. The large star has a proper motion of 0".056 in the direction of 234°3 (AUWERS). B is probably only an optical companion.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...]

 **$\beta$  623.** Lalande 29127

R.A. 15<sup>h</sup> 54<sup>m</sup> 51<sup>s</sup> }  
Decl. - 6° 38' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.45 | 238.4 | 0.97 | 8.0... 9.0 | 1 <sup>n</sup> | $\beta$ |
| 1878.68 | 236.8 | 0.99 | 8.0... 8.5 | 3 <sup>n</sup> | Cin     |
| 1888.27 | 237.8 | 1.01 | 8.0... 9.0 | 1 <sup>n</sup> | Lv      |

Discovered with the 18½-inch. Recent measures are wanting.

[ $\beta$  (X)... $\beta^1$ ...Cin<sup>5</sup>...Lv<sup>1</sup>...Glasenapp (1)...]

 **$\beta$  37.** Cord. (24°) 12474

R.A. 15<sup>h</sup> 55<sup>m</sup> 15<sup>s</sup> }  
Decl. - 24° 15' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1879.39 | 39.1 | 2.85 | 8.5... 9.5 | 1 <sup>n</sup> | Cin     |
| 1891.49 | 44.6 | 2.69 | 9.0... 9.4 | 3 <sup>n</sup> | $\beta$ |
| 1892.41 | 43.4 | 3.09 | 8.6... 9.7 | 3 <sup>n</sup> | Lv      |

Discovered with the 6-inch.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1893)...]

 **$\beta$  38.** Lalande 29136

R.A. 15<sup>h</sup> 55<sup>m</sup> 39<sup>s</sup> }  
Decl. - 24° 41' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.53 | 350.4 | 4.08 | 8.0...10.5 | 1 <sup>n</sup> | Cin     |
| 1880.48 | 351.5 | 4.07 | 8.5...10.0 | 1 <sup>n</sup> | Cin     |
| 1891.49 | 352.9 | 4.52 | 7.7... 9.2 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 6-inch. Unchanged.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>4</sup>...Cin<sup>6</sup>...]

 **$\beta$  947.**  $\beta$  *Scorpii*

R.A. 15<sup>h</sup> 58<sup>m</sup> 28<sup>s</sup> }  
Decl. - 19° 29' }

A and B

|         |      |      |          |                |         |
|---------|------|------|----------|----------------|---------|
| 1879.59 | 97.3 | 0.85 | 2 ... 10 | 1 <sup>n</sup> | H1      |
| 1880.06 | 88.4 | 0.91 | ... 9.7  | 5 <sup>n</sup> | $\beta$ |
| 1881.50 | 92.7 | 0.96 | ... 9.3  | 3 <sup>n</sup> | $\beta$ |
| 1887.59 | 99.2 | 1.09 | ...      | 2 <sup>n</sup> | H1      |
| 1887.60 | 88.5 | 0.98 | ...      | 3 <sup>n</sup> | Sp      |
| 1889.41 | 93.9 | 0.94 | ... 10.8 | 5 <sup>n</sup> | $\beta$ |
| 1891.55 | 95.7 | 1.00 | ... 10   | 2 <sup>n</sup> | H1      |
| 1892.41 | 95.8 | 1.03 | ... 9.5  | 3 <sup>n</sup> | $\beta$ |
| 1897.57 | 90.6 | 1.00 | ... 11   | 3 <sup>n</sup> | A       |

A and C (= H<sup>1</sup> III. 7 = Sh 217)

|         |      |       |            |                |                |
|---------|------|-------|------------|----------------|----------------|
| 1782.29 | 25.1 | 14.37 | ...        | 1 <sup>n</sup> | H <sup>1</sup> |
| 1823.28 | 26.5 | 13.65 | ...        | 1 <sup>n</sup> | Sh             |
| 1868.56 | 25.5 | 13.71 | 2.7... 5.1 | 4 <sup>n</sup> | J              |
| 1879.52 | 24.4 | 13.50 | ...        | 4 <sup>n</sup> | $\beta$        |
| 1879.55 | 24.3 | 13.82 | ...        | 4 <sup>n</sup> | Cin            |
| 1881.59 | 25.2 | 13.41 | ...        | 3 <sup>n</sup> | $\beta$        |
| 1885.01 | 25.3 | 13.59 | 3.9... 6.0 | 6 <sup>n</sup> | En             |
| 1888.08 | 24.8 | 13.62 | ...        | 4 <sup>n</sup> | H1             |

The close pair was discovered with the 18½-inch. The measures do not indicate any material change, but it is a physical system, as the components have a common proper motion. This movement is given by AUWERS in his *Fundamental Catalogue* as 0".0457 in the direction of 233°7. If the small star was fixed in space the change in the

position of B would be very apparent in the time covered by the measures. The Herschel companion appears to be fixed with reference to A, and is therefore a member of the system. If C had no proper motion, its angle and distance in the interval between 1823 and 1888 would increase respectively  $4^{\circ}.7$  and  $2''.7$ . It is evident from the measures that no such change has taken place. The Harvard photometric magnitude of  $\beta$  *Scorpii* is 3.0, and of C 5.2.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta^4$ ... $\beta$  (2957,3142)... $\beta$  (*Pub. L. O.* 11)... Sp (11)...Hall (1, 11)...Aitken (3465)...]

A few only of the measures of AC are given. The following refer to this companion:

Powell (*Mem. R. A. S.* xxv, xxxii)...Mitchell (*Cin*<sup>2</sup>) (*Sid. Mess.* April 1846)...Madler (*Fixstern-Systeme* 1, p. 213) *Anal. d. Königsberg Sternwarte*, München xvii...Worster and Jacob (*Madras Obsns.* 2d Series)...Herschel (*Mem. R. A. S.* v, xxxviii)...Beer and Madler (280)...Oudemans (926)...Secchi (*Cat. 1321 Stelle Doppie*) (*Double Star Measures* 1855)...*Radcliffe Obsns.* xxi, xxii, xxviii...Hall (*Wash. Obsns.* 1863)... $\Delta$  (1192)... $\Delta$  (1)...Pritchett (*Pub. Morrison Obsy.* 1)...Engelmann (2786)...*Cin*<sup>5</sup>...Tebbutt (*Mon. Not.* 1, 23)...Wilson (*Cin*<sup>10</sup>)...Cruls (*Annals Imp. Obsy. Rio de Janeiro*, iv, Part 1)...Glasenapp (1)...Hussey (*A. J.* 397)...]

$\beta$  948. *Librae* 213

R.A.  $15^h 59^m 20^s$  }  
Decl.  $- 5^{\circ} 58'$  }

A and B

|         |                 |        |                 |      |         |
|---------|-----------------|--------|-----------------|------|---------|
| 1879.59 | $150^{\circ}.5$ | $1.46$ | $6.8 \dots 9.5$ | $4n$ | $\beta$ |
| 1888.46 | $147.4$         | $1.55$ | $6.9 \dots 9.4$ | $2n$ | Lv      |
| 1892.40 | $149.3$         | $1.54$ | $7.1 \dots 9.4$ | $3n$ | Lv      |

A and C (=  $\Sigma$  2005 *rej.*)

|         |                 |          |              |      |         |
|---------|-----------------|----------|--------------|------|---------|
| 1835.6  | $230^{\circ}.5$ | $20 \pm$ | $7 \dots 12$ | $1n$ | $H^2$   |
| 1879.42 | $233.7$         | $28.54$  | $\dots 10.4$ | $2n$ | $\beta$ |
| 1892.41 | $234.8$         | $29.05$  | $\dots 10.4$ | $2n$ | Lv      |

A and D

|         |                 |          |              |      |         |
|---------|-----------------|----------|--------------|------|---------|
| 1835.6  | $185^{\circ}.0$ | $35 \pm$ | $\dots 12$   | $1n$ | $H^2$   |
| 1879.42 | $192.7$         | $52.27$  | $\dots 10.8$ | $2n$ | $\beta$ |
| 1892.41 | $194.9$         | $52.72$  | $\dots 10.8$ | $2n$ | Lv      |

The duplicity of the principal star of  $\Sigma$  2005 *rej.* was discovered with the  $18\frac{1}{2}$ -inch. All the measures of the distant stars are given above.

GOULD puts this in *Ophiuchus*, 6.8 m. Lalande 29280.

[ $\beta$  (XIII)... $\beta^3$ ...Lv<sup>1</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Herschel (*Cape Obsns.*)...]

$\beta$  811. *W<sup>2</sup> XV.* 1500

R.A.  $16^h 0^m 4^s$  }  
Decl.  $+ 22^{\circ} 30'$  }

|         |         |        |                  |      |         |
|---------|---------|--------|------------------|------|---------|
| 1881.31 | $221.6$ | $3.49$ | $8.1 \dots 12.1$ | $3n$ | $\beta$ |
| 1888.56 | $219.0$ | $3.76$ | $8.5 \dots 12.0$ | $3n$ | Com     |
| 1889.49 | $220.7$ | $3.70$ | $7.8 \dots 10.8$ | $3n$ | $\beta$ |
| 1899.28 | $221.5$ | $3.88$ | $8.0 \dots 10.0$ | $2n$ | $\beta$ |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. This star, according to the *Berlin A. G. Catalogue*, has a proper motion of  $0''.109$  in the direction of  $297^{\circ}.3$ . The components are obviously moving together.

[ $\beta$  (X11)... $\beta^4$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* 11)... Comstock (*Pub. Washburn Obsy.* v1)...]

$\beta$  39. *II Scorpii*

R.A.  $16^h 0^m 57^s$  }  
Decl.  $- 12^{\circ} 25'$  }

|         |                 |        |                  |      |          |
|---------|-----------------|--------|------------------|------|----------|
| 1872.55 | $258^{\circ}.2$ | $3.75$ | $\dots 10.3$     | $1n$ | Kn       |
| 1875.71 | $256.5$         | $3.35$ | $6.1 \dots 10.4$ | $4n$ | $\Delta$ |
| 1879.38 | $258.9$         | $3.77$ | $6.0 \dots 11.0$ | $1n$ | Cin      |
| 1879.49 | $258.4$         | $3.33$ | $6.0 \dots 11.0$ | $3n$ | $\beta$  |
| 1879.58 | $256.5$         | $3.31$ | $\dots$          | $1n$ | Pt       |
| 1880.48 | $256.9$         | $3.20$ | $6.0 \dots 9.0$  | $1n$ | Cin      |
| 1882.38 | $254.6$         | $3.36$ | $\dots 9.0$      | $2n$ | W        |
| 1888.44 | $259.4$         | $3.33$ | $5.5 \dots 10.0$ | $1n$ | Lv       |
| 1889.44 | $257.7$         | $3.25$ | $6.0 \dots 10.5$ | $2n$ | T        |
| 1899.38 | $258.3$         | $3.31$ | $6.0 \dots 9.7$  | $2n$ | $\beta$  |

Discovered with the 6-inch. The measures do not show any relative motion, and the proper motion of the principal star of  $0''.080$  in the direction of  $245^{\circ}.8$  (AUWERS) belongs to the small star as well. It will be shown hereafter to be a physical system, but of long period. There is a 13 m star,  $313^{\circ}.8 : 30''.0$ .

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^3$ ... $\Delta$  (1)... Knott (*Mem. R. A. S.* xliii)...*Cin*<sup>5</sup>...*Cin*<sup>6</sup>...Pritchett (*Pub. Morrison Obsy.* 1)... Wilson (*Cin*<sup>10</sup>)...Lv<sup>1</sup>...Tarrant (3186)...]

**β 812.** W<sup>2</sup> XV. 1553

R.A. 16<sup>h</sup> 1<sup>m</sup> 42<sup>s</sup> }  
Decl. + 17° 13' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1881.31 | 127.4 | 0.87 | 8.2... | 8.3 | 3 <sup>n</sup> | β   |
| 1888.45 | 125.2 | 0.76 | 8.7... | 9.0 | 3 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy.* vi)...]

**β 949.** Lalande 29365

R.A. 16<sup>h</sup> 1<sup>m</sup> 54<sup>s</sup> }  
Decl. — 9° 47' }

|         |       |      |        |     |                |    |
|---------|-------|------|--------|-----|----------------|----|
| 1880.25 | 197.8 | 0.62 | 7.6... | 7.7 | 4 <sup>n</sup> | β  |
| 1887.89 | 195.2 | 0.48 | ...    |     | 2 <sup>n</sup> | Sp |
| 1898.52 | 208.6 | 0.41 | 7.5... | 7.5 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. Motion is probable.

[β (xiii)...β<sup>3</sup>...Sp (iii)...Aitken ( )...]

**β 355.** Lalande 29506

R.A. 16<sup>h</sup> 4<sup>m</sup> 14<sup>s</sup> }  
Decl. + 45° 42' }

## A and B

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1876.34 | 279.3 | 0.34 | 7.8... | 8.0 | 4 <sup>n</sup> | Δ   |
| 1878.83 | 269.5 | 0.40 | 7.2... | 8.0 | 3 <sup>n</sup> | Sp  |
| 1886.67 | 280.0 | 0.36 | ...    |     | 7 <sup>n</sup> | En  |
| 1887.57 | 269.5 | 0.35 | ...    |     | 5 <sup>n</sup> | Sp  |
| 1888.61 | 273.8 | 0.4± | ...    |     | 3 <sup>n</sup> | Sp  |
| 1892.27 | 277.4 | 0.40 | 7.9... | 9.2 | 3 <sup>n</sup> | β   |
| 1897.34 | 278.5 | 0.44 | ...    |     | 1 <sup>n</sup> | Lew |
| 1898.53 | 278.1 | 0.42 | ...    |     | 2 <sup>n</sup> | Bow |

## AB and C

|         |      |       |     |    |                |     |
|---------|------|-------|-----|----|----------------|-----|
| 1892.27 | 97.3 | 12.8  | ... | 13 | 1 <sup>n</sup> | β   |
| 1898.53 | 99.2 | 12.87 | ... |    | 1 <sup>n</sup> | Bow |
| 1898.53 | 98.0 | 12.49 | ... |    | 1 <sup>n</sup> | Lew |

Discovered with the 6-inch. The measures, taken together, do not indicate any change. It is 56<sup>s</sup> ρ Σ 2015. The faint star was added with the 36-inch.

[β (vi)...β (2062,3142)...β (*Pub. L. O.* ii)...Δ (i)...Sp (ii, iii)...Engelmann (2786)...Lewis and Bowyer (*Mon. Not. LIX*, 400)...]

**β 40.** O. Arg. S. 15343

R.A. 16<sup>h</sup> 4<sup>m</sup> 29<sup>s</sup> }  
Decl. — 27° 14' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1877.00 | 352.7 | 5.02 | 8.0... | 9.5 | 2 <sup>n</sup> | Cin |
| 1890.46 | 354.7 | 5.71 | 8.5... | 9.3 | 2 <sup>n</sup> | Gl  |
| 1891.48 | 355.2 | 5.07 | 8.4... | 9.4 | 4 <sup>n</sup> | β   |

Discovered with the 6-inch April 27, 1870. This pair precedes all others in this catalogue in reference to date of discovery. There does not appear to be any sensible change. GLASENAPP measures a third star 9.8 m, 95° 9 : 98.37 (1890.46) 2<sup>n</sup>.

[β (i)...β (*Mon. Not. XXXIII*, 351)...β (3114)...β (*Pub. L. O.* ii)...Cin<sup>3</sup>...Cin<sup>4</sup>...Glaseapp (i)...]

**β 1087.** τ *Coronae*

R.A. 16<sup>h</sup> 4<sup>m</sup> 35<sup>s</sup> }  
Decl. + 36° 48' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1889.21 | 169.1 | 3.11 | 5.5... | 13.8 | 3 <sup>n</sup> | β |
| 1890.32 | 168.3 | 3.12 | ...    | 13.5 | 3 <sup>n</sup> | β |
| 1891.32 | 170.7 | 3.17 | ...    | 14.2 | 3 <sup>n</sup> | β |
| 1892.36 | 169.9 | 3.10 | ...    | 13.9 | 3 <sup>n</sup> | β |
| 1898.37 | 172.9 | 3.17 | ...    | 14.0 | 3 <sup>n</sup> | β |
| 1898.64 | 169.9 | 3.27 | 5.3... | 14.3 | 3 <sup>n</sup> | A |

Discovered with the 36-inch. τ *Coronae* has a considerable proper motion :

|        |   |   |       |          |
|--------|---|---|-------|----------|
| Auwers | - | - | 0.345 | in 348.3 |
| Porter | - | - | 0.346 | in 349.8 |

It is obvious from an inspection of the measures that the small star is moving at the same rate. This movement of A is almost exactly in the opposite direction, and if the small star was fixed in space, its distance would increase annually by the amount given above, which would make the distance in 1898 more than double that given by the first measures.

[β (xv)...β (2929,3048,3114,3142)...β (*Pub. L. O.* ii)...Aitken ( )...]

**β 120.** ν *Scorpii*

R.A. 16<sup>h</sup> 5<sup>m</sup> 1<sup>s</sup> }  
Decl. — 19° 9' }

## A and B

|         |       |      |        |                |                |   |
|---------|-------|------|--------|----------------|----------------|---|
| 1874.40 | 357.7 | ...  | ...    | 6 <sup>n</sup> | β              |   |
| 1874.47 | 365.2 | ...  | ...    | 1 <sup>n</sup> | N              |   |
| 1876.35 | 360.0 | 0.73 | 4.2... | 6.7            | 8 <sup>n</sup> | Δ |

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1876.53 | 361.5 | 0.67 | 4.2... 6.5 | 5 <sup>n</sup> | Sp      |
| 1877.49 | 364.4 | 0.64 | 4.2... 6.0 | 1 <sup>n</sup> | Cin     |
| 1878.35 | 363.7 | 1.04 | ...        | 2 <sup>n</sup> | $\beta$ |
| 1878.36 | 359.4 | 0.52 | ...        | 2 <sup>n</sup> | Ru      |
| 1879.03 | 360.2 | 0.74 | 4.2... 6.0 | 3 <sup>n</sup> | Cin     |
| 1879.58 | 362.0 | 0.65 | ...        | 5 <sup>n</sup> | Sp      |
| 1879.59 | 365.3 | 0.74 | 4 ... 7    | 1 <sup>n</sup> | Hl      |
| 1880.00 | 366.2 | 0.66 | 4.7... 5.7 | 8 <sup>n</sup> | $\beta$ |
| 1880.40 | 361.0 | ...  | ...        | 1 <sup>n</sup> | Cin     |
| 1880.54 | 360.9 | 0.53 | ...        | 2 <sup>n</sup> | Pt      |
| 1881.45 | 366.7 | 0.81 | ...        | 6 <sup>n</sup> | $\beta$ |
| 1882.55 | 359.9 | 0.72 | ...        | 2 <sup>n</sup> | Sp      |
| 1884.40 | 363.4 | ...  | 7.0... 7.5 | 1 <sup>n</sup> | W       |
| 1886.30 | 367.2 | 0.65 | 4 ... 6    | 1 <sup>n</sup> | LM      |
| 1886.42 | 357.3 | ...  | ...        | 1 <sup>n</sup> | Sm      |
| 1886.52 | 369.3 | 1.08 | 4.0... 7.0 | 2 <sup>n</sup> | T       |
| 1886.61 | 363.9 | 0.74 | ...        | 3 <sup>n</sup> | Hl      |
| 1888.36 | 362.8 | 0.95 | ...        | 3 <sup>n</sup> | T       |
| 1888.41 | 364.1 | 0.80 | 4.0... 5.5 | 3 <sup>n</sup> | Lv      |
| 1888.57 | 364.9 | 0.59 | ...        | 2 <sup>n</sup> | Hl      |
| 1889.44 | 361.2 | 0.80 | ...        | 3 <sup>n</sup> | $\beta$ |
| 1895.48 | 362.8 | 0.81 | 6.0... 6.5 | 3 <sup>n</sup> | A       |
| 1896.51 | 363.5 | 1.15 | ...        | 1 <sup>n</sup> | Hu      |
| 1896.59 | 367.4 | 0.88 | ...        | 2 <sup>n</sup> | Pt      |
| 1897.48 | 360.6 | 0.71 | ...        | 3 <sup>n</sup> | A       |

C and D (= Mitchell)

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1846.58 | 39.0 | 1.11 | 7.0... 8.0 | 2 <sup>n</sup> | Mh      |
| 1868.51 | 41.3 | 2.03 | ...        | 1 <sup>n</sup> | Hd      |
| 1875.42 | 47.9 | 1.89 | 7.0... 8.0 | 4 <sup>n</sup> | J       |
| 1877.78 | 45.6 | 2.08 | 7.0... 8.0 | 8 <sup>n</sup> | Sp      |
| 1879.41 | 45.2 | 2.07 | 7.1... 8.0 | 9 <sup>n</sup> | Cin     |
| 1881.31 | 46.6 | 2.02 | ...        | 4 <sup>n</sup> | $\beta$ |
| 1886.51 | 49.5 | 2.10 | 7.3... 8.0 | 4 <sup>n</sup> | T       |
| 1886.61 | 45.8 | 2.05 | ...        | 3 <sup>n</sup> | Hl      |
| 1888.42 | 48.3 | 2.22 | 7.4... 8.1 | 3 <sup>n</sup> | Lv      |
| 1897.48 | 48.7 | 2.02 | 7 ... 8    | 3 <sup>n</sup> | Sc      |
| 1897.48 | 43.6 | 2.05 | ...        | 3 <sup>n</sup> | A       |
| 1897.60 | 45.5 | 1.78 | ...        | 4 <sup>n</sup> | Bar     |
| 1898.54 | 45.0 | 2.05 | ...        | 2 <sup>n</sup> | Maw     |

AB and C (= H<sup>1</sup> V. 6 = Sh 220)

|         |       |       |     |                |                |
|---------|-------|-------|-----|----------------|----------------|
| 1782.30 | 334.9 | 38.33 | ... | 1 <sup>n</sup> | H <sup>1</sup> |
| 1821.36 | 338.2 | 40.82 | ... | 1 <sup>n</sup> | Sh             |
| 1875.43 | 336.8 | 40.77 | ... | 4 <sup>n</sup> | J              |
| 1879.58 | 337.7 | 40.98 | ... | 3 <sup>n</sup> | Sp             |
| 1881.60 | 336.6 | 40.97 | ... | 3 <sup>n</sup> | $\beta$        |
| 1886.61 | 336.5 | 40.91 | ... | 3 <sup>n</sup> | Hl             |
| 1897.60 | 326.4 | 41.12 | ... | 3 <sup>n</sup> | Bar            |

The close pair was discovered with the 6-inch. The duplicity of Herschel's companion was discovered by MITCHELL at Cincinnati in 1846, and independently by JACOB the following year. The measures of AB show no sensible motion, and the same may be said of CD. There has been no change in the distance or direction of the two pairs with reference to each other. The principal star, according to AUWERS, has a proper motion of 0".042 in the direction of 251°.9. The four components are evidently moving together, and undoubtedly form one vast quadruple system. This is in the midst of a complex nebulous area discovered by BARNARD (see *Mon. Not.* LIX, 367).

[ $\beta$  (III)... $\beta$  (*Mon. Not.* XXXIV, 59; XXXV, 28)... $\beta^1$ ... $\beta^3$ ... $\beta^4$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)...Newcombe (*Wash. Obsns.* 1874)... $\Delta$  (1)... $\Delta$  (2186)...Russell (*Sydney Obsns.* 1871-81)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Sp (11)...Sp (2133)...III (1, II)...Pritchett (*Pub. Morrison Obsy.* 1) (*A. J.* 397)...Wilson (Cin<sup>10</sup>)...LM...Smith (*Mem. R. A. S.* L)...Tarrant (2866,2991)...L.v<sup>1</sup>...L.v (*Sid. Mess.* VIII, 77)...Hussey (*A. J.* 397)...Aitken (3465) (*Ast. Soc. Pac.* VII, 305)...Scott (*Mon. Not.* LIX, 427)...Barnard (...)]

The following relate to observations of the old components :

[Herschel (*Cape Obsns.*)...Wrottesley (*Mem. R. A. S.* XXIX)...Worster and Jacob (*Madras Obsns.*, First Series)...Secchi (*Catalogo di 1321 Stelle Doppie*, app.) (*Mem. Coll. Rom.* 1855)...*Annals Harvard Obsy.* XIII...Mitchell (Cin<sup>2</sup>)...Glasenapp (1)...Sellors (3154)...Maw (*Mem. R. A. S.* LIII)...]

$\beta$  624. O. Arg. S. 15565

R.A. 16<sup>h</sup> 15<sup>m</sup> 42<sup>s</sup> }  
Decl. - 22° 50' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1878.47 | 321.7 | 1.12 | 8.0... 9.7  | 2 <sup>n</sup> | $\beta$ |
| 1879.39 | 320.0 | 1.25 | 7.7... 9.3  | 3 <sup>n</sup> | Cin     |
| 1880.38 | 320.9 | ...  | ...         | 1 <sup>n</sup> | Cin     |
| 1891.51 | 322.2 | 1.17 | 8.1... 10.2 | 6 <sup>n</sup> | $\beta$ |
| 1895.63 | 316.1 | 1.15 | 8.1... 9.6  | 3 <sup>n</sup> | A       |

Discovered with the 6-inch. Near  $\gamma$  Ophiuchi.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>...Cin<sup>6</sup>...Aitken (*Ast. Soc. Pac.* VII, 305)...]

$\beta$  1198.  $\tau$  Herculis

R.A. 16<sup>h</sup> 16<sup>m</sup> 8<sup>s</sup> }  
Decl. + 46° 36' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.35 | 145.3 | 6.57 | 4 ... 13.9 | 4 <sup>n</sup> | $\beta$ |
| 1892.40 | 145.6 | 6.70 | ... 14.0   | 1 <sup>n</sup> | $\beta$ |
| 1898.51 | 145.0 | 6.79 | ... 14.0   | 2 <sup>n</sup> | $\beta$ |
| 1898.64 | 149.4 | 7.10 | ... 14.2   | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. AUWERS gives the proper motion of  $\tau$  *Herculis*  $0''.035$  in the direction of  $330^\circ.5$ . It is uncertain from the measures whether or not the companion shares this movement. From the position of 1890, and this proper motion, the small star in 1898, if fixed in space, should be  $145^\circ.5 : 6''.8$ . The probabilities are that this is not a physical system. The magnitude of the companion, and its distance from the primary during the whole of the present century, will explain its non-discovery heretofore.

[ $\beta$  (xvii)... $\beta$  (3048,3142)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

$\beta$  41. D.M. ( $61^\circ$ ) 1583

R.A.  $16^h 17^m 26^s$  }  
Decl.  $+ 61^\circ 44'$  }

|         |      |      |            |            |   |
|---------|------|------|------------|------------|---|
| 1875.37 | 58.9 | 2.44 | 9.0...10.7 | 3 <i>n</i> | J |
| 1893.46 | 64.1 | 2.41 | 9.0...11.2 | 3 <i>n</i> | W |
| 1897.71 | 62.5 | 2.22 | 9...11     | 3 <i>n</i> | D |
| 1898.63 | 61.6 | 2.36 | 9.0...11.0 | 3 <i>n</i> | A |

Discovered with the 6-inch. Probably fixed.  $\Sigma$  2045 is  $\mathcal{S}$  in a low-power field.

[ $\beta$  (i)... $\beta$  (*Mon. Not. xxxiii*, 351)... $\Delta$  (i)...Wilson ( ) ...Aitken ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  1115. Lalande 29840

R.A.  $16^h 18^m 13^s$  }  
Decl.  $- 23^\circ 11'$  }

|         |      |      |            |            |         |
|---------|------|------|------------|------------|---------|
| 1889.39 | 26.3 | 0.90 | 8.1... 9.2 | 4 <i>n</i> | $\beta$ |
| 1897.42 | 18.4 | 0.72 | 8.0... 9.0 | 3 <i>n</i> | A       |
| 1897.65 | 26.7 | 0.97 | 8.0...10.5 | 1 <i>n</i> | See     |
| 1898.47 | 23.5 | 1.02 | 8.0... 9.2 | 2 <i>n</i> | D       |

Discovered with the 36-inch. This is in the field with 5 *Ophiuchi* (= Sh 228), and was measured from that star by JACOB at Madras. These are all the measures:

5 *Ophiuchi* and  $\beta$  1115

|         |       |        |            |           |
|---------|-------|--------|------------|-----------|
| 1846.21 | 253.8 | 161.00 | 1 <i>n</i> | Jacob     |
| 1889.39 | 253.0 | 156.43 | 3 <i>n</i> | $\beta$   |
| 1890.41 | 253.2 | 155.97 | 2 <i>n</i> | Glazenapp |
| 1898.33 | 253.3 | 156.86 | 4 <i>n</i> | Doolittle |

The proper motion of Lalande 29840 is given by PORTER as  $0''.064$  in the direction of  $225^\circ.3$ . The components are therefore moving together in space, and doubtless form a binary system. The last *Radcliffe Catalogue* gives the proper motion of 5 *Ophiuchi*  $0''.046$  in the direction of  $258^\circ.7$ .

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Aitken (3465)... See (3495)...Glazenapp (i)...]

$\beta$  950. S.D. ( $9^\circ$ ) 4381

R.A.  $16^h 18^m 41^s$  }  
Decl.  $- 9^\circ 35'$  }

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1880.50 | 355.1 | 1.18 | 8.2... 9.3 | 5 <i>n</i> | $\beta$ |
| 1888.46 | 350.9 | ...  | 8.0...10.0 | 1 <i>n</i> | Lv      |
| 1892.37 | 354.5 | 1.07 | 8.2... 9.0 | 3 <i>n</i> | $\beta$ |

Discovered with the  $18\frac{1}{2}$ -inch.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Lv...]

$\beta$  951. W<sup>2</sup> XVI. 543

R.A.  $16^h 18^m 59^s$  }  
Decl.  $+ 33^\circ 38'$  }

|         |      |      |            |            |         |
|---------|------|------|------------|------------|---------|
| 1879.32 | 57.3 | 0.98 | 8.2... 8.7 | 2 <i>n</i> | $\beta$ |
| 1892.24 | 55.4 | 0.91 | 8.1... 9.0 | 3 <i>n</i> | $\beta$ |
| 1898.53 | 56.8 | 1.07 | ...        | 1 <i>n</i> | L       |

Discovered with the  $18\frac{1}{2}$ -inch. Near  $\nu$  *Coronae*.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Lewis (*Mon. Not. LIX*, 400)...]

$\beta$  625.  $\omega$  *Herculis*

R.A.  $16^h 19^m 53^s$  }  
Decl.  $+ 14^\circ 19'$  }

A and B

|         |       |      |            |            |            |
|---------|-------|------|------------|------------|------------|
| 1879.21 | 176.8 | 1.91 | 5.0...11.5 | 3 <i>n</i> | $\beta$    |
| 1885.51 | 183.2 | 2.11 | ...        | 2 <i>n</i> | H $\Sigma$ |
| 1890.38 | 178.2 | 1.76 | ...11.7    | 2 <i>n</i> | $\beta$    |
| 1898.50 | 184.3 | 1.86 | 5.5...11.5 | 3 <i>n</i> | A          |

A and C

|         |       |       |         |            |         |
|---------|-------|-------|---------|------------|---------|
| 1879.05 | 103.5 | 33.89 | ...11.2 | 4 <i>n</i> | $\beta$ |
| 1890.37 | 103.5 | 33.41 | ...12.2 | 3 <i>n</i> | $\beta$ |
| 1898.50 | 102.7 | 32.96 | ...12.2 | 3 <i>n</i> | A       |

Discovered with the 18½-inch. AUWERS (A.N. 3509) gives the corrected proper motion of this star 0".065 in the direction of 159°. The measures of C in 1890 and 1898 give for the movement of A, assuming the small star to be fixed, 0".079 in 149°. It is probable, therefore, that this star has no sensible motion of its own, and that AB form a physical system.

[β (x)...β¹...β²...β (3048)...β (Pub. L. O. II)...Aitken ( )...HΣ ( )...]

β 813. W² XVI. 661

R.A. 16<sup>h</sup> 23<sup>m</sup> 2<sup>s</sup> }  
Decl. + 26° 48' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1881.30 | 165.4 | 0.96 | 8.4... | 8.4 | 3n | β   |
| 1888.61 | 165.4 | 1.09 | 8.5... | 8.6 | 3n | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β⁴...Comstock (Pub. Washburn Obsy. vi)...]

β 814. W² XVI. 676

R.A. 16<sup>h</sup> 23<sup>m</sup> 9<sup>s</sup> }  
Decl. + 40° 9' }

|         |       |       |        |     |    |     |
|---------|-------|-------|--------|-----|----|-----|
| 1881.38 | 322.6 | 0.36  | 8.4... | 8.7 | 3n | β   |
| 1891.32 | 324.1 | 0.31  | 8.4... | 8.4 | 3n | β   |
| 1893.57 | 318.9 | 0.25± | ...    | ... | 1n | Com |
| 1895.62 | 328.4 | 0.25± | ...    | ... | 3n | Com |
| 1896.43 | 331.9 | 0.25  | ...    | ... | 2n | Com |
| 1898.47 | 325.9 | 0.29  | 8+...  | 8+  | 2n | D   |
| 1898.53 | 325.2 | 0.28  | ...    | ... | 1n | Lew |
| 1898.67 | 326.4 | 0.35  | 8.5... | 8.5 | 3n | A   |

Discovered with the 15½-inch at the Washburn Observatory. The measures show no sensible change.

[β (xii)...β⁴...β (3114)...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy. x)...Doolittle (Pub. Flower Obsy. 1)...Lewis (Mon. Not. LIX, 400)...Aitken ( )...]

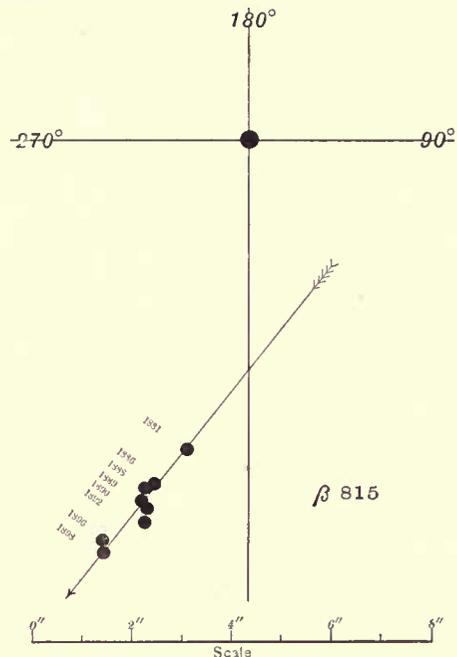
β 815. W² XVI. 686

R.A. 16<sup>h</sup> 23<sup>m</sup> 16<sup>s</sup> }  
Decl. + 43° 11' }

|         |       |      |        |      |    |     |
|---------|-------|------|--------|------|----|-----|
| 1881.30 | 348.4 | 6.42 | 8.1... | 10.4 | 3n | β   |
| 1886.40 | 344.5 | 7.28 | 8.2... | 10.3 | 7n | En  |
| 1888.95 | 343.2 | 7.42 | 8.1... | 10.0 | 4n | Com |
| 1889.43 | 343.3 | 7.68 | 8.5... | 10.8 | 3n | β   |

|         |       |      |        |      |    |       |
|---------|-------|------|--------|------|----|-------|
| 1890.33 | 344.4 | 7.76 | 8.4... | 9.7  | 3n | β     |
| 1892.17 | 344.5 | 8.07 | 8.4... | 10.2 | 3n | β     |
| 1896.47 | 341.6 | 8.65 | 8.1... | 10.3 | 3n | Lv    |
| 1896.59 | 337.8 | 8.73 | 8.5... | 10.2 | 2n | Soulé |
| 1897.70 | 340.1 | 9.09 | ...    | ...  | 3n | D     |
| 1898.61 | 340.6 | 8.89 | 8.5... | 10.5 | 3n | A     |

Discovered with the 15½-inch at the Washburn Observatory. The change shown by the measures is certainly due to proper motion of one star or the other. PORTER finds no evidence of this in the meridian observations of A. The companion has an apparent annual motion of 0".155 in the direction of 141°. This is unusual in so small a star. The measured positions are shown in the following diagram:



[β (xii)...β⁴...β (2957,3048,3142)...β (Pub. L. O. II)...β (Sid. Mess. IX, 299) (Ast. & A.-P. XIII, 18)...Engelmann (2786)...Comstock (Pub. Washburn Obsy. vi) (Sid. Mess. IX, 78)...Lv (A. J. 407)...Soulé (A. J. 410)...Doolittle (Pub. Flower Obsy. 1)...Aitken ( )...]

β 626. φ Ophiuchi

R.A. 16<sup>h</sup> 24<sup>m</sup> 16<sup>s</sup> }  
Decl. - 16° 21' }

|         |      |       |     |     |      |    |   |
|---------|------|-------|-----|-----|------|----|---|
| 1878.41 | 35.9 | 32.46 | 4   | ... | 12.5 | 2n | β |
| 1892.40 | 35.8 | 33.40 | ... | ... | 13.0 | 2n | β |
| 1898.30 | 35.5 | 33.59 | ... | ... | 13.5 | 2n | β |
| 1898.41 | 36.7 | 33.38 | ... | ... | 12.5 | 3n | A |

This distant companion was noted with the 18½-inch. The principal star has a proper motion of 0.078 in the direction of 249.1 (AUWERS). This accounts for the change in the companion. The proper motion and the position of 1878 give for B in 1898, 37.4 : 33.61.

[ $\beta$  (x)... $\beta^4$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Aitken ( )...]

**$\beta$  816.** 31 *Herculis*

R.A. 16<sup>h</sup> 27<sup>m</sup> 0<sup>s</sup> }  
Decl. + 33° 46' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1881.30 | 224.1 | 4.97 | 6.3...11.8 | 3 <sup>n</sup> | $\beta$    |
| 1884.89 | 223.6 | 5.65 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1888.54 | 221.2 | 5.31 | 7.5...11.8 | 3 <sup>n</sup> | Com        |
| 1892.17 | 224.2 | 5.28 | 6.3...11.8 | 3 <sup>n</sup> | $\beta$    |
| 1898.47 | 221.9 | 5.11 | 6.0... 9.5 | 2 <sup>n</sup> | D          |

Discovered with the 15½-inch at the Washburn Observatory. AUWERS gives this star a proper motion of 0.042 in the direction of 260.3. With this movement, and the position of 1881, the companion, if fixed, should be at the date of the last measures, 218.6 : 4.41. It is therefore probable that it is moving with the primary.

[ $\beta$  (xii)... $\beta^4$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...H $\Sigma$  ( )  
...Comstock (*Pub. Washburn Obsy. VI*)...Doolittle (*Pub. Flower Obsy. I*)...]

**$\beta$  817.** W<sup>2</sup> XVI. 796

R.A. 16<sup>h</sup> 27<sup>m</sup> 29<sup>s</sup> }  
Decl. + 23° 29' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.31 | 147.0 | 1.14 | 8.2... 8.2 | 4 <sup>n</sup> | $\beta$ |
| 1888.48 | 327.6 | 1.14 | 8.6... 8.7 | 3 <sup>n</sup> | Com     |

Discovered with the 15½-inch at the Washburn Observatory. Unchanged.

[ $\beta$  (xii)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy. VI*)...]

**$\beta$  818.** 32 *Herculis*

R.A. 16<sup>h</sup> 28<sup>m</sup> 49<sup>s</sup> }  
Decl. + 30° 45' }

|         |      |      |            |                |            |
|---------|------|------|------------|----------------|------------|
| 1881.48 | 33.5 | 3.29 | 6.3...13.5 | 3 <sup>n</sup> | $\beta$    |
| 1885.53 | 33.4 | 3.83 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1889.25 | 36.1 | 3.42 | 6.5...13.5 | 3 <sup>n</sup> | Com        |
| 1889.28 | 32.9 | 3.64 | 6.0...13.5 | 3 <sup>n</sup> | $\beta$    |
| 1898.64 | 33.8 | 3.96 | 6.3...13.8 | 3 <sup>n</sup> | A          |

Discovered with the 15½-inch at the Washburn Observatory. AUWERS gives the proper motion of 32 *Herculis*, 0.067 in the direction of 243.7. This does not fully explain the change in the distance of the companion. That change would indicate a proper motion of about 0.04 in 213.

[ $\beta$  (xii)... $\beta^4$ ... $\beta$  (2930)... $\beta$  (*Pub. L. O. II*)...H $\Sigma$  ( )...  
Comstock (*Pub. Washburn Obsy. VI*)...Aitken ( )...]

**$\beta$  356.** O. Arg. N. 16336

R.A. 16<sup>h</sup> 29<sup>m</sup> 42<sup>s</sup> }  
Decl. + 69° 12' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1876.21 | 118.8 | 6.85 | 9.2...11.5 | 3 <sup>n</sup> | $\Delta$ |
| 1892.34 | 118.9 | 7.17 | 8.6...11.5 | 3 <sup>n</sup> | $\beta$  |
| 1897.70 | 119.2 | 6.85 | 8.9...11   | 3 <sup>n</sup> | D        |

Discovered with the 6-inch. Without change.

[ $\beta$  (vi)... $\beta$  (2062,3142)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (i)...Doolittle (*Pub. Flower Obsy. I*)...]

**$\beta$  819.** S.D. (4°) 4133

R.A. 16<sup>h</sup> 30<sup>m</sup> 26<sup>s</sup> }  
Decl. — 4° 55' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.44 | 230.8 | 1.59 | 8.6...11.3 | 3 <sup>n</sup> | $\beta$ |
| 1888.60 | 231.3 | 1.59 | 8.7...11.5 | 3 <sup>n</sup> | Com     |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (xii)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy. VI*)...]

**$\beta$  952.** W<sup>2</sup> XVI. 938

R.A. 16<sup>h</sup> 31<sup>m</sup> 9<sup>s</sup> }  
Decl. + 37° 9' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1880.48 | 146.1 | 3.85 | 8.0...10.3 | 3 <sup>n</sup> | $\beta$ |
| 1892.24 | 146.1 | 3.96 | 8.1... 9.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.67 | 144.8 | 3.78 | 8.0... 9.0 | 2 <sup>n</sup> | A       |

B and C

|         |       |      |         |                |         |
|---------|-------|------|---------|----------------|---------|
| 1892.24 | 244.3 | 2.13 | ...13.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.67 | 233.5 | 2.58 | ...14.0 | 2 <sup>n</sup> | A       |

B was discovered with the 18½-inch, and in measuring that with the 36-inch the third star was added.

[β (XIII)...β³...β (3142)...β (Pub. L. O. II)...Aitken ( )...]

**β 820.** Lalande 30279

R.A. 16<sup>h</sup> 33<sup>m</sup> 8<sup>s</sup> }  
Decl. — 2° 52'

|         |       |      |        |        |                |                |   |
|---------|-------|------|--------|--------|----------------|----------------|---|
| 1881.35 | 237.6 | "    | 4.24   | 8.0... | 9.5            | 3 <sup>n</sup> | β |
| 1888.50 | 233.1 | 4.30 | 7.8... | 9.5    | 3 <sup>n</sup> | Com            |   |
| 1892.38 | 237.4 | 4.28 | 7.8... | 10.4   | 3 <sup>n</sup> | β              |   |

Discovered with the 15½-inch at the Washburn Observatory. The *Radcliffe Catalogue* for 1890 gives the proper motion of this star 0".112 in the direction of 290°.9. The measures show no relative change, and therefore this movement belongs to both stars.

[β (XII)...β⁴...β (3142)...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy. VI)...]

**β 42.** W<sup>2</sup> XVI. 1076

R.A. 16<sup>h</sup> 35<sup>m</sup> 20<sup>s</sup> }  
Decl. + 29° 15'

|         |      |      |         |        |                |                |    |
|---------|------|------|---------|--------|----------------|----------------|----|
| 1873.47 | 39.3 | "    | 7.50    | 8.5... | 9.0            | 1 <sup>n</sup> | OΣ |
| 1874.40 | 39.4 | 6.80 | 9       | ...    | 10             | 1 <sup>n</sup> | WS |
| 1875.10 | 41.9 | 7.23 | 10.0... | 10.5   | 3 <sup>n</sup> | Δ              |    |
| 1892.33 | 41.9 | 7.28 | 8.8...  | 9.1    | 2 <sup>n</sup> | β              |    |
| 1898.51 | 40.2 | 7.45 | 9.7...  | 9.9    | 2 <sup>n</sup> | Gl             |    |

Discovered with the 6-inch. Probably fixed.

[β (I)...β (Mon. Not. XXXIII, 351)...β (3142)...β (Pub. L. O. II)...Wilson and Seabroke (Mem. R. A. S. XLIII)...OΣ (Poulkova Obsns. X)...Δ (I)...Glasesnapp (V)...]

**β III6.** B.A.C. 5600

R.A. 16<sup>h</sup> 36<sup>m</sup> 51<sup>s</sup> }  
Decl. — 27° 14'

|         |       |      |        |        |                |                |   |
|---------|-------|------|--------|--------|----------------|----------------|---|
| 1889.39 | 359.4 | "    | 1.78   | 6.7... | 11.7           | 3 <sup>n</sup> | β |
| 1897.46 | 355.3 | 1.85 | 6+     | ...    | 12             | 3 <sup>n</sup> | A |
| 1897.48 | 356.7 | 2.21 | 6.5... | 11.2   | 1 <sup>n</sup> | See            |   |

Discovered with the 12-inch. In *Scorpio*; Gould 6.8 m. See measures a 14 m star, 197° 0': 25".42 (1897.48) 1 n.

[β (XVI)...β (2956)...Aitken (3465)...See (3496)...]

**β 953.** O. Arg. N. 16454

R.A. 16<sup>h</sup> 37<sup>m</sup> 21<sup>s</sup> }  
Decl. + 70° 2'

|         |       |      |        |        |                |                |   |
|---------|-------|------|--------|--------|----------------|----------------|---|
| 1879.27 | 328.7 | "    | 0.30   | 7.8... | 8.3            | 1 <sup>n</sup> | β |
| 1891.42 | 302.8 | 0.12 | 7.8... | 8.5    | 1 <sup>n</sup> | β              |   |
| 1892.39 | 298.1 | 0.18 | 8.0... | 8.5    | 3 <sup>n</sup> | β              |   |
| 1898.27 | 265.9 | 0.32 | 8.0... | 9.0    | 1 <sup>n</sup> | β              |   |

Discovered with the 18½-inch. It was a very difficult pair with that aperture at the time of discovery, and is still more difficult since. It is a binary in rapid motion. The distance in the last measure (1898) is certainly too large. This is the *sp* of two 8 m stars; the other is 22<sup>s</sup> f and 1' 40" n.

[β (XIII)...β³...β (3114,3142)...β (Pub. L. O. II)...]

**β 1199.** (Messier 13)

R.A. 16<sup>h</sup> 37<sup>m</sup> 23<sup>s</sup> }  
Decl. + 36° 41'

B and C

|         |       |      |      |         |      |                |     |
|---------|-------|------|------|---------|------|----------------|-----|
| 1890.45 | 239.4 | "    | 0.88 | 11.4... | 12.0 | 3 <sup>n</sup> | β   |
| 1898.54 | 240.4 | 0.97 | ...  |         |      | 2 <sup>n</sup> | Bar |

A and B

|         |       |      |      |         |  |                |     |
|---------|-------|------|------|---------|--|----------------|-----|
| 1890.45 | 310.3 | "    | 2.61 | 10.8... |  | 3 <sup>n</sup> | β   |
| 1898.54 | 308.1 | 2.76 | ...  |         |  | 4 <sup>n</sup> | Bar |

One of the principal stars, and near the center, of the great cluster in *Hercules* (Messier 13); discovered with the 36-inch. The close pair is No. 320 of *Scheiner's Catalogue* of the stars in M 13.

[β (XVII)...β (3047)...β (Pub. L. O. II)...Barnard ( )...]

**β 43.** W<sup>1</sup> XVI. 785

R.A. 16<sup>h</sup> 42<sup>m</sup> 19<sup>s</sup> }  
Decl. + 2° 57'

|         |       |      |        |     |                |                |                |    |
|---------|-------|------|--------|-----|----------------|----------------|----------------|----|
| 1874.43 | 71.0  | "    | 0.95   | 8   | ...            | 9              | 1 <sup>n</sup> | WS |
| 1875.22 | 246.5 | 0.89 | 8.7... | 8.8 | 4 <sup>n</sup> | Δ              |                |    |
| 1878.54 | 244.6 | 0.98 | 8.5... | 9.0 | 2 <sup>n</sup> | Sp             |                |    |
| 1892.38 | 245.0 | 1.01 | 8.2... | 8.3 | 2 <sup>n</sup> | β              |                |    |
| 1898.64 | 242.8 | 1.15 | ...    |     |                | 1 <sup>n</sup> | Br             |    |

Discovered with the 6-inch. Fixed.

[β (I)...β (Mon. Not. XXXIII, 351)...β (3142)...β (Pub. L. O. II)...Wilson and Seabroke (Mem. R. A. S. XLIII)...Δ (I)...Sp (II)...Brown ( )...]

**β 627.** 52 *Herculis*

R.A. 16<sup>h</sup> 45<sup>m</sup> 43<sup>s</sup> }  
Decl. + 46° 12' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1878.38 | 309.4 | 1.83 | 5.0...10.5 | 5 <sup>n</sup> | β   |
| 1881.42 | 306.6 | 1.76 | 5...10     | 1 <sup>n</sup> | Big |
| 1884.23 | 306.2 | 1.99 | ...        | 3 <sup>n</sup> | HΣ  |
| 1886.33 | 307.6 | 2.03 | 5.1...9.5  | 8 <sup>n</sup> | En  |
| 1892.24 | 318.7 | 1.62 | 5.0...9.1  | 3 <sup>n</sup> | β   |
| 1896.49 | 317.3 | 1.82 | 5.0...9.5  | 4 <sup>n</sup> | Lv  |
| 1898.61 | 314.5 | 1.90 | 5.0...9.3  | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. The principal star has a proper motion of 0.073 in the direction of 210°7 (AUWERS). The measures indicate that this is common to both components, as otherwise there would be a much larger increase in the angle, with a distance of about 2.5 at the date of the last measures. BIGOURDAN measures two 12 m stars 228°.6 : 67°.01, and 267°.6 : 143°.15 (1881.42) 1<sup>n</sup>.

[β (x)...β<sup>1</sup>...β (3142)...β (Pub. L. O. II)...β (Ast. & A.-P. XI, 465)...Bigourdan (Paris Obsns. 1883)...Lv (A. J. 407)...Aitken ( )...HΣ ( )...]

**β 821.** D.M. (32°) 2799

R.A. 16<sup>h</sup> 47<sup>m</sup> 13<sup>s</sup> }  
Decl. + 32° 3' }

|         |       |      |           |                |     |
|---------|-------|------|-----------|----------------|-----|
| 1881.43 | 313.6 | 1.21 | 8.4...8.9 | 3 <sup>n</sup> | β   |
| 1888.48 | 313.6 | 1.30 | 8.7...9.5 | 3 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β<sup>1</sup>...Comstock (Pub. Washburn Obsy. VI)...]

**β 123.** O. Arg. S. 16094

R.A. 16<sup>h</sup> 47<sup>m</sup> 29<sup>s</sup> }  
Decl. - 21° 51' }

|         |       |      |           |                |     |
|---------|-------|------|-----------|----------------|-----|
| 1877.42 | 203.5 | 1.67 | 8.5...8.8 | 2 <sup>n</sup> | Cin |
| 1886.41 | 205.1 | 1.56 | 8.5...8.5 | 1 <sup>n</sup> | W   |
| 1892.48 | 203.9 | 1.57 | 8.4...8.8 | 3 <sup>n</sup> | Lv  |

Discovered with the 6-inch. Fixed. In S.D. 8.0 m.

[β (III)...β (Mon. Not. XXXIV, 59)...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...]

**β 241.** *Ophiuchi* 74

R.A. 16<sup>h</sup> 48<sup>m</sup> 23<sup>s</sup> }  
Decl. - 21° 22' }

|         |       |      |           |                |     |
|---------|-------|------|-----------|----------------|-----|
| 1877.49 | 337.9 | 0.57 | 7.0...7.1 | 2 <sup>n</sup> | Cin |
| 1878.88 | 345.1 | 0.62 | 7.0...7.0 | 2 <sup>n</sup> | Sp  |
| 1879.06 | 159.6 | 0.63 | 7.0...7.2 | 2 <sup>n</sup> | Cin |
| 1880.47 | 341.0 | 0.7± | ...       | 1 <sup>n</sup> | β   |
| 1881.55 | 343.0 | 0.65 | 6.7...6.8 | 3 <sup>n</sup> | β   |
| 1884.38 | 345.0 | 0.5± | ...       | 1 <sup>n</sup> | W   |
| 1887.56 | 165.3 | 0.42 | 7...7     | 1 <sup>n</sup> | Ho  |
| 1888.56 | 164.2 | 0.6  | 7.2...7.2 | 2 <sup>n</sup> | Lv  |
| 1890.46 | 160.0 | 0.75 | 7.2...7.2 | 3 <sup>n</sup> | β   |
| 1895.63 | 162.1 | 0.71 | 7.0...7.2 | 3 <sup>n</sup> | A   |

Discovered with the 6-inch. Change is uncertain. Lalande 30725. In GOULD 6.8 m.

[β (v)...β (Mon. Not. XXXV, 31)...β<sup>3</sup>...β<sup>4</sup>...β (3048)...β (Pub. L. O. II)...Sp (II)...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...Hough (2978)...Lv<sup>1</sup>...Aitken (Ast. Soc. Pac. VII, 305)...]

**β 1117.** 24 *Ophiuchi*

R.A. 16<sup>h</sup> 49<sup>m</sup> 34<sup>s</sup> }  
Decl. - 22° 57' }

|         |       |      |           |                |    |
|---------|-------|------|-----------|----------------|----|
| 1889.39 | 264.2 | 0.70 | 6.4...6.5 | 4 <sup>n</sup> | β  |
| 1889.63 | 235.7 | ...  | ...       | 1 <sup>n</sup> | Ho |
| 1890.45 | 264.3 | 0.58 | ...       | 3 <sup>n</sup> | β  |
| 1893.41 | 269.9 | 0.76 | 6.0...6.2 | 2 <sup>n</sup> | W  |
| 1893.50 | 270.6 | 0.56 | 6.1...6.4 | 2 <sup>n</sup> | Lv |
| 1897.47 | 267.2 | 0.62 | 6+...6+   | 3 <sup>n</sup> | A  |

Discovered with the 12-inch. It had been previously seen by HOUGH, and appears as Ho 265 of his list of new pairs subsequently published. There is no material change in either angle or distance. This star has a proper motion of 0.027 in the direction of 265°9 (AUWERS), and this is the movement of both stars; otherwise, it would have been discovered long before.

[β (XVI)...β (2956,3048)...β (Pub. L. O. II)...Hough (2977)...Wilson ( )...Lv (A. J. 382)...Aitken (3465)...]

**β 954.** 54 *Herculis*

R.A. 16<sup>h</sup> 50<sup>m</sup> 6<sup>s</sup> }  
Decl. + 18° 38' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1879.36 | 175.4 | 2.56 | 5.0...12.3 | 3 <sup>n</sup> | β  |
| 1882.16 | 14.2  | 3.62 | 5.0...11.0 | 1 <sup>n</sup> | OΣ |
| 1887.17 | 178.1 | 2.81 | ...        | 5 <sup>n</sup> | HΣ |
| 1891.27 | 174.9 | 2.56 | 5.5...12.5 | 3 <sup>n</sup> | β  |
| 1898.47 | 175.8 | 2.73 | 5...10.2   | 2 <sup>n</sup> | D  |

Discovered with the 18½-inch. There is no relative change, but it must be a physical system, as the components have a common proper motion of 0".119 in the direction of 282°.1 (AUWERS). If the small star was fixed, the change in the position angle to 1891 would be about 25°. The measure by OΣ is noted "very uncertain."

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...OΣ (Poulkova Obsns. X)...Doolittle (Pub. Flower Obsy. I)...HΣ ( )...]

β 955. Redhill 2542

R.A. 16<sup>h</sup> 55<sup>m</sup> 50<sup>s</sup> }  
Decl. + 82° 3' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.68 | 348.0 | 0.54 | 8.2... 9.5 | 1 <sup>n</sup> | β |
| 1891.32 | 352.0 | 0.64 | 8.1... 9.3 | 3 <sup>n</sup> | β |
| 1898.63 | 351.0 | 0.76 | 8.2... 9.5 | 3 <sup>n</sup> | A |

Discovered with the 18½-inch. It is 11' S of ε Ursae Minoris and 2<sup>m</sup> 27<sup>s</sup> P.

[β (XIII)...β³...β (3114)...β (Pub. L. O. II)...Aitken ( )...]

β 822. Hercules 198

R.A. 16<sup>h</sup> 58<sup>m</sup> 40<sup>s</sup> }  
Decl. + 19° 51' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1881.56 | 228.0 | 1.50 | 6.9... 11.3 | 3 <sup>n</sup> | β   |
| 1885.50 | 215.2 | 1.72 | ...         | 2 <sup>n</sup> | HΣ  |
| 1888.50 | 230.9 | 1.81 | 7.0... 10.0 | 3 <sup>n</sup> | Com |
| 1896.52 | 228.1 | 1.64 | 6.8... 11.2 | 3 <sup>n</sup> | Lv  |

Discovered with the 15½-inch at the Washburn Observatory. The Berlin A. G. Catalogue gives this star a proper motion of 0".036 in the direction of 291°.0, and the measures show that this is the movement of the small star.

[β (XII)...β⁴...Comstock (Pub. Washburn Obsy. VI)...Lv (A. J. 407)...HΣ ( )...]

β 357. Lalande 31094

R.A. 16<sup>h</sup> 59<sup>m</sup> 52<sup>s</sup> }  
Decl. + 10° 43' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1875.56 | 294.0 | 1.15 | 8.3... 10.0 | 3 <sup>n</sup> | Δ  |
| 1876.50 | 298.9 | 1.14 | 7-8... 9+   | 1 <sup>n</sup> | OΣ |
| 1882.54 | 316.9 | 1.69 | 7-8... 10   | 1 <sup>n</sup> | OΣ |

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1885.52 | 295.5 | 1.56 | ...        | 2 <sup>n</sup> | HΣ  |
| 1891.49 | 302.5 | 1.08 | 8.4... 9.4 | 3 <sup>n</sup> | β   |
| 1895.50 | 302.5 | 1.31 | 8.2... 9.4 | 3 <sup>n</sup> | A   |
| 1896.51 | 298.0 | 1.20 | 8.0... 9.3 | 3 <sup>n</sup> | Lv  |
| 1896.53 | 300.0 | 0.99 | ...        | 2 <sup>n</sup> | Lew |

Discovered with the 6-inch. Change uncertain.

[β (VI)...β (2062,3114)...β (Pub. L. O. II)...Δ (1)...OΣ (Poulkova Obsns. X)...HΣ ( )...Aitken (Ast. Soc. Pac. VII, 305)...Lv (A. J. 407)...Lewis (Mon. Not. I.IX, 400)...]

β 823. Lalande 31107

R.A. 17<sup>h</sup> 0<sup>m</sup> 29<sup>s</sup> }  
Decl. + 0° 49' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1881.39 | 353.9 | 1.04 | 8.2... 9.2  | 4 <sup>n</sup> | β   |
| 1888.41 | 357.1 | 1.19 | 8.5... 9.5  | 3 <sup>n</sup> | Com |
| 1888.52 | 358.2 | ...  | 8.0... 9.3  | 1 <sup>n</sup> | Lv  |
| 1889.48 | 359.8 | 1.17 | 8.7... 9.5  | 3 <sup>n</sup> | β   |
| 1893.43 | 361.4 | 1.15 | 8.8... 10.2 | 3 <sup>n</sup> | W   |
| 1895.67 | 366.4 | 0.85 | 8.3... 9.4  | 3 <sup>n</sup> | A   |
| 1895.71 | 363.3 | 0.97 | ...         | 5 <sup>n</sup> | Sp  |
| 1896.49 | 365.3 | 0.95 | 8.0... 9.2  | 3 <sup>n</sup> | Lv  |

Discovered with the 15½-inch at the Washburn Observatory. Direct angular motion is clearly established by the measures.

[β (XII)...β⁴...β (2957)...β (Pub. L. O. II)...Comstock (Pub. Washburn Obsy. VI)...Lv⁴...Lv (A. J. 407)...Wilson ( )...Aitken (Ast. Soc. Pac. VII, 305)...Sp (III)...]

β 1088. μ Draconis

R.A. 17<sup>h</sup> 2<sup>m</sup> 51<sup>s</sup> }  
Decl. + 54° 38' }

B and C

|         |       |       |          |                |     |
|---------|-------|-------|----------|----------------|-----|
| 1889.27 | 190.0 | 12.25 | ... 13.0 | 3 <sup>n</sup> | β   |
| 1891.30 | 189.7 | 12.20 | ... 13.3 | 3 <sup>n</sup> | β   |
| 1892.36 | 191.3 | 12.11 | ... 13.7 | 3 <sup>n</sup> | β   |
| 1895.28 | 190.8 | 12.36 | ...      | 3 <sup>n</sup> | Bar |
| 1898.62 | 190.6 | 12.33 | ... 13.5 | 3 <sup>n</sup> | A   |
| 1899.44 | 193.2 | 12.33 | ...      | 1 <sup>n</sup> | β   |

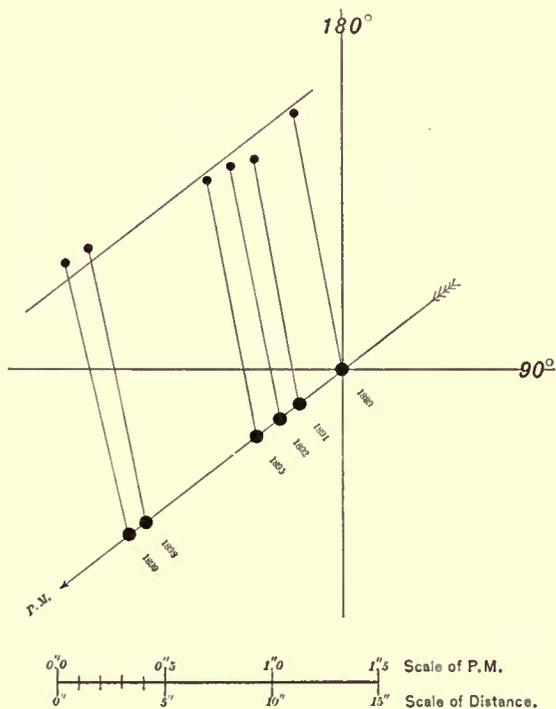
A and B (= Σ 2130 = H<sup>1</sup> II. 13 = Sh. 242)

|         |       |      |            |                 |   |
|---------|-------|------|------------|-----------------|---|
| 1836.79 | 202.8 | 3.27 | 5.0... 5.1 | 4 <sup>n</sup>  | Σ |
| 1854.26 | 188.3 | 3.04 | ...        | 11 <sup>n</sup> | Δ |

|         |       |      |     |                 |     |
|---------|-------|------|-----|-----------------|-----|
| 1858.23 | 185.1 | 2.78 | ... | 3 <sup>n</sup>  | OΣ  |
| 1863.57 | 182.1 | 2.62 | ... | 7 <sup>n</sup>  | J   |
| 1871.29 | 178.5 | 2.62 | ... | 3 <sup>n</sup>  | OΣ  |
| 1877.42 | 169.7 | 2.64 | ... | 5 <sup>n</sup>  | H1  |
| 1883.63 | 165.0 | 2.66 | ... | 6 <sup>n</sup>  | En  |
| 1889.27 | 159.4 | 2.40 | ... | 4 <sup>n</sup>  | β   |
| 1894.66 | 154.6 | 2.39 | ... | 11 <sup>n</sup> | Com |
| 1898.50 | 149.1 | 2.41 | ... | 6 <sup>n</sup>  | D   |

The faint star, C, was detected with the 36-inch. The bright stars, A and B, have the same proper motion, according to AUWERS, of 0".126 in the direction of 308°.2. With this movement of B, and the position of the companion from the measures of 1889, if C was fixed in space, its relation to B at the date of the last measures in 1898 should be 186°.2 : 12".83. It seems practically certain, from the measures taken together, that no such change in C has taken place, and that, therefore, the new star is a member of the physical system.

On the accompanying diagram the measured positions of C from the several places of B in the line of its proper motion are shown :



Proper motion of  $\mu$  Draconis and Companion.

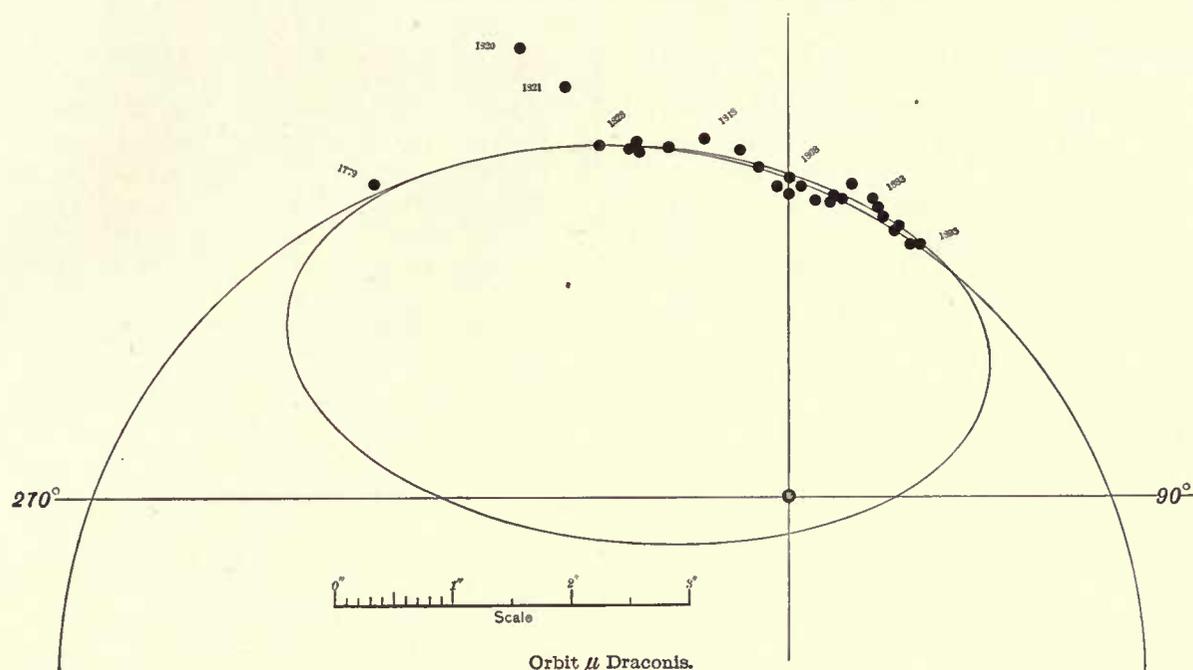
[ $\beta$  (XIV)... $\beta$  (2875,2929,3114,3142)... $\beta$  (*Pub. L. O. II*) (*Mon. Not. LVII*, 547)...Barnard (*A. J.* 447)...Aitken ( )...]

As a double star this is known as  $\Sigma$  2130 (= H<sup>+</sup> II. 13 = Sh 242). It was discovered by HERSCHEL I. 1779 October 17, and, as the distance was between 4" and 8", it was placed in his Class II. Both angle and distance were measured, and the latter recorded as 4".354 "mean measure" (*Phil. Trans.* 1782). In his "Synopsis" of his father's double-star observations (*Mem. R.A.S.* Vol. xxxv) HERSCHEL II. gives this distance as 4".69, and the date a few days later than that in the original publication, and the date of the measure of the position angle as 1781.73. The latter would seem to be a mistake, since HERSCHEL I. has only the single observation of 1779 October 19 in his first catalogue above referred to. There may be some warrant for this in the original MS., and for increasing the distance to 4".69; but the smaller distance value is used in *Herschel and South's Catalogue* of 1824, and in the early measures of DAWES and other observers. I have used here the original values of both distance and epoch.

In 1804 HERSCHEL recognized the angular motion, and said: "The stars being of nearly equal magnitude, we can have no inducement to suppose them to be at very different distances from us." STRUVE made measures of it in 1819 and 1821 before the commencement of the work recorded in *Mensura Micrometrica*, and SOUTH and HERSCHEL have a single observation in 1821. After citing the previous measures, the latter observers say: "No doubt, therefore, can remain of the reality of an angular motion in this star, as announced by SIR WILLIAM HERSCHEL in 1804; and the observations here brought together prove it to have been hitherto nearly uniform, and averaging 0°.579 per annum in the direction *npsf*, or retrograde. There can be little doubt of its being a binary system—a miniature of a *Geminorum*."

Systematic work on this star was commenced by STRUVE in 1828, and since that time there is no lack of carefully made reliable mean results from measures on different nights down to the present time. The retrograde motion recognized by the early observers has steadily continued, accompanied with a slow diminution in the distance. According to STRUVE, the magnitudes of the components are 5.0 and 5.1.

On the accompanying diagram I have given a careful selection of the best measures by the principal observers for the last hundred years. The



following dates and observers are represented by complete measures of angle and distance :

|             |                 |                        |
|-------------|-----------------|------------------------|
| 1781        | 1 <sup>n</sup>  | H <sup>r</sup>         |
| 1820        | 2 <sup>n</sup>  | Σ                      |
| 1821        | 1 <sup>n</sup>  | Sh                     |
| 1828-36 (4) | 13 <sup>n</sup> | Σ                      |
| 1840        | 6 <sup>n</sup>  | Da                     |
| 1848        | 1 <sup>n</sup>  | Da                     |
| 1855        | 15 <sup>n</sup> | Δ                      |
| 1858        | 3 <sup>n</sup>  | Δ                      |
| 1863        | 7 <sup>n</sup>  | Δ                      |
| 1866        | 6 <sup>n</sup>  | Δ                      |
| 1868        | 3 <sup>n</sup>  | Du                     |
| 1871        | 11 <sup>n</sup> | OΣ, Du                 |
| 1872        | 7 <sup>n</sup>  | Δ                      |
| 1875        | 7 <sup>n</sup>  | Du                     |
| 1876        | 3 <sup>n</sup>  | Jed                    |
| 1877        | 8 <sup>n</sup>  | Hall                   |
| 1879        | 3 <sup>n</sup>  | Jed                    |
| 1883        | 10 <sup>n</sup> | Per, En, Jed           |
| 1885        | 7 <sup>n</sup>  | Hall, Per, Jed         |
| 1886        | 3 <sup>n</sup>  | Jed                    |
| 1888        | 3 <sup>n</sup>  | Maw                    |
| 1889        | 10 <sup>n</sup> | β, Hall, Maw           |
| 1893        | 7 <sup>n</sup>  | Leavenworth, Comstock  |
| 1895        | 10 <sup>n</sup> | See, Collins, Comstock |

It is evident that the distances in the early measures of STRUVE, and HERSCHEL and SOUTH, 1819 to 1821, are too large, or that the distance in 1781

is too small. The later measures of STRUVE appear to show that his previous measures of distance were much too large, and he seems to have considered them as not very reliable, since they are not mentioned in *Mensurae Micrometricae*.

One orbit has been computed for this system. BERBERICH (*Astr. Nach.* 2582), from an examination of the measures down to 1883, found a period of 648.0 years. As in all double stars as wide as this, and as easy of measurement, where the observed arc is short, the various measured positions are well represented by the apparent orbit; and, so far as the agreement between the observed and computed places is concerned, there is nothing for unfavorable criticism; but it is obvious enough from even a casual inspection of the diagram that the data are altogether insufficient for even the roughest approximation to the apparent ellipse and the elements of the real orbit. Indeed, as might be expected, the measures since 1883 are steadily leaving the computed positions. The chances are that the relative change will finally resolve itself into orbital motion; but, judging from the motion in the last hundred years, it will be a very long time before anything more than the bare fact of physical connection can be established, to say nothing about the details of that relation.

By way of showing how easily these positions are represented by orbits wholly unlike in all respects, I have given on the diagram two of the

many which could be found. So far as the observed arc is concerned, these figures are practically identical, and represent all the measures down to 1883 as well as, if not better than, the computed orbit, and the six later positions are much better represented. HERSCHEL'S distance is practically perfect, and the angle requires a correction of only 2°.8, which is much less than the probable error of measures made in the last century. The ellipse with a major axis of 5".88 gives a period of about 280 years, and the circle with a diameter of 9".16 a period of 1190 years, the eccentricity in the one case being 0.84, and zero in the other. Of course an almost infinite variety of conic sections could be shown which would be equally satisfactory, so far as the measures are concerned.—*Monthly Notices R. A. S.* LVII, 547.

A few only of the measures of AB are given, all will be found in the following :

[Madler (324) (*Fixstern-Systeme* I) (*Dorpat Obsns.* XI, XIII, XV)... Herschel (*Mem. R. A. S.* v)... Mitchell (Cin<sup>2</sup>)... Wrottesley (*Phil. Trans.* 1851) (*Mem. R. A. S.* XXIX)... Miller (806)... Fletcher (*Mem. R. A. S.* XXII)... *Obsns. at Bishops Obsy.*... Dawes (*Mem. R. A. S.* VIII, XIX, XXXV)... *Greenwich Obsns.* 1840... Kaiser (1519) (*Annalen der Stern-Leiden*, III)... Winnecke (1738) (*Ast. Beob. Stern. zu Berlin*, v)... *Obsns. at Barclay's Obsy.* II, III, IV... Secchi (1614) (*Cat. 1321 Stelle Doppie*) (*Serie Seconda delle misure microm.* Coll. Rom. 1863-66)... *Radcliffe Obsns.* XXII, XXVII, XXIX, XXXII... *Annals Harvard Obsy.* XIII... Duner (*Mes. Microm. Lund*, 1876)... Ball (*Dunsink Obsns.*, Part 5)... Brunnow (*Dunsink Obsns.*, Part 3)... Plummer (*Oxford Obsns.*, No. 1)... Flammarion (*Etoiles Doubles et Multiples*)... Gledhill (*Mem. R. A. S.* XLII)... Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII, XLVI, 1)... Engelmann (1674,2677)... Pritchett (*Pub. Morrison Obsy.* 1)... Bigourdan (*Paris Obsns.* 1883) (*Bul. Ast.* XVIII)... Seagrave (*Sid. Mess.* II, 22)... Doberck (2092,2198,3023) (*Trans. R. I. Acad.* XXVI, XXIX)... OΣ (*Poulikorwa Obsns.* IX)... Δ (I, II)... Δ (1032,1115,1474,1735,2081)... Jedrzejewicz (2369, 2772)... Goldney (2557)... Berberich (2582)... Kustner (2584)... Perrotin (2529) (*Nice Obsns.* II)... de Boll (2753)... Tar-rant (2866)... Knorre and See (*Beob. Berlin*, No. 6, 1892)... Jones (*A. J.* 312) (*Proc. Haverford Coll. Obsy.* 1891, 1892)... Hall (I, II) (*Wash. Obsns.* 1885)... Maw (*Mem. R. A. S.* L, LI, LIII)... Searle (*A. J.* 299)... Glasenapp (III)... Collins (*A. J.* 378)... Comstock (*Pub. Washburn Obsy.* x)... See (*A. J.* 359)... Lv (*A. J.* 382)... Morgan (*A. J.* 439)... Doolittle (*Pub. Flower Obsy.* 1)...]

β 1118. η Ophiuchi

R.A. 17<sup>h</sup> 3<sup>m</sup> 30<sup>s</sup> }  
Decl. — 15° 34' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1889.39 | 274.7 | 0.35 | 3.4... 3.9 | 4 <sup>n</sup> | β |
| 1890.45 | 271.1 | 0.38 | ...        | 4 <sup>n</sup> | β |

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1892.40 | 270.0 | 0.36 | ...        | 3 <sup>n</sup> | β   |
| 1896.52 | 259.8 | 0.38 | 4.0... 5.0 | 3 <sup>n</sup> | Lv  |
| 1897.47 | 259.1 | 0.40 | ...        | 4 <sup>n</sup> | A   |
| 1897.48 | 260.7 | 0.53 | 3.8... 3.8 | 1 <sup>n</sup> | See |
| 1898.55 | 256.7 | 0.52 | ...        | 3 <sup>n</sup> | β   |
| 1898.28 | 250.7 | 0.50 | 3.5... 4.0 | 1 <sup>n</sup> | A   |
| 1899.37 | 253.8 | 0.47 | 3.5... 4.1 | 4 <sup>n</sup> | A   |

Discovered with the 36-inch. As this star has a proper motion of 0".097 in the direction of 2°6 (AUWERS), it was certain at the time of discovery that it was a binary system, since the components must be moving together, or it would have been discovered before. So far the relative motion is not as rapid as would be expected in a pair of this class. At present the retrograde movement is about 2° per annum. It is probable that the distance is very nearly maximum.

The following are measures of two distant stars in the field :

AB and C

|         |       |       |        |                |   |
|---------|-------|-------|--------|----------------|---|
| 1898.56 | 142.5 | 93.41 | ... 13 | 1 <sup>n</sup> | β |
|---------|-------|-------|--------|----------------|---|

AB and D

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1898.56 | 288.6 | 99.78 | ... 11.5 | 3 <sup>n</sup> | β |
|---------|-------|-------|----------|----------------|---|

[β (xvi)... β (2912,2956,3048,3142)... β (*Pub. L. O.* II)... Lv (*A. J.* 407)... Aitken (3465)... See (3496)... Aitken ( )...]

β 124. Lalande 31224

R.A. 17<sup>h</sup> 4<sup>m</sup> 0<sup>s</sup> }  
Decl. — 0° 36' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1874.43 | 263.0 | 0.9± | 8 ... 10    | 1 <sup>n</sup> | WS  |
| 1875.11 | 253.5 | 1.12 | 7.3... 10.3 | 3 <sup>n</sup> | Δ   |
| 1879.37 | 263.2 | 1.15 | 8.0... 10.5 | 1 <sup>n</sup> | Cin |
| 1881.42 | 266.3 | 0.94 | 7.0... 11.0 | 2 <sup>n</sup> | β   |
| 1891.71 | 266.8 | 0.94 | 7.2... 11.2 | 2 <sup>n</sup> | β   |
| 1892.64 | 267.9 | 0.85 | ...         | 1 <sup>n</sup> | Sp  |

Discovered with the 6-inch. Change is uncertain.

[β (III)... β (*Mon. Not.* XXXIV, 59)... β<sup>4</sup>... β (3114)... β (*Pub. L. O.* II)... Δ (I)... Wilson and Seabroke (*Mem. R. A. S.* XLIII)... Cin<sup>5</sup>... Sp (III)...]

**β 956.** O. Arg. S. 16420

R.A. 17<sup>h</sup> 4<sup>m</sup> 10 }  
Decl. — 26° 33' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1880.51 | 163.1 | 0.63 | 8.0... 9.7 | 2 <i>n</i> | β   |
| 1893.49 | 161.1 | 0.76 | 8.0... 8.5 | 1 <i>n</i> | W   |
| 1897.65 | 163.3 | 0.58 | 7.5... 8.5 | 1 <i>n</i> | See |

This difficult pair was suspected with the 6-inch in 1873 at the time of the discovery of β 125, and referred to in the note to the latter pair. It proved to be a very difficult object to verify, although it was examined many times with both the 6 and 18½-inch refractors. Finally in 1880 it was fairly well seen and measured with the larger aperture. This star is 3<sup>m</sup> 49<sup>s</sup> *p* and 8' *s* of the well-known pair, 36 *Ophiuchi*. β 125 is 20' *s*.

[β (XIII)...β<sup>3</sup>...β (*Mon. Not.* XXXIV, 63)...See (3496)... Wilson ( )...]

**β 125.** B.A.C. 5789

R.A. 17<sup>h</sup> 4<sup>m</sup> 43<sup>s</sup> }  
Decl. — 26° 53' }

|         |      |      |             |            |     |
|---------|------|------|-------------|------------|-----|
| 1877.42 | 62.9 | 1.74 | 7.2... 11.0 | 2 <i>n</i> | Cin |
| 1880.51 | 68.3 | 1.56 | 7.9... 10.9 | 2 <i>n</i> | β   |
| 1889.47 | 61.3 | 1.48 | 7.9... 10.0 | 3 <i>n</i> | β   |
| 1897.65 | 67.1 | 1.65 | 6.6... 10.2 | 2 <i>n</i> | See |

Discovered with the 6-inch. Further measures are necessary to show whether or not there is any relative motion. It is 3<sup>m</sup> 16<sup>s</sup> *p* and 28' *s* of 36 *Ophiuchi*. β 956 is 20' *n*.

[β (III)...β (*Mon. Not.* XXXIV, 59)...β<sup>3</sup>...β (2957)...β (*Pub. L. O.* II)...Cin<sup>4</sup>...See (3496)...]

**β 1247.** Lalande 31296

R.A. 17<sup>h</sup> 7<sup>m</sup> 3<sup>s</sup> }  
Decl. — 9° 9' }

|         |       |      |             |            |   |
|---------|-------|------|-------------|------------|---|
| 1891.48 | 345.5 | 1.62 | 8.0... 10.3 | 4 <i>n</i> | β |
| 1897.60 | 339.6 | 1.39 | 7+... 10+   | 3 <i>n</i> | A |

Discovered with the 36-inch.

[β (XVIII)...β (3113)...β (*Pub. L. O.* II)...Aitken (3465)...]

**β 282.** S.D. (14°) 4585

R.A. 17<sup>h</sup> 8<sup>m</sup> 31<sup>s</sup> }  
Decl. — 14° 27' }

|         |       |      |             |            |     |
|---------|-------|------|-------------|------------|-----|
| 1875.41 | 154.1 | 4.23 | 6.7... 11.8 | 3 <i>n</i> | J   |
| 1879.55 | 153.2 | 3.31 | 7.5... 11.0 | 1 <i>n</i> | Cin |
| 1879.81 | 154.8 | 3.94 | 6.2... 11.6 | 3 <i>n</i> | β   |
| 1880.44 | 153.1 | 4.25 | 6.0... 10.5 | 1 <i>n</i> | Cin |
| 1881.42 | 151.7 | 4.41 | 6.6... 11.1 | 3 <i>n</i> | β   |
| 1889.42 | 151.9 | 4.31 | 6.3... 11.3 | 3 <i>n</i> | β   |
| 1896.57 | 153.7 | 4.28 | ...         | 2 <i>n</i> | Hu  |

Discovered with the 18½-inch. Evidently unchanged. This star, considering its brightness, is singularly missing in some of the star catalogues covering this region. Magnitude in LAMONT 5, GOULD 6.3, and S.D. 6.4. The Cincinnati observers thought the principal star was a close pair. I have examined it many times under favorable conditions with apertures of 15½, 18½, and 36 inches, and am satisfied that it is not double.

[β (V)...β (*Mon. Not.* XXXV, 31)...β<sup>3</sup>...β<sup>4</sup>...β (2957)...β (*Pub. L. O.* II)...Cin<sup>5</sup>...Cin<sup>6</sup>...Δ (1)...Hussey (*A. J.* 397)...]

**β 957.** Lalande 31341

R.A. 17<sup>h</sup> 8<sup>m</sup> 58<sup>s</sup> }  
Decl. — 10° 10' }

|         |       |      |            |            |    |
|---------|-------|------|------------|------------|----|
| 1880.16 | 203.6 | 0.58 | 7.9... 7.9 | 3 <i>n</i> | β  |
| 1887.74 | 194.5 | 0.4± | ...        | 5 <i>n</i> | Sp |
| 1888.54 | 199.5 | 0.5± | 8.0... 8.0 | 1 <i>n</i> | Lv |
| 1889.50 | 201.7 | 0.47 | 8.2... 8.4 | 3 <i>n</i> | β  |

Discovered with the 18½-inch. Apparently without change.

[β (XIII)...β<sup>3</sup>...β (2957)...β (*Pub. L. O.* II)...Sp (III)...Lv<sup>1</sup>...]

**β 958.** Lalande 31344

R.A. 17<sup>h</sup> 9<sup>m</sup> 25<sup>s</sup> }  
Decl. — 19° 12' }

|         |       |      |            |            |     |
|---------|-------|------|------------|------------|-----|
| 1880.52 | 221.0 | 1.38 | 8.3... 8.8 | 2 <i>n</i> | β   |
| 1888.45 | 216.2 | 1.37 | 8.3... 9.2 | 1 <i>n</i> | Lv  |
| 1892.39 | 216.9 | 1.38 | 8.3... 8.7 | 3 <i>n</i> | β   |
| 1897.66 | 212.6 | 1.61 | 8.5... 9.1 | 1 <i>n</i> | See |
| 1898.44 | 213.6 | 1.66 | 8.7... 9.0 | 3 <i>n</i> | A   |

Discovered with the 18½-inch. Without sensible change.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O. II*)...Lv<sup>1</sup>...See (3496)...Aitken ( )...]

$\beta$  44. D.M. (28°) 2697

R.A. 17<sup>h</sup> 9<sup>m</sup> 12<sup>s</sup> }  
Decl. + 28° 57' }

|         |      |      |             |                |            |
|---------|------|------|-------------|----------------|------------|
| 1874.98 | 20.9 | 5.51 | 7.8... 9.5  | 2 <sup>n</sup> | O $\Sigma$ |
| 1875.01 | 18.6 | 5.33 | 9.2... 10.5 | 4 <sup>n</sup> | J          |
| 1892.48 | 19.2 | 5.54 | 8.4... 9.5  | 3 <sup>n</sup> | Lv         |

Discovered with the 6-inch. Unchanged.

[ $\beta$  (i)... $\beta$  (*Mon. Not. xxxiii, 351*)...O $\Sigma$  (*Poukova Obsns. x*)... $\Delta$  (i)...Lv (*A. J. 278*) (*Proc. Haverford Coll. Obsy. 1892*)...]

$\beta$  1119. B.A.C. 5820

R.A. 17<sup>h</sup> 9<sup>m</sup> 40<sup>s</sup> }  
Decl. - 30° 2' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1889.40 | 355.8 | 0.75 | 7.0... 7.6 | 3 <sup>n</sup> | $\beta$ |
| 1897.60 | 357.5 | 0.54 | ...        | 3 <sup>n</sup> | A       |
| 1897.66 | 353.7 | 0.56 | 7.5... 8.2 | 1 <sup>n</sup> | See     |

Discovered with the 12-inch.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Aitken (3465)... See (3496)...]

$\beta$  416. *Scorpii* 185

R.A. 17<sup>h</sup> 10<sup>m</sup> 47<sup>s</sup> }  
Decl. - 34° 51' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1876.52 | 240±  | 1.8± | 6.0... 8.0 | 1 <sup>n</sup> | $\beta$ |
| 1877.53 | 222.6 | 1.80 | 7.0... 8.0 | 1 <sup>n</sup> | Cin     |
| 1877.64 | 224.4 | 1.97 | 7... 9     | 1 <sup>n</sup> | Rus     |
| 1888.72 | 147.5 | 1.89 | 6.0... 7.5 | 1 <sup>n</sup> | $\beta$ |
| 1889.43 | 134.1 | 1.35 | 6.4... 7.5 | 3 <sup>n</sup> | $\beta$ |
| 1889.63 | 131.9 | 0.97 | 6... 8.5   | 1 <sup>n</sup> | Pol     |
| 1890.60 | 122.0 | 0.82 | ...        | 2 <sup>n</sup> | Sel     |
| 1891.53 | 82.3  | 0.51 | 6.9... 7.6 | 3 <sup>n</sup> | $\beta$ |
| 1892.38 | 24.4  | 0.58 | 6.0... 8.3 | 4 <sup>n</sup> | $\beta$ |
| 1893.55 | 348.3 | 0.71 | ...        | 5 <sup>n</sup> | Sel     |
| 1894.56 | 334.5 | 1.30 | ...        | 5 <sup>n</sup> | Bar     |
| 1894.57 | 331.8 | 0.88 | ...        | 7 <sup>n</sup> | Sel     |
| 1895.60 | 321.7 | 0.91 | ...        | 2 <sup>n</sup> | Com     |

|         |       |      |            |                |        |
|---------|-------|------|------------|----------------|--------|
| 1895.62 | 322.2 | 1.43 | 6.0... 7.6 | 3 <sup>n</sup> | Sel    |
| 1895.74 | 321.4 | 0.99 | ...        | 1 <sup>n</sup> | See    |
| 1896.44 | 314.8 | 1.45 | ...        | 3 <sup>n</sup> | A      |
| 1896.46 | 315.4 | 1.61 | ...        | 3 <sup>n</sup> | Scott  |
| 1896.59 | 315.8 | 1.87 | 6.0... 7.2 | 4 <sup>n</sup> | Sel    |
| 1896.60 | 314.9 | 1.26 | ...        | 1 <sup>n</sup> | Com    |
| 1897.38 | 307.0 | 1.69 | 7.1... 8.2 | 1 <sup>n</sup> | See    |
| 1897.46 | 309.1 | 2.00 | ...        | 3 <sup>n</sup> | A      |
| 1897.47 | 308.8 | 1.80 | ...        | 5 <sup>n</sup> | Sc     |
| 1897.47 | 310.2 | 1.86 | ...        | 4 <sup>n</sup> | Lehman |
| 1898.35 | 303.8 | 1.99 | 6.5... 7.3 | 4 <sup>n</sup> | A      |
| 1899.38 | 300.2 | 1.83 | 6.4... 7.1 | 4 <sup>n</sup> | A      |

A and C (= H 4935)

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1837    | 130±  | ...   | ...      | 1 <sup>n</sup> | H       |
| 1876    | 130±  | ...   | ... 10   | 1 <sup>n</sup> | $\beta$ |
| 1877.64 | 132.4 | ...   | ...      | 1 <sup>n</sup> | Ru      |
| 1889.43 | 128.6 | 31.03 | ... 10.5 | 3 <sup>n</sup> | $\beta$ |
| 1891.53 | 128.8 | 30.52 | ... 12   | 3 <sup>n</sup> | $\beta$ |
| 1892.36 | 129.4 | 30.55 | ... 12   | 2 <sup>n</sup> | $\beta$ |
| 1894.61 | 129.4 | 30.01 | ...      | 1 <sup>n</sup> | Bar     |
| 1895.58 | 130.1 | 30.50 | ...      | 1 <sup>n</sup> | Com     |
| 1897.38 | 129.3 | 29.98 | ... 12.8 | 1 <sup>n</sup> | See     |
| 1898.41 | 130.4 | 30.22 | ... 11.2 | 2 <sup>n</sup> | A       |

The duplicity of the principal star of the wide pair, H<sub>4935</sub>, was discovered with the 6-inch. This is now known to be one of the most interesting and remarkable systems in the heavens. In the twenty-two years following the discovery of the close pair the companion has passed over an arc of about 300°, and a whole revolution will soon be completed. Several orbits have been computed. The dates in the first column give the last measures used.

|      |           |             |   |
|------|-----------|-------------|---|
| 1892 | Gore      | 34.48 years | <i>Mon. Not.</i> LIII, 335                  |
| 1892 | Glazenapp | 34.85 "     | <i>Ast. &amp; A.-P.</i> XII, 402            |
| 1892 | Burnham   | 24.7 "      | <i>Pub. L. O. II</i> , 247                  |
| 1893 | Glazenapp | 32.23 "     | <i>Proc. Soc. N. S. Wales</i> , June, 1894  |
| 1895 | See       | 33.0 "      | <i>Evolution of the Stellar Systems</i> , I |

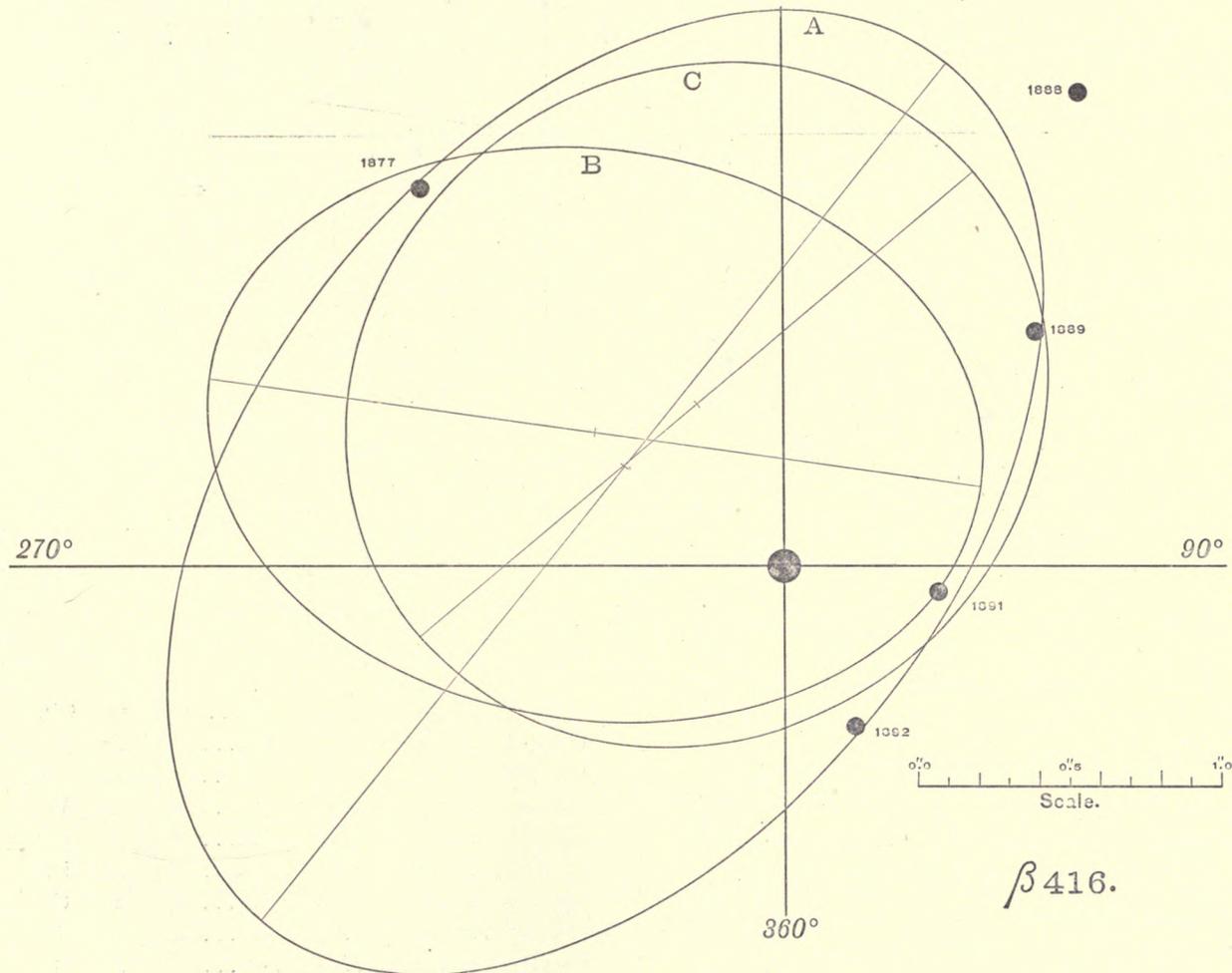
The first three orbits, which are based upon the same measures, are shown on the accompanying diagram (marked respectively A, B, and C repro-

duced from *Pub. L. O.* II, pp. 245, 247). It will be seen that the first ellipse best represents the later measures.

This system is of additional interest by reason of its large proper motion of  $1''.15$  in the direction of  $98^\circ.1$  (PORTER). This movement and the rapid angular motion in connection with the comparatively large apparent distance between the components, suggests the possibility of this system having

a considerable parallax. This should be investigated by observers in the southern hemisphere.

In Fig. 2 I have given the principal measured positions down to 1899. While the general form of the apparent orbit is fairly well indicated, an investigation of this time could give only a provisional value. A revolution will soon be completed, and then a reliable determination of the elements can be made.



The distant star, noted by HERSCHEL at the Cape of Good Hope, was not measured by him, and the angle only estimated from a diagram. The foregoing are all the measures I have found of this star. The measures since 1889 show beyond question that this star is moving in space with the close pair, and that the three form a triple system. SEE measures a 13.2 m star  $86^\circ.1 : 55''.42$  (1897.38) *IN*.

The principal star is B.A.C. 5825 (= LACAILLE 7215). The different estimates of magnitudes are

not very accordant; in B.A.C. 6; GOULD 6.1; YARNALL 7.0; Cape 7.6.

[ $\beta$  (VII)... $\beta$  (2103,2957,3114,3142)... $\beta$  (*Pub. L. O.* II)... $\beta$  (*Sid. Mess.* X, 489) (*Ast. & A.-P.* XII, 792)...Russell (*Pub. Sydney Obsy.* 1871-81)...Cin<sup>4</sup>...Pollock (*Pub. Sydney Obsy.* 1891) (*Mem. R. A. S. L.*)...Sellors (3154,3240,3274,3303,3369)...Barnard (*A. J.* 447)...Comstock (*Pub. Washburn Obsy.* X)...See (*A. J.* 359,372,378)...See (3496)...Lehman (*Ast. Soc. Pac.* IX, 141)...Everett (*Mon. Not.* LVI, 464)...Scott (*Brit. Ast. Asso.* VIII, 66) (*Mon. Not.* LIX, 427)...Innes (*A. J.* 385) (*Mon. Not.* LVIII, 90)...Aitken (3396,3465,3585)...Aitken ( )...]



β 416. Fig.2.

β 1200. Lalande 31421

R.A. 17<sup>h</sup> 11<sup>m</sup> 5<sup>s</sup> }  
Decl. + 14° 49' }

|         |      |      |            |    |     |
|---------|------|------|------------|----|-----|
| 1890.44 | 12.6 | 1.42 | 7.8...12.2 | 3n | β   |
| 1896.46 | 14.1 | 1.21 | ...        | 2n | Lew |

Discovered with the 36-inch. The *p* of two 8 m stars, same declination, and 33<sup>s</sup> apart; near *α Herculis*.

[β (xvii)...β (3047)...β (*Pub. L. O.* II)...Lewis (*Mon. Not.* LIX, 400)...]

β 126. Piazzì XVII. 43

R.A. 17<sup>h</sup> 12<sup>m</sup> 54<sup>s</sup> }  
Decl. - 17° 38' }

A and B

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1875.11 | 261.3 | 1.74 | 6.4... 7.5 | 5n | Δ   |
| 1877.41 | 260.6 | 1.58 | 6.7... 8.0 | 2n | Cin |

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1879.27 | 260.8 | 1.77 | 6.0... 7.0 | 1n | Cin |
| 1879.54 | 261.3 | 1.24 | 6.5... 8.5 | 2n | β   |
| 1879.58 | 261.9 | 1.81 | 6.2... 7.5 | 4n | Sp  |
| 1884.41 | 261.5 | 1.94 | 7.0... 8.2 | 2n | W   |
| 1887.69 | 261.5 | 1.59 | 6.5... 8.0 | 1n | Ho  |
| 1888.54 | 263.4 | 1.89 | 6.2... 8.3 | 2n | Lv  |
| 1890.50 | 262.8 | 2.20 | 6.1... 7.4 | 2n | Gl  |
| 1892.37 | 262.0 | 1.67 | 6.2... 8.5 | 3n | β   |
| 1897.29 | 261.0 | 2.20 | ...        | 2n | D   |
| 1897.45 | 262.4 | 1.66 | ...        | 2n | Sc  |

A and C

|                      |       |       |         |    |     |
|----------------------|-------|-------|---------|----|-----|
| 1879.27 <sup>†</sup> | 140.4 | 11.59 | ...10.0 | 1n | Cin |
| 1879.54              | 139.7 | 11.49 | ...11.7 | 2n | β   |
| 1887.69              | 138.2 | 11.12 | ...12   | 1n | Ho  |
| 1892.37              | 138.9 | 11.59 | ...12.0 | 3n | β   |

The close pair was discovered with the 6-inch, and the third star subsequently added with the 18½-inch. The measures show no change in

either companion. This is a naked-eye star in *Ophiucus*; GOULD 6.1 m. B.A.C. 5839.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)... $\Delta$  (2086)...Cin<sup>4</sup>...Cin<sup>5</sup>...Lv<sup>1</sup>... Wilson (Cin<sup>6</sup>)...Sp (II)...Hough (2978)...Glaserapp (I)...Scott (*Brit. Ast. Asso.* VIII, 66)...Doolittle (*Pub. Flower Obsy.* I)...]

$\beta$  629. D.M. (32°) 2883

|         |       |   |            |                |         |
|---------|-------|---|------------|----------------|---------|
|         |       | R.A. 17 <sup>h</sup> 13 <sup>m</sup> 0 <sup>s</sup> } |            |                |         |
|         |       | Decl. + 32° 13' }                                     |            |                |         |
| 1878.40 | 345.8 | 0.99  | 8.3... 9.0 | 2 <sup>n</sup> | $\beta$ |
| 1890.62 | 340.9 | 1.05  | ...        | 1 <sup>n</sup> | Sp      |
| 1891.31 | 343.8 | 1.01  | 8.5... 8.8 | 3 <sup>n</sup> | $\beta$ |
| 1892.39 | 343.9 | 1.02  | 8.4... 8.7 | 3 <sup>n</sup> | $\beta$ |
| 1895.56 | 343.8 | 0.95  | ...        | 1 <sup>n</sup> | Sp      |
| 1898.65 | 344.1 | 0.97  | ...        | 2 <sup>n</sup> | Bow     |
| 1898.70 | 341.1 | 1.20  | ...        | 2 <sup>n</sup> | Bry     |

Discovered with the 18½-inch. No sensible motion.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114,3142) (*Pub. L. O.* II)...Sp (III)...Bowyer and Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  127. Lalande 31454

|         |      |  |            |                |     |
|---------|------|--|------------|----------------|-----|
|         |      | R.A. 17 <sup>h</sup> 13 <sup>m</sup> 25 <sup>s</sup> } |            |                |     |
|         |      | Decl. - 27° 13' }                                      |            |                |     |
| 1876.51 | 95.3 | 5.26   | 8.2... 9.0 | 2 <sup>n</sup> | Cin |
| 1877.53 | 93.8 | 5.16   | 8.5... 9.5 | 1 <sup>n</sup> | Cin |
| 1879.47 | 93.7 | 4.85   | 8.0... 8.5 | 1 <sup>n</sup> | Cin |
| 1890.42 | 97.1 | 4.91   | 8.8... 9.6 | 2 <sup>n</sup> | Gl  |
| 1896.52 | 86.4 | 5.27   | ...        | 2 <sup>n</sup> | Sc  |
| 1897.49 | 93.2 | 4.92   | 7.8... 8.7 | 1 <sup>n</sup> | See |
| 1898.47 | 93.0 | 5.04   | 8.2... 9.5 | 3 <sup>n</sup> | A   |

Discovered with the 6-inch. Apparently unchanged.

$\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>... Glaserapp (I)...Scott (*Brit. Ast. Asso.* VIII, 66)...See (3496)...Aitken (3585)...]

$\beta$  45. W<sup>2</sup> XVII. 345

|         |       |  |             |                |            |
|---------|-------|--|-------------|----------------|------------|
|         |       | R.A. 17 <sup>h</sup> 13 <sup>m</sup> 29 <sup>s</sup> } |             |                |            |
|         |       | Decl. + 32° 37' }                                      |             |                |            |
| 1873.47 | 289.3 | 5.04   | 8.0... 8.5  | 1 <sup>n</sup> | O $\Sigma$ |
| 1874.43 | 287.0 | 4.84   | 9.0... 9.5  | 1 <sup>n</sup> | WS         |
| 1875.05 | 289.9 | 4.83   | 9.7... 10.3 | 4 <sup>n</sup> | $\Delta$   |
| 1892.40 | 289.8 | 4.98   | 8.6... 8.8  | 2 <sup>n</sup> | $\beta$    |

Discovered with the 6-inch. No relative motion.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Wilson and Seabroke (*Mem. R. A. S.* XLIII)...O $\Sigma$  (*Poulkowa Obsns.* X)...]

$\beta$  628. W<sup>2</sup> XVII. 359

|         |       |  |            |                |         |
|---------|-------|--|------------|----------------|---------|
|         |       | R.A. 17 <sup>h</sup> 13 <sup>m</sup> 55 <sup>s</sup> } |            |                |         |
|         |       | Decl. + 32° 47' }                                      |            |                |         |
| 1878.41 | 365.6 | 0.54   | 9.0... 9.5 | 1 <sup>n</sup> | $\beta$ |
| 1889.69 | 358.9 | 0.4±   | ...        | 1 <sup>n</sup> | Sp      |
| 1892.30 | 358.6 | 0.52   | 8.7... 9.3 | 3 <sup>n</sup> | $\beta$ |
| 1892.64 | 362.9 | 0.5±   | ...        | 1 <sup>n</sup> | Sp      |
| 1895.51 | 361.5 | 0.35±  | ...        | 1 <sup>n</sup> | Sp      |
| 1898.71 | 354.2 | 0.46   | ...        | 1 <sup>n</sup> | Br      |

Discovered with the 18½-inch. This pair,  $\beta$  45,  $\beta$  629, and  $\beta$  630 are all in the same vicinity, and near 68 *Herculis* (O $\Sigma$  328).

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Brown ( )...]

$\beta$  630. D.M. (32°) 2891

|         |       |  |             |                |         |
|---------|-------|--|-------------|----------------|---------|
|         |       | R.A. 17 <sup>h</sup> 14 <sup>m</sup> 46 <sup>s</sup> } |             |                |         |
|         |       | Decl. + 32° 28' }                                      |             |                |         |
| 1878.40 | 225.4 | 1.66   | 8.7... 10.7 | 2 <sup>n</sup> | $\beta$ |
| 1892.33 | 224.8 | 1.45   | 8.5... 9.6  | 3 <sup>n</sup> | $\beta$ |
| 1898.65 | 225.1 | 1.42   | ...         | 2 <sup>n</sup> | Bow     |
| 1898.71 | 221.9 | 1.55   | ...         | 2 <sup>n</sup> | Bry     |

Discovered with the 18½-inch. Apparently no change.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Bowyer and Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  959. *Ophiuchi* 185

|         |       |   |             |                |         |
|---------|-------|---|-------------|----------------|---------|
|         |       | R.A. 17 <sup>h</sup> 16 <sup>m</sup> 9 <sup>s</sup> } |             |                |         |
|         |       | Decl. + 5° 7' }                                       |             |                |         |
| 1879.54 | 254.7 | 3.87  | 7.0... 10.0 | 1 <sup>n</sup> | Cin     |
| 1879.88 | 258.7 | 3.26  | 7.1... 12.0 | 5 <sup>n</sup> | $\beta$ |
| 1891.48 | 257.3 | 3.15  | 7.2... 11.7 | 5 <sup>n</sup> | $\beta$ |
| 1898.67 | 256.0 | 3.53  | ...         | 2 <sup>n</sup> | Br      |

Discovered with the 18½-inch. There is no relative motion. LALANDE 31588.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>...Brown ( )...]

**$\beta$  1248.** D.M. (4°) 3406

R.A. 17<sup>h</sup> 16<sup>m</sup> 31<sup>s</sup> }  
Decl. + 4° 29' }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1891.46 | 165.4 | 8.49 | 8.0... 9.3 | 3 $n$ | $\beta$ |
| 1897.57 | 164.4 | 8.08 | 8 ... 10   | 2 $n$ | A       |

Discovered with the 36-inch.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11)...Aitken (3465)...]

 **$\beta$  242.** Lalande 31610

R.A. 17<sup>h</sup> 17<sup>m</sup> 21<sup>s</sup> }  
Decl. - 11° 35' }

A and B

|         |      |      |            |       |          |
|---------|------|------|------------|-------|----------|
| 1875.92 | 68.9 | 0.96 | 8.2... 9.0 | 5 $n$ | $\Delta$ |
| 1879.60 | 73.6 | 0.92 | 8.0... 9.0 | 3 $n$ | Sp       |
| 1888.50 | 74.0 | 0.99 | 8.0... 9.3 | 1 $n$ | Lv       |
| 1892.48 | 70.9 | 0.99 | 8.2... 8.7 | 3 $n$ | Lv       |
| 1898.63 | 73.4 | 0.83 | ...        | 1 $n$ | Br       |

AB and C

|         |      |      |          |       |          |
|---------|------|------|----------|-------|----------|
| 1876.01 | 63.4 | 8.90 | ... 11.0 | 4 $n$ | $\Delta$ |
| 1888.50 | 64.6 | 9.66 | ... 11.2 | 1 $n$ | Lv       |
| 1892.48 | 62.0 | 9.04 | ... 11.0 | 1 $n$ | Lv       |
| 1898.63 | 62.5 | 9.62 | ...      | 1 $n$ | Br       |

AB and D

|         |      |       |          |       |          |
|---------|------|-------|----------|-------|----------|
| 1876.01 | 63.8 | 47.46 | ... 10.4 | 4 $n$ | $\Delta$ |
| 1892.48 | 64.8 | 47.83 | ... 10.0 | 1 $n$ | Lv       |
| 1898.63 | 63.6 | 47.92 | ...      | 1 $n$ | Br       |

Discovered with the 6-inch. The measures show no change in any of the companions.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\Delta$  (i)...Sp (ii)...Lv<sup>1</sup>...Lv (*A. J.* 278) (*Proc. Haverford Col. Obsy.* 1892)...Brown ( )...]

 **$\beta$  1284.** D.M. (15°) 3173

R.A. 17<sup>h</sup> 17<sup>m</sup> 38<sup>s</sup> }  
Decl. + 15° 1' }

|         |        |      |             |       |         |
|---------|--------|------|-------------|-------|---------|
| 1884.61 | 180.0± | 1.5± | 8 ... 11    |       | $\beta$ |
| 1896.53 | 182.2  | 1.20 | 8.0... 14   | 1 $n$ | Lew     |
| 1899.42 | 180.1  | 1.23 | 8.3... 11.3 | 3 $n$ | $\beta$ |

This pair was discovered with the 18½-inch August 11, 1884, but not included in my catalogues of that time. It was looked for with the

36-inch in 1891 and not found, but it now appears that the declination used was 10° too small. In the measures by LEWIS (*Mon. Not.* LIX, 400) this is called  $\beta$  46. There is no indication of change.

 **$\beta$  46.** W<sup>2</sup> XVII. 296

R.A. 17<sup>h</sup> 18<sup>m</sup> 7<sup>s</sup> }  
Decl. + 13° 31' }

|         |        |      |             |       |          |
|---------|--------|------|-------------|-------|----------|
| 1874.43 | 192.0± | 2.7± | 8 ... 12    | 1 $n$ | WS       |
| 1875.01 | 203.0  | 2.15 | 7.7... 10.9 | 4 $n$ | $\Delta$ |
| 1883.68 | 201.1  | 2.00 | 7.5... 11.0 | 2 $n$ | Ho       |
| 1892.49 | 202.6  | 1.91 | 7.9... 11.2 | 4 $n$ | Lv       |
| 1894.53 | 203.2  | 2.15 | ...         | 1 $n$ | Lew      |
| 1898.64 | 205.4  | 1.98 | ...         | 2 $n$ | Br       |

Discovered with the 6-inch. Relatively fixed. It is the  $p$  star of a small equilateral triangle; the  $f$  star is  $\Sigma$  2159.

[ $\beta$  (i)... $\beta$  (*Mon. Not.* xxxiii, 351)...Wilson and Seabroke (*Mem. R. A. S.* xliii)... $\Delta$  (i)...Hough (2978)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Lewis (*Gr. Obsns.* 1894)...Brown ( )...]

 **$\beta$  128.** B.A.C 5879

R.A. 17<sup>h</sup> 19<sup>m</sup> 24<sup>s</sup> }  
Decl. - 26° 14' }

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1876.56 | 327.3 | 3.66 | 8.0... 10.0 | 1 $n$ | Cin     |
| 1877.50 | 324.5 | 4.10 | 7.5... 9.7  | 2 $n$ | Cin     |
| 1891.56 | 328.0 | 4.04 | 7.7... 10.3 | 3 $n$ | $\beta$ |
| 1897.68 | 322.8 | 3.97 | 7.2... 10.2 | 2 $n$ | See     |

Discovered with the 6-inch. Probably fixed. It had been previously seen by the Harvard observers, but published long after  $\beta$  (111).

[ $\beta$  (111)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>3</sup>...Cin<sup>4</sup>...*Annals Harvard Obsy.* xiii...See (3496)...]

 **$\beta$  1249.** Rumker 5837

R.A. 17<sup>h</sup> 19<sup>m</sup> 30<sup>s</sup> }  
Decl. + 53° 58' }

A and B

|         |      |      |            |       |         |
|---------|------|------|------------|-------|---------|
| 1891.43 | 80.1 | 0.44 | 8.8... 9.0 | 3 $n$ | $\beta$ |
| 1897.71 | 82.3 | 0.46 | ...        | 1 $n$ | A       |
| 1898.71 | 82.2 | 0.49 | ...        | 1 $n$ | Br      |

AB and C

|         |      |       |            |       |         |
|---------|------|-------|------------|-------|---------|
| 1891.41 | 74.3 | 62.46 | 8.7... 8.9 | 3 $n$ | $\beta$ |
| 1898.71 | 74.6 | 63.66 | ...        | 1 $n$ | Br      |

Discovered with the 12 inch. A and C are respectively D.M. (53°) 1938 and D.M. (54°) 1875.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Aitken (*A. J.* 429)...Brown (...)]

$\beta$  1250. W<sup>2</sup> XVII. 559

R.A. 17<sup>h</sup> 20<sup>m</sup> 19<sup>s</sup> }  
Decl. + 30° 52' }

|         |      |      |             |                |          |
|---------|------|------|-------------|----------------|----------|
| 1877.26 | 57.6 | 1.93 | 10.3...10.8 | 3 <sup>n</sup> | $\Delta$ |
| 1884.65 | 60.2 | 1.41 | 8.7... 8.7  | 2 <sup>n</sup> | Ho       |
| 1891.72 | 63.7 | 2.02 | 9.4... 9.5  | 2 <sup>n</sup> | $\beta$  |
| 1896.99 | 68.9 | 2.23 | ...         | 2 <sup>n</sup> | Lew      |
| 1897.58 | 67.5 | 1.84 | ...         | 2 <sup>n</sup> | Bow      |
| 1897.71 | 64.8 | 1.99 | ...         | 3 <sup>n</sup> | A        |
| 1898.70 | 64.2 | 2.26 | ...         | 2 <sup>n</sup> | Bry      |
| 1898.70 | 65.7 | 2.18 | ...         | 1 <sup>n</sup> | Lew      |

Discovered with the 6-inch May 31, 1876, but not included in my catalogues of new pairs published at that time. It is the *s* star of a small equilateral triangle, all in the field. The magnitude in D.M. is 8.5.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1, p. 347)...Ho (2978)...Aitken (*A. J.* 429)...Lewis, Bryant and Bowyer (*Mon. Not.* LIX, 400)...]

$\beta$  129 =  $\beta$  1120. Piazzii XVII. 100

R.A. 17<sup>h</sup> 21<sup>m</sup> 14<sup>s</sup> }  
Decl. — 25° 24' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.41 | 100.2 | 0.96 | 7.5... 8.0 | 1 <sup>n</sup> | Cin     |
| 1879.34 | 98.8  | 1.09 | 8.0... 8.0 | 1 <sup>n</sup> | Cin     |
| 1880.59 | 279.4 | 1.10 | 7.5... 8.0 | 3 <sup>n</sup> | Sp      |
| 1889.14 | 100.0 | 0.93 | 7.0... 7.0 | 3 <sup>n</sup> | $\beta$ |
| 1890.50 | 103.3 | ...  | 7.2... 8.0 | 2 <sup>n</sup> | Gl      |
| 1893.65 | 100.2 | 0.86 | 7½... 7½   | 2 <sup>n</sup> | Sel     |
| 1897.57 | 99.0  | 0.93 | 7 ... 7+   | 3 <sup>n</sup> | A       |
| 1897.65 | 106.4 | 1.02 | 8 ... 8.4  | 1 <sup>n</sup> | See     |

Discovered with the 6-inch, and inadvertently put as new in  $\beta$  (xvi). Apparently without change. This is B.A.C. 5896.

[ $\beta$  (III, xvi)... $\beta$  (*Mon. Not.* xxxiii, 437)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Cin<sup>4</sup>...Cin<sup>5</sup>...Sp (II)...Glasenapp (1)...Sellors (3240)...Aitken (3465)...See (3496)...]

$\beta$  1089. W<sup>1</sup> XVII. 387

R.A. 17<sup>h</sup> 23<sup>m</sup> 22<sup>s</sup> }  
Decl. — 5° 48' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1888.64 | 365.2 | 0.95 | 6.8...11.0 | 3 <sup>n</sup> | $\beta$ |
| 1897.52 | 354.6 | 0.92 | 7.0...11.0 | 3 <sup>n</sup> | A       |

Discovered with the 12-inch. There may be a change in the angle. Lalande 31816.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O. II*)...Aitken (3465)...]

$\beta$  1201. O. Arg. N. 17215

R.A. 17<sup>h</sup> 26<sup>m</sup> 37<sup>s</sup> }  
Decl. + 67° 52' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.49 | 338.2 | 0.43 | 7.8... 7.8 | 3 <sup>n</sup> | $\beta$ |
| 1898.62 | 340.4 | 0.43 | 7.9... 8.0 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...Aitken (3585)...]

$\beta$  1090.  $\beta$  *Draconis*

R.A. 17<sup>h</sup> 27<sup>m</sup> 43<sup>s</sup> }  
Decl. + 52° 23' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1889.26 | 13.4 | 3.97 | 3 ... 14.0 | 4 <sup>n</sup> | $\beta$ |
| 1890.34 | 12.8 | 4.18 | ... 13.8   | 3 <sup>n</sup> | $\beta$ |
| 1891.31 | 12.3 | 4.06 | ... 14.5   | 3 <sup>n</sup> | $\beta$ |
| 1892.32 | 13.7 | 4.04 | ... 13.7   | 3 <sup>n</sup> | $\beta$ |
| 1898.31 | 12.2 | 4.27 | ... 14.0   | 4 <sup>n</sup> | $\beta$ |

The minute attendant to  $\beta$  *Draconis* was discovered with the 36-inch. It is beyond the reach of all but the largest refractors. AUWER's latest value of the proper motion of the bright star is 0.01096 in the direction of 290°.9. This movement is small, but if the small star was fixed in space, it would increase the position-angle 2°.5 in the interval between 1889 and 1898. The measures do not seem to indicate any such change in the direction of the companion, and the probabilities are that it is moving with the primary.

[ $\beta$  (xv)... $\beta$  (2929,3048,3114,3142)... $\beta$  (*Pub. L. O. II*)...]

$\beta$  1121. D.M. (12°) 3264

R.A. 17<sup>h</sup> 31<sup>m</sup> 52<sup>s</sup> }  
Decl. + 12° 36' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1889.14 | 240.1 | 0.71 | 8.5... 9.0 | 3 <sup>n</sup> | $\beta$ |
| 1892.64 | 242.4 | 0.69 | ...        | 6 <sup>n</sup> | Sp      |
| 1895.67 | 236.0 | 0.61 | 8.4... 9.5 | 3 <sup>n</sup> | A       |
| 1897.00 | 248.0 | 0.66 | ...        | 2 <sup>n</sup> | Lew     |
| 1897.56 | 244.2 | 0.73 | ...        | 2 <sup>n</sup> | Bow     |
| 1897.71 | 240.8 | 0.64 | ...        | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. Change uncertain. This is 2<sup>m</sup> 30<sup>s</sup> *f* and 2' 5 *s* of a *Ophiuchi*.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Sp (III)...Aitken (*Ast. Soc. Pac.* VII, 305) (*A. J.* 429)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

**β 960.** Lalande 32122

R.A. 17<sup>h</sup> 32<sup>m</sup> 3<sup>s</sup> }  
Decl. — 1° 5' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1880.53 | 294.9 | 3.18 | 8.4...11.1 | 4 <sup>n</sup> | β  |
| 1891.56 | 301.2 | 2.98 | 8.3...12.4 | 3 <sup>n</sup> | β  |
| 1898.52 | 297.7 | 3.44 | 8.0...11.8 | 3 <sup>n</sup> | A  |
| 1898.64 | 294.2 | 3.54 | ...        | 2 <sup>n</sup> | Br |

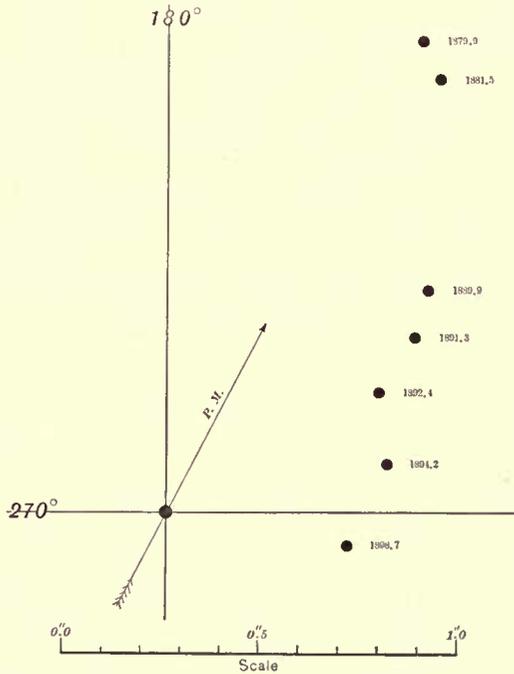
Discovered with the 18½-inch.

[β (xiii)...β³...β (3114)...β (*Pub. L. O. II*)...Aitken (3585)  
...Brown ( )...]

**β 962.** 26 Draconis

R.A. 17<sup>h</sup> 33<sup>m</sup> 45<sup>s</sup> }  
Decl. + 61° 58' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.39 | 148.9 | 1.31 | 5.5...11.0 | 1 <sup>n</sup> | Cin |
| 1879.97 | 151.8 | 1.37 | 5.5...10.1 | 4 <sup>n</sup> | β   |
| 1881.53 | 148.1 | 1.31 | 5.8...10.2 | 3 <sup>n</sup> | β   |
| 1889.42 | 130.1 | 0.95 | ...11.0    | 4 <sup>n</sup> | β   |
| 1890.37 | 131.5 | 0.81 | ...        | 3 <sup>n</sup> | β   |
| 1891.33 | 125.7 | 0.78 | ...11.6    | 3 <sup>n</sup> | β   |
| 1892.41 | 119.9 | 0.62 | ...        | 2 <sup>n</sup> | β   |
| 1894.19 | 102.7 | 0.58 | ...        | 1 <sup>n</sup> | Bar |
| 1898.70 | 79.7  | 0.47 | ...12.0    | 1 <sup>n</sup> | A   |



26 Draconis. β 962.

Discovered with the 18½-inch. The principal star has a proper motion of 0".583 in the direction of 152°.7 (*Bonn Observations*), and it was therefore certain at the time of my second set of measures in 1881, that this was a binary system from the common proper motion of the components. The distance has been steadily decreasing, and it is now (1898) an extremely difficult pair. This is principally due to the great difference in the magnitudes of the stars. It will probably be a very difficult pair to measure for some years. The several positions are shown on the accompanying diagram. Of course it is impossible at this time to say anything about the probable period.

[β (xiii)...β³...β⁴...β (2957, 3048, 3114, 3142)...β (*Pub. L. O. II*)...β (*Sid. Mess.* VIII, 356)...Cin⁵...Barnard (*A. J.* 447)...Aiken ( )...]

**β 631.** Ophiuchi 155

R.A. 17<sup>h</sup> 33<sup>m</sup> 47<sup>s</sup> }  
Decl. — 0° 35' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.55 | 73.0  | 0.40 | 7.0... 7.0 | 4 <sup>n</sup> | β   |
| 1883.34 | 81.2  | 0.42 | 7.0... 7.0 | 4 <sup>n</sup> | Sp  |
| 1884.63 | 60.0  | 0.40 | ...        | 3 <sup>n</sup> | Sp  |
| 1886.65 | 65.8  | 0.36 | ...        | 7 <sup>n</sup> | En  |
| 1887.88 | 65.3  | 0.37 | ... 8.2    | 2 <sup>n</sup> | Sp  |
| 1888.50 | 57.2  | 0.43 | 7.0... 7.0 | 2 <sup>n</sup> | Lv  |
| 1891.58 | 67.2  | 0.36 | 7.5... 7.6 | 3 <sup>n</sup> | β   |
| 1895.68 | 69.8  | 0.37 | ...        | 1 <sup>n</sup> | Lew |
| 1896.69 | 33.3  | 0.97 | ...        | 1 <sup>n</sup> | Dy  |
| 1898.47 | 244.3 | 0.57 | 7.2... 7.2 | 2 <sup>n</sup> | Doo |
| 1898.54 | 244.0 | 0.42 | 7.0... 7.3 | 2 <sup>n</sup> | β   |

Discovered with the 18½-inch. A binary in slow retrograde motion. In GOULD 6.4 m. Lalande 32200.

[β (x)...β¹...β³...β (3114)...β (*Pub. L. O. II*)...Sp (II app)...Sp (III)...Engelmann (2786)...Lv¹...Lv (*Sid. Mess.* VIII, 77)...Lewis and Dyson (*Mon. Not.* LVI, 359; LIX, 400 (*Greenwich Obsns.* 1895)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 961 = β 963.** Lalande 32206

R.A. 17<sup>h</sup> 33<sup>m</sup> 32<sup>s</sup> }  
Decl. + 3° 28' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.65 | 141.4 | 8.00 | 6.9...11.5 | 7 <sup>n</sup> | β |
| 1892.37 | 141.6 | 8.13 | 6.9...11.8 | 3 <sup>n</sup> | β |

Discovered with the 18½-inch. Two minute stars, more distant, in the same quadrant. In GOULD 7.1 in.

[β (XIII)...β³...β (3142)...β (Pub. L. O. II)...]

**β 1251.** B.A.C. 5991

R.A. 17<sup>h</sup> 36<sup>m</sup> 35<sup>s</sup> }  
Decl. + 16° 1' }

|         |        |       |             |                |     |
|---------|--------|-------|-------------|----------------|-----|
| 1884.61 | 90.0 ± | 1.2 ± | 6.0... 9.0  | 1 <sup>n</sup> | β   |
| 1891.56 | 79.0   | 1.37  | 6.0... 11.5 | 3 <sup>n</sup> | β   |
| 1896.51 | 84.9   | 1.25  | ...         | 1 <sup>n</sup> | Lew |
| 1897.58 | 65.2   | 1.23  | 6... 11+    | 3 <sup>n</sup> | A   |
| 1898.48 | 71.5   | 1.42  | 6.2... 10.0 | 3 <sup>n</sup> | D   |
| 1898.67 | 69.1   | 1.41  | ...         | 1 <sup>n</sup> | Br  |

This pair was discovered with the 18½-inch at Chicago, but not included in any of the catalogues of new pairs issued at that time. This is a naked-eye star in *Ophiucus*; in D.M. 5m; HEIS 6m; Harvard 5.7m. The *Berlin A. G. Catalogue* gives the principal star a proper motion of 0".121 in the direction of 350°.4 (PORTER 0".115 in 360°.0). The relative change appears to be small, but it is certain that the two stars have a common proper motion and form a physical system.

[β (XVIII)...β (3113)...β (Pub. L. O. II)...Aitken (3465)... Lewis (*Mon. Not.* LIX, 400)...Doolittle (*Pub. Flower Obsy.* I)...Brown ( )...]

**β 824.** D.M. (-1°) 3400

R.A. 17<sup>h</sup> 42<sup>m</sup> 41<sup>s</sup> }  
Decl. - 1° 50' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.40 | 350.9 | 0.67 | 8.5... 8.6 | 3 <sup>n</sup> | β   |
| 1888.54 | 349.4 | 0.69 | 8.8... 8.9 | 4 <sup>n</sup> | Com |
| 1898.67 | 351.3 | 0.63 | ...        | 1 <sup>n</sup> | Br  |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β⁴...Comstock (*Pub. Washburn Obsy.* VI)...Brown ( )...]

**β 358.** W<sup>2</sup> XVII. 1374

R.A. 17<sup>h</sup> 43<sup>m</sup> 10<sup>s</sup> }  
Decl. + 34° 32' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1879.37 | 202.8 | 4.29 | 8.2... 9.5  | 2 <sup>n</sup> | Cin |
| 1892.39 | 206.1 | 4.22 | 8.5... 10.5 | 1 <sup>n</sup> | β   |

Discovered with the 6-inch.

[β (VI)...β (2062, 3142)...β (Pub. L. O. II)...Cin⁵...]

**β 632.** Lalande 32600

R.A. 17<sup>h</sup> 43<sup>m</sup> 32<sup>s</sup> }  
Decl. + 34° 19' }

A and B

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1877.97 | 343.6 | 5.46 | 6.3... 12.5 | 1 <sup>n</sup> | β  |
| 1882.53 | 344.0 | 5.48 | 7.0... 12.0 | 1 <sup>n</sup> | Ho |
| 1892.52 | 344.5 | 5.25 | 7.0... 12.5 | 1 <sup>n</sup> | Ho |
| 1899.39 | 343.9 | 5.46 | ... 12.7    | 2 <sup>n</sup> | β  |

A and C (= OΣ 336 rej.)

|         |       |       |             |                |    |
|---------|-------|-------|-------------|----------------|----|
| 1843.31 | 164.0 | 44.66 | ...         | 1 <sup>n</sup> | Ma |
| 1866.86 | 164.9 | 43.16 | 6.3... 10.3 | 3 <sup>n</sup> | Δ  |
| 1877.97 | 164.9 | 42.80 | ...         | 1 <sup>n</sup> | β  |
| 1892.52 | 164.5 | ...   | ... 10      | 1 <sup>n</sup> | Ho |
| 1899.39 | 164.2 | 42.44 | ...         | 3 <sup>n</sup> | β  |

The faint companion to the principal star of this wide pair was detected with the 18½-inch. The three stars seem to be relatively fixed. The magnitude in D.M. is 6.5. All the measures of AC are given.

[β (X)...β<sup>2</sup>...Hough (2978, 3234)...Δ (i)...Madler (*Dorpat Obsns.* XI)...]

**β 1122.** Cord. G. C. 24248

R.A. 17<sup>h</sup> 44<sup>m</sup> 38<sup>s</sup> }  
Decl. - 28° 27' }

B and C

|         |       |      |              |                |   |
|---------|-------|------|--------------|----------------|---|
| 1889.39 | 175.2 | 1.31 | 10.4... 10.9 | 3 <sup>n</sup> | β |
| 1897.61 | 170.6 | 1.47 | ...          | 3 <sup>n</sup> | A |

A and BC (= Howe)

|         |      |      |             |                |     |
|---------|------|------|-------------|----------------|-----|
| 1877.57 | 10.3 | 6.39 | 8.0... 10.0 | 1 <sup>n</sup> | Cin |
| 1880.44 | 8.7  | 6.54 | 8.5... 9.8  | 2 <sup>n</sup> | Cin |
| 1889.39 | 9.6  | 6.46 | 8.7...      | 3 <sup>n</sup> | β   |
| 1897.60 | 10.4 | 6.41 | 8... 12+    | 2 <sup>n</sup> | A   |

A and D

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1897.61 | 357.0 | 12.30 | ... 12+ | 2 <sup>n</sup> | A |
|---------|-------|-------|---------|----------------|---|

The duplicity of HOWE's companion was discovered with the 12-inch. There seems to be no change in its position with reference to the principal star. The fourth star, D, was added by AITKEN with the 12-inch.

[β (XVI)...β (2956)...β (Pub. L. O. II)...Cin⁴...Cin⁶... Aitken (3466)...]

**β 1123.** Cord. G. C. 24262

R.A. 17<sup>h</sup> 45<sup>m</sup> 20<sup>s</sup> }  
Decl. — 34° 42' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1889.48 | 212.8 | 0.58 | 7.4... | 7.8 | 4 <sup>n</sup> | β   |
| 1897.64 | 220.4 | 0.27 | 6.9... | 7.2 | 2 <sup>n</sup> | See |
| 1898.49 | 207.6 | 0.45 | 7.2... | 7.2 | 2 <sup>n</sup> | A   |

Discovered with the 12-inch. In the large cluster, *Messier* 7.

[β (xvi)...β (2956)...β (*Pub. L. O.* 11)...See (3496)...Aitken (3585)...]

**β 964.** Radcliffe 3775

R.A. 17<sup>h</sup> 47<sup>m</sup> 39<sup>s</sup> }  
Decl. + 48° 26' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1879.27 | 329.2 | 0.97 | 7.5... | 12.5 | 1 <sup>n</sup> | β |
| 1893.67 | 328.9 | 1.02 | 7.5... | 11.8 | 2 <sup>n</sup> | W |

Discovered with the 18½-inch.

[β (xiii)...β<sup>3</sup>...Wilson ( )...]

**β 130.** 90 *Herculis*

R.A. 17<sup>h</sup> 49<sup>m</sup> 24<sup>s</sup> }  
Decl. + 40° 2' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1875.52 | 123.0 | 1.82 | 5.9... | 9.2  | 6 <sup>n</sup> | Δ   |
| 1879.47 | 118.6 | 1.76 | ...    |      | 1 <sup>n</sup> | β   |
| 1879.56 | 121.6 | 1.74 | 6.0... | 9.2  | 2 <sup>n</sup> | OΣ  |
| 1881.46 | 122.2 | 1.90 | 6.0... | 9.7  | 4 <sup>n</sup> | β   |
| 1886.08 | 130.0 | 1.78 | 6.0... | 10.3 | 6 <sup>n</sup> | En  |
| 1888.42 | 123.3 | 1.67 | 5.7... | 9.0  | 3 <sup>n</sup> | T   |
| 1889.67 | 121.5 | 1.63 | ...    |      | 4 <sup>n</sup> | Maw |
| 1898.47 | 121.8 | 1.70 | 5.5... | 7.7  | 2 <sup>n</sup> | D   |

Discovered with the 6-inch; a beautiful pair, even with a small aperture. The components have a striking difference in color—*golden* and *blue*. The bright star has a proper motion of 0".064 in the direction of 5°1 (AUWERS). If the small star was fixed in space, the movement of A during the interval covered by the measures would increase the position-angle of the companion 27°.4 and its distance 1". The measures show no sensible change, and there is little doubt of its being a physical system.

[β (11)...β (*Mon. Not.* xxxiii, 437)...β<sup>3</sup>...β<sup>4</sup>...OΣ (*Poulkova Obsns.* x)...Δ (1)...Δ (2086)...Engelmann (2786)...Tarrant (2991)...Maw (*Mem. R. A. S. L.*, 75)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 417.** Lalande 32939

R.A. 17<sup>h</sup> 52<sup>m</sup> 13<sup>s</sup> }  
Decl. + 39° 27' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1877.37 | 270.2 | 1.58 | 8.1... | 10.0 | 4 <sup>n</sup> | Δ   |
| 1889.66 | 270.9 | 1.43 | ...    |      | 3 <sup>n</sup> | Maw |
| 1898.65 | 273.1 | 1.54 | ...    |      | 2 <sup>n</sup> | Br  |

Discovered with the 6-inch. In the field with Σ 2246.

[β (vii)...β (2103)...Maw (*Mem. R. A. S. L.*, 75)...Brown ( )...]

**β 633.** γ *Draconis*

R.A. 17<sup>h</sup> 53<sup>m</sup> 49<sup>s</sup> }  
Decl. + 51° 30' }

A and B

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1878.38 | 152.1 | 20.88 | 2.4... | 13.0 | 2 <sup>n</sup> | β |
| 1879.80 | 151.6 | 20.94 | ...    | 13.2 | 2 <sup>n</sup> | β |
| 1889.25 | 151.3 | 21.10 | ...    | 12.5 | 3 <sup>n</sup> | β |
| 1898.30 | 151.3 | 20.92 | ...    | 13.2 | 2 <sup>n</sup> | β |

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1878.38 | 227.1 | 47.89 | ... | 12.5 | 1 <sup>n</sup> | β |
| 1898.34 | 230.2 | 45.73 | ... | 13.5 | 1 <sup>n</sup> | β |

A and D

|         |      |       |     |      |                |   |
|---------|------|-------|-----|------|----------------|---|
| 1878.38 | 13.7 | 56.68 | ... | 12.5 | 1 <sup>n</sup> | β |
| 1898.34 | 10.4 | 57.33 | ... | 13.0 | 1 <sup>n</sup> | β |

A and E

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1898.30 | 234.8 | 97.54 | ... | 11.5 | 2 <sup>n</sup> | β |
|---------|-------|-------|-----|------|----------------|---|

A and F

|         |       |        |     |      |                |   |
|---------|-------|--------|-----|------|----------------|---|
| 1879.27 | 116.3 | 124.77 | ... | 10.8 | 1 <sup>n</sup> | β |
| 1898.27 | 116.5 | 125.52 | ... | 11.5 | 1 <sup>n</sup> | β |

A and G

|         |      |        |     |      |                |   |
|---------|------|--------|-----|------|----------------|---|
| 1898.27 | 28.0 | 139.24 | ... | 11.5 | 1 <sup>n</sup> | β |
|---------|------|--------|-----|------|----------------|---|

The minute companion to γ *Draconis* was discovered with the 18½-inch. This star has a proper motion of 0".028 in the direction of 214°.6 (AUWERS). This is very nearly in the direction of B, and, in the twenty years covered by the measures, should diminish the distance of that star 0".5 if it is not moving with the large star. The measures do

not show any change in the distance, and the two are probably moving together.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (*Ast. & A.-P.* XIII, 1)... $\beta$  (2930)... $\beta$  (*Pub. L. O.* II)...]

$\beta$  283. B.A.C. 6088

R.A. 17<sup>h</sup> 54<sup>m</sup> 38<sup>s</sup> }  
Decl. - 22° 47' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.86 | 239.3 | 8.05 | 6.0...12.5 | 3 <sup>n</sup> | $\beta$ |
| 1892.39 | 238.6 | 8.17 | 6.0...13.0 | 2 <sup>n</sup> | $\beta$ |
| 1895.54 | 237.7 | 8.45 | 6.1...13.0 | 3 <sup>n</sup> | A       |

A and C

|         |      |       |       |                |         |
|---------|------|-------|-------|----------------|---------|
| 1892.39 | 34.4 | 14.10 | ...14 | 1 <sup>n</sup> | $\beta$ |
|---------|------|-------|-------|----------------|---------|

The nearest companion was discovered with the 18½-inch, and the other added with the 36-inch. This is a naked-eye star in *Sagittarius*, about 15' *n* of the trifold nebula.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* XXXV, 31)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* II)...Aitken (*Ast. Soc. Pac.* VII, 305)...]

$\beta$  1124. 67 *Ophiuchi*

R.A. 17<sup>h</sup> 54<sup>m</sup> 38<sup>s</sup> }  
Decl. + 2° 56' }

A and B

|         |       |      |           |                |         |
|---------|-------|------|-----------|----------------|---------|
| 1889.39 | 195.6 | 6.79 | 5 ...14.8 | 3 <sup>n</sup> | $\beta$ |
| 1898.54 | 195.8 | 6.72 | ...       | 1 <sup>n</sup> | $\beta$ |

C and D (=  $\beta$  634)

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.57 | 129.2 | 8.46 | 9.0...13.0 | 1 <sup>n</sup> | $\beta$ |
| 1889.40 | 129.6 | 8.40 | 8.3...11.5 | 2 <sup>n</sup> | $\beta$ |
| 1898.54 | 128.7 | 8.16 | ...        | 1 <sup>n</sup> | $\beta$ |

A and C (= Sh 255)

|         |       |       |            |                |            |
|---------|-------|-------|------------|----------------|------------|
| 1823.41 | 143.1 | 55.23 | 5.6... 9   | 1 <sup>n</sup> | Sh         |
| 1849.94 | 142.7 | 54.47 | 4.2... 8.0 | 3 <sup>n</sup> | O $\Sigma$ |
| 1875.59 | 142.8 | 54.83 | 4.2... 7.6 | 4 <sup>n</sup> | $\Delta$   |
| 1878.57 | 143.0 | 54.70 | 5.6... 9.0 | 1 <sup>n</sup> | $\beta$    |
| 1886.34 | 142.9 | 54.29 | 4.4... 8.1 | 7 <sup>n</sup> | En         |
| 1889.40 | 143.6 | 54.54 | ...        | 2 <sup>n</sup> | $\beta$    |

A and E

|         |       |       |       |                |         |
|---------|-------|-------|-------|----------------|---------|
| 1878.57 | 179.8 | 45.94 | ...12 | 1 <sup>n</sup> | $\beta$ |
| 1898.54 | 178.0 | 45.66 | ...   | 1 <sup>n</sup> | $\beta$ |

The companion to A was discovered with the 36-inch, and the companion to C with the 18½-inch. The wide stars AC = H<sup>1</sup> VI. 2 = Sh 255 = O $\Sigma$  (app) 162. These stars appear to be relatively fixed. The principal star has a small proper motion, 0.027 in the direction of 257°5 (AUWERS). The measures of B hardly cover a sufficient time to show whether or not that star is moving with the primary.

[ $\beta$  (x, xvi)... $\beta^1$ ... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...]

The principal measures of AC are given. The following relate to the old components:

[ $\Delta$  (1)...Engelmann (2786)...*Annalen Königsberg Sternwarte* XVII...Powell (*Mem. R. A. S.* XXV)...*Radcliffe Obsns.* XXI, XXXVIII...O $\Sigma$  (*Poulkova Obsns.* X, p. 36)...]

$\beta$  47. Lalande 32978

R.A. 17<sup>h</sup> 54<sup>m</sup> 52<sup>s</sup> }  
Decl. - 10° 14' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.74 | 268.3 | 1.84 | 8.9...10.9 | 4 <sup>n</sup> | $\Delta$ |
| 1891.61 | 273.8 | 1.37 | 8.0...10.8 | 3 <sup>n</sup> | $\beta$  |
| 1893.82 | 273.0 | 1.46 | ...        | 5 <sup>n</sup> | Sp       |
| 1895.63 | 277.1 | 1.46 | 8.0...10.4 | 3 <sup>n</sup> | A        |
| 1896.55 | 273.2 | 1.64 | 8.1...10.8 | 3 <sup>n</sup> | Lv       |

Discovered with the 6-inch. It is a difficult pair with that aperture.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Sp (III)...Aitken (*Ast. Soc. Pac.* VII, 305)...Lv (*A. J.* 407)...]

$\beta$  1202. D.M. (3°) 3564

R.A. 17<sup>h</sup> 55<sup>m</sup> 33<sup>s</sup> }  
Decl. + 3° 32' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.48 | 353.1 | 0.74 | 8.2... 9.3 | 3 <sup>n</sup> | $\beta$ |
| 1892.65 | 356.8 | 0.65 | ...        | 2 <sup>n</sup> | Sp      |
| 1895.56 | 362.5 | 0.60 | ...        | 1 <sup>n</sup> | Sp      |
| 1897.73 | 346.3 | 0.82 | ...        | 3 <sup>n</sup> | A       |
| 1899.26 | 355.8 | 0.58 | 8.5... 9.0 | 1 <sup>n</sup> | $\beta$ |

C and D

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1890.48 | 93.2 | 3.91 | 9.4...11.3 | 3 <sup>n</sup> | $\beta$ |
| 1899.26 | 94.6 | 3.87 | 9.5...11.5 | 1 <sup>n</sup> | $\beta$ |

AB and C

|         |      |        |     |                |   |
|---------|------|--------|-----|----------------|---|
| 1890.47 | 28.2 | 103.87 | ... | 4 <sup>n</sup> | β |
| 1899.26 | 28.1 | 103.85 | ... | 1 <sup>n</sup> | β |

AB and E

|         |       |       |        |     |                |   |
|---------|-------|-------|--------|-----|----------------|---|
| 1890.47 | 138.5 | 90.32 | 8.7... | 8.5 | 4 <sup>n</sup> | β |
| 1899.26 | 138.2 | 90.14 | ...    | 8.5 | 1 <sup>n</sup> | β |

Discovered with the 36 inch. A and E are respectively Lamont 2849 and 2852, but the declination of the latter should be 1' more. There is a 13<sup>m</sup> star, from C, 145°0 : 15".8.

[β (xvii)...β (3048)...β (Pub. L. O. II)...Aitken (A. J. 429) ...Sp (III)...]

β 1125. 68 Ophiuchi

R.A. 17<sup>h</sup> 55<sup>m</sup> 40<sup>s</sup> }  
Decl. + 1° 19' }

|         |      |      |        |      |                |    |
|---------|------|------|--------|------|----------------|----|
| 1889.39 | 14.9 | 1.01 | 5.1... | 9.9  | 5 <sup>n</sup> | β  |
| 1890.47 | 19.7 | 0.91 | 5.0... | 8.7  | 3 <sup>n</sup> | β  |
| 1892.37 | 22.0 | 0.89 | 5.0... | 9.2  | 4 <sup>n</sup> | β  |
| 1894.13 | 14.9 | 0.78 | ...    |      | 4 <sup>n</sup> | Sp |
| 1897.51 | 10.5 | 0.99 | 5.0... | 10.0 | 3 <sup>n</sup> | A  |
| 1898.52 | 15.3 | 0.86 | ...    | 9.0  | 3 <sup>n</sup> | β  |
| 1898.53 | 16.6 | 1.02 | 5.2... | 10.0 | 3 <sup>n</sup> | A  |

Discovered with the 36-inch. The proper motion of the large star is very small, 0".012 in the direction of 256°.6 (AUWERS). The relative change is slow, but there is not much doubt of these stars forming a physical system.

SCHIAPARELLI finds the principal star a close pair, and from a single measure gives, 320°0 : 0".3± (1892.66). There are no other observations of this, and I have had no opportunity to examine it under sufficiently favorable conditions since receiving recently the measures of Sp. It would seem to be a triple of extraordinary interest.

[β (xvi)...β (2956,3048,3142)...β (Pub. L. O. II)...Aitken (3466,3585)...]

β 635. D.M. (1°) 3565

R.A. 17<sup>h</sup> 56<sup>m</sup> 41<sup>s</sup> }  
Decl. + 1° 37' }

A and B

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1878.07 | 114.5 | 1.58 | 9.0... | 10.0 | 2 <sup>n</sup> | β  |
| 1891.55 | 116.3 | 1.40 | 9.4... | 11.4 | 2 <sup>n</sup> | β  |
| 1898.50 | 117.7 | 1.56 | 9.2... | 10.5 | 3 <sup>n</sup> | A  |
| 1898.65 | 116.7 | 1.49 | ...    |      | 2 <sup>n</sup> | Br |

A and C

|         |       |       |     |     |                |    |
|---------|-------|-------|-----|-----|----------------|----|
| 1891.55 | 121.8 | 69.31 | ... | 8.1 | 2 <sup>n</sup> | β  |
| 1898.50 | 122.2 | 69.41 | ... | 9.5 | 3 <sup>n</sup> | A  |
| 1898.65 | 122.1 | 69.20 | ... |     | 2 <sup>n</sup> | Br |

Discovered with the 18½-inch. There may be some change in the angle of AB. C is D.M. (1°) 3566. The magnitudes of A and C in the D.M. are respectively 9.0 and 8.7.

[β (x)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...Aitken (3585)...Brown ( )...]

β 1126. Yarnall 7599

R.A. 17<sup>h</sup> 56<sup>m</sup> 53<sup>s</sup> }  
Decl. - 24° 15' }

A and B

|         |      |      |        |     |                |   |
|---------|------|------|--------|-----|----------------|---|
| 1889.40 | 55.6 | 0.63 | 8.7... | 9.5 | 4 <sup>n</sup> | β |
| 1899.51 | 58.3 | 0.67 | 8.1... | 9.5 | 2 <sup>n</sup> | A |

AB and C (= H 5009)

|         |      |      |        |     |                |                |   |
|---------|------|------|--------|-----|----------------|----------------|---|
| 1837.70 | 20.8 | 2±   | 10     | ... | 12             | 1 <sup>n</sup> | H |
| 1879.47 | 19.7 | 3.89 | 8.0... | 9.0 | 1 <sup>n</sup> | Cin            |   |
| 1880.58 | 19.9 | 3.86 | 9.0... | 9.5 | 1 <sup>n</sup> | Cin            |   |
| 1889.40 | 23.3 | 4.05 | ...    | 9.6 | 4 <sup>n</sup> | β              |   |
| 1899.51 | 21.2 | 3.87 | 8.2... | 9.5 | 4 <sup>n</sup> | A              |   |

The principal star of H 5009 was found to be a close pair with the 36-inch. This is in the cluster, *Messier* 8, and is described by HERSCHEL as "the star γ in the monograph of M 8" (*Cape Observations*). The above are all the measures of C.

[β (xvi)...β (2956)...β (Pub. L. O. II)...Cin<sup>5</sup>...Cin<sup>6</sup>...Aitken ( )...]

β 825. Lalande 33157

R.A. 17<sup>h</sup> 58<sup>m</sup> 20<sup>s</sup> }  
Decl. + 25° 22' }

A and B

|         |       |       |        |      |                |     |
|---------|-------|-------|--------|------|----------------|-----|
| 1881.37 | 197.7 | 11.41 | 8.4... | 13.0 | 3 <sup>n</sup> | β   |
| 1888.66 | 193.1 | 11.52 | 8.0... | 11.7 | 2 <sup>n</sup> | Com |
| 1889.47 | 194.6 | 11.20 | ...    | 11.5 | 3 <sup>n</sup> | β   |
| 1891.44 | 194.8 | 11.46 | ...    | 13.0 | 2 <sup>n</sup> | β   |
| 1898.38 | 194.1 | 11.85 | 8.0... | 12.0 | 5 <sup>n</sup> | D   |

A and C (= Σ 2268 = S 699)

|         |        |       |        |     |    |   |
|---------|--------|-------|--------|-----|----|---|
| 1829.70 | 218.2° | 18.13 | 8.0... | 9.0 | 2n | Σ |
| 1866.52 | 214.0  | 19.32 | 8.1... | 9.0 | 6n | Δ |
| 1881.37 | 212.5  | 20.08 | 8.4... | 8.8 | 3n | β |
| 1889.47 | 211.6  | 20.00 | 8.5... | 8.8 | 4n | β |
| 1891.44 | 211.4  | 20.24 | 8.3... | 8.5 | 2n | β |
| 1898.38 | 210.7  | 20.63 | ...    |     | 5n | D |

B and C

|         |        |      |     |  |    |   |
|---------|--------|------|-----|--|----|---|
| 1891.44 | 232.2° | 9.82 | ... |  | 2n | β |
| 1898.48 | 231.0  | 9.30 | ... |  | 3n | D |

The faint star nearly midway between the components of Σ 2268 was discovered with the 15½-inch at the Washburn Observatory. The change in AC is evidently due to the proper motion of one of these stars. Assuming that this is the principal star, the measures give a movement of about 0.05 in the direction of 350°.

[β (xii)...β<sup>4</sup>...β (2957,3114)...β (*Ast. & A.-P.* XIII, 17)...β (*Pub. L. O.* II)...Comstock (*Pub. Washburn Obsy.* VI)...Doolittle (*Pub. Flower Obsy.* I)...]

A few of the measures of AC are given. All will be found by the following references:

Madler (*Fixstern-Systeme I*) (*Dorpat Obsns.* XI, XIII, XV)... Δ (ii)...Δ (1572)...Sp (ii)...Bigourdan (*Paris Obsns.* 1883)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLVIII)...Pritchett (*Pub. Morrison Obsy.* I)...Glasenapp (IV)...]

β 1127. Groombridge 2500

R.A. 17<sup>h</sup> 58<sup>m</sup> 59<sup>s</sup> }  
Decl. + 44° 14' }

|         |        |      |        |      |    |     |
|---------|--------|------|--------|------|----|-----|
| 1889.53 | 144.7° | 0.80 | 7.8... | 9.7  | 3n | β   |
| 1895.65 | 147.4  | 0.86 | 7.8... | 10.2 | 3n | A   |
| 1897.71 | 130.5  | 0.88 | ...    |      | 3n | A   |
| 1897.75 | 147.0  | 0.57 | ...    |      | 1n | Lew |
| 1898.61 | 139.6  | 0.74 | ...    |      | 1n | Bow |
| 1898.70 | 135.6  | 0.76 | ...    |      | 1n | Lew |

Discovered with the 12-inch. Change is still uncertain. The magnitude in D.M. is 6.5, and in RADCLIFFE 7.2.

[β (xvi)...β (2956)...β (*Pub. L. O.* II)...Aitken (*A. J.* 429) (*Ast. Soc. Pac.* VII, 305)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

β 243. O. Arg. S. 19762

R.A. 18<sup>h</sup> 0<sup>m</sup> 55<sup>s</sup> }  
Decl. — 22° 17' }

A and B

|         |        |      |        |     |    |     |
|---------|--------|------|--------|-----|----|-----|
| 1878.58 | 125.8° | 0.84 | 8.0... | 8.7 | 2n | Cin |
| 1881.58 | 123.3  | 0.76 | 8.2... | 8.2 | 3n | β   |
| 1897.65 | 124.1  | 0.52 | 7.9... | 8.3 | 1n | See |
| 1898.52 | 125.4  | 0.92 | 7.9... | 8.0 | 3n | D   |

A and C

|         |       |       |     |     |    |   |
|---------|-------|-------|-----|-----|----|---|
| 1898.52 | 56.5° | 40.17 | ... | 9.0 | 3n | D |
|---------|-------|-------|-----|-----|----|---|

Discovered with the 6-inch. Evidently unchanged.

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>4</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...See (3496)...Doolittle (*Pub. Flower Obsy.* I)...]

β 244. Lalande 33188

R.A. 18<sup>h</sup> 1<sup>m</sup> 1<sup>s</sup> }  
Decl. — 27° 53' }

|         |        |      |        |      |    |     |
|---------|--------|------|--------|------|----|-----|
| 1876.56 | 261.1° | 2.06 | 8.0... | 9.0  | 1n | Cin |
| 1877.55 | 255.5  | 2.22 | 8.0... | 9.0  | 2n | Cin |
| 1880.58 | 257.3  | 2.01 | ...    |      | 1n | Cin |
| 1881.59 | 258.2  | 2.03 | 8.0... | 9.8  | 3n | β   |
| 1892.54 | 257.9  | 2.04 | 8.0... | 10.3 | 2n | Lv  |
| 1897.63 | 257.6  | 2.38 | 7.0... | 9.0  | 3n | See |

Discovered with the 6-inch. Probably fixed.

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>4</sup>...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>6</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)... See (3496)...]

β 418. O. Arg. N. 17847

R.A. 18<sup>h</sup> 1<sup>m</sup> 28<sup>s</sup> }  
Decl. + 64° 26' }

|         |        |       |        |      |    |   |
|---------|--------|-------|--------|------|----|---|
| 1879.29 | 227.9° | 14.33 | 8.2... | 12.0 | 1n | β |
| 1893.44 | 228.4  | 14.60 | 8.0... | 12.2 | 3n | W |
| 1899.32 | 227.8  | 14.60 | 8.5... | 11.5 | 1n | β |

Discovered with the 6-inch. No sensible change. There is an error of 180° in the angle as printed in β (vii).

[β (vii)...β (2103)...β<sup>3</sup>...Wilson ( )...]

**β 636.** LaLande 33280

R.A. 18<sup>h</sup> 2<sup>m</sup> 4<sup>s</sup> }  
Decl. + 2° 12' }

A and B

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.62 | 127.0 | 4.92 | 7.0...12.2 | 2 <sup>n</sup> | β  |
| 1885.51 | 127.9 | 5.12 | ...        | 2 <sup>n</sup> | HΣ |
| 1892.55 | 123.2 | 4.60 | 7.5...12.0 | 2 <sup>n</sup> | Ho |
| 1898.31 | 124.0 | 4.70 | 7.2...13.0 | 2 <sup>n</sup> | β  |
| 1898.52 | 123.6 | 4.73 | 7.2...12.0 | 5 <sup>n</sup> | D  |
| 1898.67 | 126.0 | 4.66 | ...        | 1 <sup>n</sup> | Br |

A and C

|         |      |       |       |                |   |
|---------|------|-------|-------|----------------|---|
| 1898.34 | 99.8 | 15.08 | ...14 | 1 <sup>n</sup> | β |
|---------|------|-------|-------|----------------|---|

Discovered with the 18½-inch; the distant star with the 40-inch.

[β (x)...β<sup>1</sup>...Hough (3234)...Doolittle (*Pub. Flower Obsy.* 1)...HΣ ( )...Brown ( )...]

**β 826.** D.M. (9°) 3566

R.A. 18<sup>h</sup> 2<sup>m</sup> 5<sup>s</sup> }  
Decl. + 9° 45' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1881.57 | 341.1 | 0.60 | 9.6... 9.7 | 3 <sup>n</sup> | β  |
| 1893.52 | 333.2 | 0.59 | 9.8... 9.9 | 2 <sup>n</sup> | Lv |
| 1893.57 | 150.9 | 0.78 | 9.5... 9.6 | 1 <sup>n</sup> | W  |
| 1896.70 | 331.5 | 0.71 | 9.5... 9.5 | 2 <sup>n</sup> | A  |

Discovered with the 15½-inch at the Washburn Observatory. Change is doubtful. There is a 7 m star 5'3 n.

[β (xii)...β<sup>4</sup>...Lv (*A. J.* 382)...Wilson ( )...Aitken (3396)...]

**β 245.** *Sagittarii* 46

R.A. 18<sup>h</sup> 2<sup>m</sup> 21<sup>s</sup> }  
Decl. - 30° 45' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1868.67 | 366.6 | 4.17 | 6 ... 8.5  | 1 <sup>n</sup> | Hd  |
| 1874.50 | 354.8 | 3.5± | 6.0...10.0 | 4 <sup>n</sup> | β   |
| 1877.53 | 352.1 | 4.02 | 6.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1888.53 | 361.9 | 4.11 | 6.0... 8.5 | 1 <sup>n</sup> | Lv  |
| 1890.65 | 351.8 | 2.99 | 6 ... 8    | 1 <sup>n</sup> | Sel |
| 1892.52 | 353.3 | 3.98 | 6.4... 8.9 | 2 <sup>n</sup> | Lv  |
| 1893.66 | 350.4 | 3.87 | 6 ... 10   | 3 <sup>n</sup> | Sel |
| 1894.58 | 352.7 | 3.93 | ...        | 4 <sup>n</sup> | Sc  |
| 1897.50 | 353.6 | 4.67 | 6.1... 9.5 | 1 <sup>n</sup> | See |

Discovered with the 6-inch. The subsequently published observations of the Harvard Observatory show that it had been seen there previously. There is probably no change. This star is B.A.C. 6145.

β (v)...β (*Mon. Not.* xxxv, 31)...*Annals Harvard Obsy.* xiii ...Cin<sup>4</sup>...Lv<sup>1</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Sellors (3154,3240)...Scott (*Brit. Ast. Assn.* vi, 249)...See (3496)...]

**β 759.** Cord. G. C. 24739

R.A. 18<sup>h</sup> 3<sup>m</sup> 49<sup>s</sup> }  
Decl. - 39° 22' }

A and B

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1887.30 | 122.0 | 2.13 | 8.5... 9.0 | 3 <sup>n</sup> | Pol |
| 1889.40 | 121.4 | 1.81 | 8.9... 9.1 | 3 <sup>n</sup> | β   |
| 1896.65 | 119.7 | 1.76 | 8.3... 9.2 | 3 <sup>n</sup> | See |

A and C (= H 5028)

|         |       |       |         |                |                |
|---------|-------|-------|---------|----------------|----------------|
| 1835.5  | 152.5 | 15±   | 9 ... 9 | 2 <sup>n</sup> | H <sup>2</sup> |
| 1886.60 | 148.7 | 15.27 | ... 9   | 1 <sup>n</sup> | Pol            |
| 1889.40 | 147.3 | 14.92 | ... 9.0 | 3 <sup>n</sup> | β              |
| 1896.67 | 149.7 | 15.43 | ... 9.5 | 1 <sup>n</sup> | See            |

The duplicity of the principal star of HERSCHEL'S pair was discovered with the 6-inch at Mt. Hamilton in 1879. C is Cord. G. C. 24740.

[β (xi)...β<sup>2</sup>...β (2957)...β (*Pub. L. O.* 11)...Pollock (*Pub. Sydney Obsy.* 1891) (*Mon. Not.* XLVII, 473) (*Mem. R. A. S.* 1)...See (3496)...Herschel (*Cape Obsns.*)...]

**β 637.** W<sup>2</sup> XVIII. 28

R.A. 18<sup>h</sup> 3<sup>m</sup> 54<sup>s</sup> }  
Decl. + 3° 6' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.64 | 195.2 | 7.26 | 6.5...12.5 | 1 <sup>n</sup> | β  |
| 1885.54 | 193.1 | 6.96 | ...        | 3 <sup>n</sup> | HΣ |
| 1891.64 | 194.9 | 7.33 | 6.4...12.1 | 2 <sup>n</sup> | β  |
| 1898.51 | 194.4 | 7.01 | 7.0...13.2 | 3 <sup>n</sup> | β  |
| 1898.52 | 191.8 | 7.55 | 6.0...12.2 | 2 <sup>n</sup> | D  |

Discovered with the 18½-inch. The principal star has a considerable proper motion:

Boss - - - - 0.185 in 166.0  
Porter - - - - 0.179 in 180.0

It is obvious from the measures that the companion is moving with it, as otherwise in the time

covered by the measures the position-angle would be 13.6 more and the distance 3.3 less than at the date of the first measures in 1878. The magnitude in ARGELANDER and HEIS is 6; GOULD 6.2.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...H $\Sigma$  ( )...  
Doolittle (Pub. Flower Obsy. 1)...]

$\beta$  132. B.A.C. 6158

R.A. 18<sup>h</sup> 4<sup>m</sup> 7<sup>s</sup> }  
Decl. - 19° 52' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.02 | 240.1 | 0.78 | 6.8... 7.2 | 4 <sup>n</sup> | $\Delta$ |
| 1875.91 | 238.9 | 0.75 | 6.8... 7.2 | 3 <sup>n</sup> | Sp       |
| 1877.41 | 230.4 | ...  | 7.0... 7.0 | 2 <sup>n</sup> | Cin      |
| 1881.58 | 237.0 | 0.79 | 7.3... 7.3 | 3 <sup>n</sup> | $\beta$  |
| 1887.53 | 229.4 | 0.64 | ...        | 2 <sup>n</sup> | Sp       |
| 1888.49 | 233.2 | 1.01 | 7.7... 8.1 | 2 <sup>n</sup> | Lv       |
| 1891.51 | 230.5 | 0.83 | 7.3... 7.3 | 3 <sup>n</sup> | $\beta$  |
| 1892.52 | 227.8 | 0.89 | 7.2... 7.3 | 2 <sup>n</sup> | Lv       |
| 1892.64 | 228.7 | 1.00 | 6.7... 7.0 | 2 <sup>n</sup> | T        |
| 1895.54 | 222.4 | 0.77 | 7.0... 7.3 | 3 <sup>n</sup> | A        |
| 1896.50 | 224.5 | 0.94 | 7.0... 7.2 | 3 <sup>n</sup> | Lv       |
| 1897.60 | 224.0 | ...  | ...        | 2 <sup>n</sup> | Sc       |

Discovered with the 6-inch. The measures appear to show slow retrograde motion.

[ $\beta$  (III)... $\beta$  (Mon. Not. xxxiv, 59)... $\beta^4$ ... $\beta$  (3114)... $\beta$  (Pub. L. O. II)... $\Delta$  (I)... $\Delta$  (2086)...Sp (2133)...Sp (II, app.)...Cin<sup>4</sup>...Sp (III)...Lv<sup>1</sup>...Lv (A. J. 278, 407) (Proc. Haverford Coll. Obsy. 1892)...Tarrant (3186)...Aitken (Ast. Soc. Pac. VII, 305)...Scott (Mon. Not. LIX, 427)...]

$\beta$  638. D.M. (2°) 3516

R.A. 18<sup>h</sup> 4<sup>m</sup> 19<sup>s</sup> }  
Decl. + 2° 34' }

B and C

|         |      |      |             |                |         |
|---------|------|------|-------------|----------------|---------|
| 1878.62 | 10.5 | 1.71 | 9.0... 11.8 | 2 <sup>n</sup> | $\beta$ |
| 1893.50 | 5.5  | 1.48 | 9.2... 12.2 | 4 <sup>n</sup> | Lv      |
| 1898.50 | 7.3  | 1.77 | 9.2... 11.4 | 4 <sup>n</sup> | D       |
| 1898.67 | 6.3  | 1.75 | ...         | 1 <sup>n</sup> | Br      |

A and B (=  $\Sigma$  2287 rej.)

|         |       |       |        |                |         |
|---------|-------|-------|--------|----------------|---------|
| 1863.63 | 150.8 | 22.22 | ...    | 1 <sup>n</sup> | H1      |
| 1878.62 | 152.0 | 22.33 | 9.0... | 1 <sup>n</sup> | $\beta$ |
| 1893.35 | 153.0 | 22.07 | 9.0... | 1 <sup>n</sup> | W       |
| 1893.51 | 152.0 | 21.86 | 8.4... | 3 <sup>n</sup> | Lv      |
| 1898.50 | 151.4 | 22.01 | 9.4... | 4 <sup>n</sup> | D       |
| 1898.67 | 151.8 | 22.40 | ...    | 1 <sup>n</sup> | Br      |

The wide pair was rejected by  $\Sigma$  in *Mensurae Micrometricae*. The smaller component was found to be double with the 18½-inch. The measures show no change. The above are all the measures of AB.

[ $\beta$  (X)... $\beta^1$ ...Lv (A. J. 382)...Doolittle (Pub. Flower Obsy. 1)...Hall (Wash. Obsns. 1863) (I, p. 134)...Wilson ( )...Brown ( )...]

$\beta$  292.  $\mu$  Sagittarii

R.A. 18<sup>h</sup> 6<sup>m</sup> 35<sup>s</sup> }  
Decl. - 21° 5' }

A and C

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1878.51 | 118.7 | 25.20 | ...      | 1 <sup>n</sup> | $\beta$ |
| 1892.57 | 117.4 | 23.73 | ... 13   | 1 <sup>n</sup> | Ho      |
| 1897.73 | 120.7 | 25.98 | ... 14   | 1 <sup>n</sup> | See     |
| 1899.55 | 119.0 | 25.92 | ... 13.5 | 1 <sup>n</sup> | $\beta$ |

A and B (= H 5035)

|         |       |       |              |                |         |
|---------|-------|-------|--------------|----------------|---------|
| 1836.50 | 259.9 | 16.08 | ...          | 1 <sup>n</sup> | Lain    |
| 1877.66 | 258.4 | 17.23 | 4 ... 10.0   | 1 <sup>n</sup> | Cin     |
| 1878.42 | 259.2 | 16.91 | ...          | 1 <sup>n</sup> | $\beta$ |
| 1879.37 | 257.7 | 16.66 | ... 11.0     | 1 <sup>n</sup> | $\beta$ |
| 1879.48 | 258.0 | 16.80 | 4 ... 12.0   | 1 <sup>n</sup> | Cin     |
| 1880.53 | 259.3 | 17.12 | 5 ... 9.0    | 1 <sup>n</sup> | Cin     |
| 1892.56 | 258.6 | 17.12 | 4.5 ... 11.2 | 2 <sup>n</sup> | Lv      |
| 1892.57 | 257.8 | 16.37 | 5 ... 11.0   | 1 <sup>n</sup> | Ho      |
| 1897.71 | 258.1 | 17.24 | 6 ... 12.5   | 3 <sup>n</sup> | See     |

A and D (= H 2822)

|         |       |       |         |                |                |
|---------|-------|-------|---------|----------------|----------------|
| 1830    | 313.8 | 45 ±  | ... 10  | 1 <sup>n</sup> | H <sup>2</sup> |
| 1847.3  | 312.9 | 48.57 | ...     |                | Jac            |
| 1879.36 | 312.1 | 48.32 | ... 9.5 | 1 <sup>n</sup> | $\beta$        |
| 1890.46 | 312.0 | 48.70 | ... 9.5 | 2 <sup>n</sup> | Gl             |
| 1892.56 | 312.8 | 48.63 | ... 9.5 | 1 <sup>n</sup> | Lv             |
| 1892.57 | 311.9 | 48.78 | ... 10  | 1 <sup>n</sup> | Ho             |

A and E

|         |       |       |         |                |                |
|---------|-------|-------|---------|----------------|----------------|
| 1830    | 115.2 | 40 ±  | ... 10  | 1 <sup>n</sup> | H <sup>2</sup> |
| 1847.3  | 115.4 | 50.54 | ...     |                | Jac            |
| 1879.36 | 115.4 | 50.13 | ... 9.5 | 1 <sup>n</sup> | $\beta$        |
| 1890.46 | 114.6 | 49.43 | ... 9.6 | 2 <sup>n</sup> | Gl             |
| 1892.56 | 116.0 | 49.96 | ... 9.7 | 1 <sup>n</sup> | Lv             |
| 1892.57 | 114.8 | 50.02 | ... 10  | 1 <sup>n</sup> | Ho             |

The faint star C, between A and E, was noted with the 26-inch at Washington. The bright star has a proper motion of 0.019 in the direction of

272.9 (AUWERS). This is too small to say with certainty whether or not the companions have the same movement.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta^3$ ...Ho (3234)... See (3496)...Jacob (*Mem. R. A. S.* xvii)...Lamont (*Analen Konigsberg Sternwarte* xvii)...Cin<sup>4</sup>...Cin<sup>5</sup>... Cin<sup>6</sup>...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Wilson and Seabroke (*Mem. R. A. S.* xlii, xliii)...Glaserapp (i)...]

$\beta$  131. Lalande 33443

R.A. 18<sup>h</sup> 6<sup>m</sup> 42<sup>s</sup> }  
Decl. - 15° 38' }

A and B

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.01 | 278.5 | 2.71 | 7.2... 9.2  | 4 <sup>n</sup> | $\Delta$ |
| 1877.41 | 277.8 | 2.66 | 7.5... 10.0 | 1 <sup>n</sup> | Cin      |
| 1880.45 | 278.0 | 2.63 | 7.8... 9.8  | 1 <sup>n</sup> | Lv       |
| 1880.53 | 279.7 | 2.58 | 8.0... 9.5  | 2 <sup>n</sup> | $\beta$  |
| 1880.58 | 279.6 | 2.71 | ...         | 1 <sup>n</sup> | Cin      |
| 1892.53 | 280.2 | 2.76 | 8.0... 9.5  | 2 <sup>n</sup> | Lv       |
| 1892.57 | 278.5 | 2.60 | 7.5... 10   | 1 <sup>n</sup> | Ho       |
| 1898.63 | 279.4 | 2.80 | 7.3... 10.0 | 3 <sup>n</sup> | Cg       |

A and C

|         |       |      |          |                |         |
|---------|-------|------|----------|----------------|---------|
| 1880.53 | 278.7 | 7.13 | ... 11.6 | 2 <sup>n</sup> | $\beta$ |
| 1892.57 | 278.5 | 7.02 | ... 13   | 1 <sup>n</sup> | Ho      |
| 1898.63 | 283.7 | 7.40 | ... 12.2 | 2 <sup>n</sup> | Cg      |

The close pair was discovered with the 6-inch, and in measuring that, the third star C was added with the 18½-inch. So far there is no evidence of change.

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\Delta$  (i)... $\Delta$  (2086)...Cin<sup>4</sup>...Cin<sup>6</sup>...Lv<sup>1</sup>...Lv... (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Hough (3234)...Cogshall (...)]

$\beta$  286. 16 Sagittarii

R.A. 18<sup>h</sup> 8<sup>m</sup> 4<sup>s</sup> }  
Decl. - 20° 25' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1878.57 | 218.5 | 5.67 | 6.0... 13.0 | 3 <sup>n</sup> | $\beta$ |
| 1891.63 | 216.0 | 6.03 | 6.0... 12.0 | 2 <sup>n</sup> | $\beta$ |
| 1897.73 | 217.2 | 6.22 | 6.0... 14.9 | 1 <sup>n</sup> | See     |
| 1898.66 | 213.5 | 5.93 | 6.2... 13.2 | 3 <sup>n</sup> | Bd      |

Discovered with the 26-inch at the Naval Observatory. AUWERS gives the proper motion of A 0.029 in the direction of 241°. If the small star

was fixed in space, the effect of the movement would be to decrease the distance of B. The reverse of this appears to be shown by the measures, and it is probable that the components are moving together.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* ii)...See (3496)...Boothroyd (...)]

$\beta$  1091. Lalande 33592

R.A. 18<sup>h</sup> 8<sup>m</sup> 35<sup>s</sup> }  
Decl. + 38° 34' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1888.78 | 38.1 | 0.53 | 8.6... 8.6 | 2 <sup>n</sup> | $\beta$ |
| 1896.69 | 25.4 | 0.66 | ...        | 1 <sup>n</sup> | Lew     |
| 1898.60 | 29.8 | 0.45 | 8.4... 8.4 | 5 <sup>n</sup> | A       |

Discovered with the 12-inch. Change in the angle is probable.

[ $\beta$  (xv)... $\beta$  (2929)... $\beta$  (*Pub. L. O.* ii)...Lewis (*Mon. Not.* lxx, 400)...Aitken (3585)...]

$\beta$  284. Lalande 33525

R.A. 18<sup>h</sup> 9<sup>m</sup> 13<sup>s</sup> }  
Decl. - 19° 2' }

A and B

|         |       |       |             |                |         |
|---------|-------|-------|-------------|----------------|---------|
| 1890.51 | 358.2 | 19.22 | 7.3... 10.5 | 2 <sup>n</sup> | G1      |
| 1891.63 | 359.8 | 17.96 | 7.2... 10.9 | 2 <sup>n</sup> | $\beta$ |
| 1898.67 | 359.3 | 17.84 | 7.3... 11.0 | 3 <sup>n</sup> | Cg      |

A and C

|         |      |       |          |                |         |
|---------|------|-------|----------|----------------|---------|
| 1891.63 | 87.0 | 31.29 | ... 10.8 | 2 <sup>n</sup> | $\beta$ |
| 1898.67 | 86.6 | 29.75 | ... 10.8 | 3 <sup>n</sup> | Cg      |

A and a

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1891.63 | 199.7 | 11.95 | ... 11.0 | 2 <sup>n</sup> | $\beta$ |
| 1898.67 | 199.6 | 11.83 | ... 11.5 | 3 <sup>n</sup> | Cg      |

A and b

|         |      |       |          |                |         |
|---------|------|-------|----------|----------------|---------|
| 1891.63 | 66.6 | 22.09 | ... 10.8 | 2 <sup>n</sup> | $\beta$ |
| 1898.67 | 66.1 | 21.15 | ... 10.8 | 3 <sup>n</sup> | Cg      |

B and c

|         |       |      |          |                |         |
|---------|-------|------|----------|----------------|---------|
| 1891.63 | 328.9 | 5.04 | ... 11.9 | 2 <sup>n</sup> | $\beta$ |
| 1898.67 | 327.2 | 5.03 | ... 11.5 | 3 <sup>n</sup> | Cg      |

These faint companions were noted with the 18½-inch. GLASENAPP measures from A three more distant stars:

|         |       |        |     |     |    |
|---------|-------|--------|-----|-----|----|
| 1890.51 | 192.1 | 57.32  | ... | 8.8 | 2n |
| 1890.51 | 179.6 | 76.01  | ... | 8.9 | 2n |
| 1890.51 | 268.5 | 138.87 | ... | 9.6 | 2n |

COGSHALL measures a 13.5 m star from A, 102° 9' 17".53 (1898.67) 1n.

[β (v)...β (Mon. Not. xxxv, 31)...β (3114)...β (Pub. L. O. II)...Glaseapp (1)...Cogshall ( )...]

β 285. O. Arg. N. 17953

R.A. 18<sup>h</sup> 9<sup>m</sup> 26<sup>s</sup> }  
Decl. — 25° 3' }

A and B

|         |       |      |        |      |    |     |
|---------|-------|------|--------|------|----|-----|
| 1874.66 | 317.2 | 1.5± | 8.0... | 11.0 | 1n | β   |
| 1877.59 | 316.4 | 1.47 | 8.5... | 10.0 | 1n | Cin |
| 1880.47 | 315.7 | 1.75 | 8.8... | 9.7  | 1n | β   |
| 1880.60 | 324.2 | ...  | 8.0... | 10.0 | 1n | Cin |
| 1893.55 | 319.1 | 1.57 | 7.5... | 9.8  | 1n | Lv  |
| 1893.70 | 316.1 | 1.61 | 9.0... | 11.0 | 1n | W   |
| 1897.67 | 321.4 | 1.49 | 8.2... | 10.0 | 1n | See |
| 1898.68 | 318.3 | 1.51 | 8.2... | 10.7 | 1n | Bd  |
| 1898.75 | 318.6 | 1.63 | ...    | 9.8  | 3n | D   |

C and D

|         |      |      |        |      |    |    |     |
|---------|------|------|--------|------|----|----|-----|
| 1880.47 | 20.7 | 1.65 | 9.5... | 10.5 | 1n | β  |     |
| 1893.70 | 16.9 | 2.24 | 9.5... | 11.5 | 1n | W  |     |
| 1897.67 | 21.7 | 1.31 | 9      | ...  | 12 | 1n | See |
| 1898.68 | 18.8 | 2.32 | ...    | 11.7 | 1n | Bd |     |
| 1898.75 | 18.0 | 1.99 | ...    | 11.1 | 3n | D  |     |

A and C

|         |       |       |        |     |    |    |
|---------|-------|-------|--------|-----|----|----|
| 1880.47 | 141.0 | 59.66 | ...    | ... | 1n | β  |
| 1890.50 | 140.8 | 60.41 | 8.2... | 8.7 | 2n | G1 |
| 1893.70 | 141.0 | 60.05 | ...    | ... | 1n | W  |
| 1898.68 | 140.5 | 59.76 | 8.2... | 9.0 | 2n | Bd |
| 1898.75 | 141.1 | 60.15 | 8.3... | 8.8 | 3n | D  |

C and E

|         |       |       |     |      |    |   |
|---------|-------|-------|-----|------|----|---|
| 1893.70 | 115.6 | 30.72 | ... | 12.0 | 1n | W |
|---------|-------|-------|-----|------|----|---|

This pretty quadruple was discovered with the 18½-inch. C is O. Arg. N. 17954.

[β (v)...β (Mon. Not. xxxv, 31)...β³...Cin⁴...Cin⁵...Lv (A. J. 382)...Wilson ( )...See (3496)...Doolittle (Pub. Flower Obsy. 1)...Boothroyd ( )...Glaseapp (1)...]

β 760. η Sagittarii

R.A. 18<sup>h</sup> 9<sup>m</sup> 30<sup>s</sup> }  
Decl. — 36° 48' }

A and B

|         |       |      |        |     |      |    |     |
|---------|-------|------|--------|-----|------|----|-----|
| 1879.67 | 99.9  | 2.83 | 3      | ... | 11.5 | 2n | β   |
| 1886.71 | 99.5  | 4.36 | 4      | ... | 11   | 1n | Pol |
| 1889.41 | 107.0 | 3.51 | ...    | ... | 11.4 | 4n | β   |
| 1895.72 | 99.2  | 3.60 | 5      | ... | 9.9  | 3n | Sel |
| 1896.46 | 101.2 | 3.65 | 3.4... | ... | 11+  | 2n | A   |
| 1897.38 | 105.3 | 3.87 | 3.5... | ... | 10   | 2n | See |

A and C

|         |       |       |     |     |    |   |
|---------|-------|-------|-----|-----|----|---|
| 1896.48 | 276.2 | 33.34 | ... | 13+ | 2n | A |
|---------|-------|-------|-----|-----|----|---|

A and D

|         |       |       |     |     |    |   |
|---------|-------|-------|-----|-----|----|---|
| 1879.66 | 302.2 | 94.38 | ... | ... | 2n | β |
| 1889.41 | 302.8 | 93.22 | ... | 10  | 2n | β |
| 1896.47 | 303.8 | 93.14 | ... | ... | 3n | A |

Discovered with the 6-inch at Mt. Hamilton in 1879. The measures at that time are subject to error in distance. There is probably no material change in the close star. The bright star has a proper motion of 0".126 in the direction of 288°.4, according to the *Second Washington Catalogue*, and B appears to be moving with it. If fixed in space, the distance at the last measures would be 2".2 more than at the time of discovery. The faint star, C, was noted by AITKEN with the 36-inch. The proper motion of A substantially accounts for the change in the position of the distant star, D.

[β (XI)...β²...β (2957)...β (Pub. L. O. II)...Pollock (Pub. Sydney Obsy. 1891) (Mon. Not. XLVII, 473) (Mem. R. A. S. L)...Aitken (3396)...Sellors (3369)...See (3496)...]

β 246. Cord. G. C. 24920

R.A. 18<sup>h</sup> 10<sup>m</sup> 34<sup>s</sup> }  
Decl. — 19° 43' }

|         |       |      |        |     |    |     |
|---------|-------|------|--------|-----|----|-----|
| 1875.49 | 108.6 | 0.42 | 8.0... | 8.0 | 6n | Δ   |
| 1877.57 | 101.4 | ...  | 8.0... | 8.2 | 1n | Cin |
| 1878.52 | 107.0 | ...  | 8.0... | 8.5 | 1n | Cin |
| 1880.47 | 102.9 | 0.49 | 7.8... | 7.8 | 1n | β   |
| 1881.59 | 110.0 | 0.47 | 8.1... | 8.1 | 3n | β   |
| 1881.61 | 117.3 | 0.47 | 8.0... | 8.0 | 3n | Sp  |
| 1891.63 | 105.6 | 0.51 | 8.2... | 8.2 | 2n | β   |
| 1898.67 | 107.9 | 0.51 | 8.0... | 8.5 | 1n | Cg  |

This difficult pair was discovered with the 6-inch. There is no evidence of relative motion. The magnitude in GOULD is  $7\frac{1}{2}$ .

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^3$ ... $\beta^4$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Cin<sup>4</sup>...Cin<sup>5</sup>...Sp (11)...Cogshall ( )...]

**$\beta$  463.** S.D. ( $16^\circ$ ) 4797

R.A.  $18^h 10^m 44^s$  }  
Decl.  $-16^\circ 54'$  }

|         |           |           |              |            |         |
|---------|-----------|-----------|--------------|------------|---------|
| 1876.61 | $100 \pm$ | $1.3 \pm$ | 9.0... 9.3   | 1 <i>n</i> | $\beta$ |
| 1888.71 | 104.2     | 2.18      | 10.0... 11.0 | 4 <i>n</i> | Com     |
| 1896.50 | 101.3     | 2.22      | 9.0... 9.8   | 3 <i>n</i> | Lv      |

Discovered with the 6-inch.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)...Comstock (*Pub. Washburn Obsy.* vi)...Lv (*A. J.* 407)...Glaserapp (11)...]

**$\beta$  299.** Lalande 33598

R.A.  $18^h 10^m 48^s$  }  
Decl.  $-18^\circ 51'$  }

A and B (= Sh 263)

|         |      |         |            |            |         |
|---------|------|---------|------------|------------|---------|
| 1823.53 | 12.1 | $54.30$ | 7 ... 10   | 2 <i>n</i> | Sh      |
| 1879.46 | 11.5 | $54.32$ | 7.0... 8.5 | 1 <i>n</i> | Cin     |
| 1891.64 | 12.4 | $53.69$ | 6.9... 7.7 | 2 <i>n</i> | $\beta$ |
| 1899.55 | 12.6 | $54.16$ | ...        | 1 <i>n</i> | $\beta$ |

B and *c*

|         |         |         |          |            |         |
|---------|---------|---------|----------|------------|---------|
| 1891.64 | $131.9$ | $10.44$ | ... 13.5 | 2 <i>n</i> | $\beta$ |
|---------|---------|---------|----------|------------|---------|

A and *f*

|         |        |         |          |            |         |
|---------|--------|---------|----------|------------|---------|
| 1891.65 | $66.0$ | $29.42$ | ... 13.5 | 2 <i>n</i> | $\beta$ |
|---------|--------|---------|----------|------------|---------|

A and *h*

|         |         |         |     |            |         |
|---------|---------|---------|-----|------------|---------|
| 1891.65 | $327.9$ | $22.04$ | ... | 1 <i>n</i> | $\beta$ |
|---------|---------|---------|-----|------------|---------|

A and *e*

|         |        |         |     |            |         |
|---------|--------|---------|-----|------------|---------|
| 1891.65 | $22.1$ | $22.20$ | ... | 1 <i>n</i> | $\beta$ |
|---------|--------|---------|-----|------------|---------|

*e* and *d*

|         |         |        |              |            |         |
|---------|---------|--------|--------------|------------|---------|
| 1891.65 | $125.3$ | $7.11$ | 12.9... 12.9 | 2 <i>n</i> | $\beta$ |
| 1899.55 | 124.1   | 8.27   | 12.5... 12.8 | 1 <i>n</i> | $\beta$ |

*g* and *h*

|         |         |        |              |            |         |
|---------|---------|--------|--------------|------------|---------|
| 1891.65 | $317.4$ | $8.39$ | 13.0... 13.5 | 1 <i>n</i> | $\beta$ |
|---------|---------|--------|--------------|------------|---------|

The faint stars near this wide pair of SOUTH and HERSCHEL were noted with the Washington 26-inch. All the measures of AB are given.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>5</sup>...]

**$\beta$  639.** Lalande 33642

R.A.  $18^h 11^m 40^s$  }  
Decl.  $-18^\circ 40'$  }

A and B

|         |         |        |                   |            |         |
|---------|---------|--------|-------------------|------------|---------|
| 1878.66 | $155.3$ | $0.57$ | 7.2... 7.7        | 2 <i>n</i> | $\beta$ |
| 1883.12 | 137.9   | $0.35$ | 7.5... 7.5        | 2 <i>n</i> | Sp      |
| 1891.65 |         |        | Single 12-inch    |            | $\beta$ |
| 1892.36 |         |        | Single 36-inch    |            | $\beta$ |
| 1898.50 |         |        | Elongated 355?    | 2 <i>n</i> | D       |
| 1898.58 |         |        | Uncertain         | 1 <i>n</i> | A       |
| 1899.49 | 210?    |        | Less than $0''.1$ | 2 <i>n</i> | A       |

C and D (=  $\beta$  300)

|         |         |        |             |            |         |
|---------|---------|--------|-------------|------------|---------|
| 1891.65 | $325.5$ | $8.30$ | ... 13.5    | 2 <i>n</i> | $\beta$ |
| 1898.50 | 322.4   | 7.55   | ... 13.7    | 2 <i>n</i> | D       |
| 1899.20 | 323.3   | 8.07   | 7.0... 13.8 | 3 <i>n</i> | A       |

AB and C (= Sh 264)

|         |        |         |            |            |         |
|---------|--------|---------|------------|------------|---------|
| 1823.45 | $52.6$ | $16.42$ | 7 ... 8    | 1 <i>n</i> | Sh      |
| 1862.72 | 51.5   | 16.83   | 7.2... 8.7 | 1 <i>n</i> | Hl      |
| 1877.60 | 52.2   | 17.37   | 7.2... 8.0 | 2 <i>n</i> | Cin     |
| 1878.66 | 51.7   | 17.30   | ... 8.0    | 2 <i>n</i> | $\beta$ |
| 1879.27 | 51.4   | 17.40   | 6.0... 8.0 | 1 <i>n</i> | Cin     |
| 1883.29 | 51.3   | 17.15   | ... 8.0    | 3 <i>n</i> | Sp      |
| 1890.50 | 51.2   | 16.67   | 7.2... 7.7 | 2 <i>n</i> | Gl      |
| 1891.65 | 52.4   | 17.21   | 7.1... 7.7 | 2 <i>n</i> | $\beta$ |
| 1893.58 | 52.5   | 16.95   | ...        | 2 <i>n</i> | Sc      |
| 1898.49 | 52.0   | 17.31   | 6.9... 7.7 | 3 <i>n</i> | D       |
| 1899.03 | 52.0   | 17.27   | 6.9... 7.0 | 2 <i>n</i> | A       |

The faint star, D, was detected with the Washington 26-inch in 1874, and subsequently the principal star of the wide pair was found to be a close pair with the  $18\frac{1}{2}$ -inch. If the distance in 1874 had not been less than at the time of discovery in 1878, I could hardly have missed it with the larger instrument. It is evidently in rapid motion. It was an easy pair in 1878, and entirely beyond the reach of the 36-inch under fine conditions in 1892.

The foregoing are all the measures of the SOUTH and HERSCHEL pair. These stars are evidently fixed.

[ $\beta$  (v, x)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta$  (3114,3142)...  
 $\beta$  (*Pub. L. O.* 11)... $\beta$  (*A. J.* 271)...Sp (11)...Doolittle  
 (*Pub. Flower Obsy.* 1)...Aitken ( )...Hall (*Wash.*  
*Obsns.* 1862)...Cin<sup>4</sup>...Ciu<sup>6</sup>...Glasenapp (1) (*A. J.* 241)  
 ...Scott (*Brit. Ast. Assn.* v, 75; vi, 250)...]

$\beta$  1274. B.A.C. 6216

R.A. 18<sup>h</sup> 12<sup>m</sup> 35<sup>s</sup> }  
 Decl. + 56° 33' }

B and C

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1892.37 | 147.1 | 0.88 | 9.8...10.6  | 3 <sup>n</sup> | $\beta$ |
| 1898.63 | 146.2 | 1.16 | 10.7...11.6 | 4 <sup>n</sup> | A       |

B and D

|         |     |      |             |                |         |
|---------|-----|------|-------------|----------------|---------|
| 1878.85 | 5.0 | 5.63 | 11.0...11.2 | 2 <sup>n</sup> | $\beta$ |
| 1892.37 | 8.5 | 5.03 | ...10.4     | 3 <sup>n</sup> | $\beta$ |
| 1898.63 | 8.2 | 5.01 | ...10.8     | 4 <sup>n</sup> | A       |

A and B

|         |       |       |        |                |         |
|---------|-------|-------|--------|----------------|---------|
| 1878.85 | 239.5 | 96.08 | 7.0... | 2 <sup>n</sup> | $\beta$ |
| 1892.35 | 239.1 | 95.61 | 6.4... | 2 <sup>n</sup> | $\beta$ |
| 1898.62 | 239.4 | 96.10 | 6.0... | 3 <sup>n</sup> | A       |

The wide double companion BD was noted with the 18½-inch in 1878, and the brighter of the two found to be a close pair with the 36-inch in 1892.

[ $\beta$  (xix)... $\beta$  (3141)... $\beta$  (*Pub. L. O.* 11)... $\beta^1$ ... $\beta^3$ ...Aitken (3585)...]

$\beta$  48. Lalande 33729

R.A. 18<sup>h</sup> 13<sup>m</sup> 55<sup>s</sup> }  
 Decl. — 19° 43' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1874.86 | 360.0 | 2.33 | 8.0...10.0 | 3 <sup>n</sup> | $\Delta$ |
| 1877.58 | 358.7 | 2.17 | 8.0... 9.5 | 1 <sup>n</sup> | Cin      |
| 1880.58 | 360.6 | 2.36 | 9.0... 9.5 | 1 <sup>n</sup> | Cin      |
| 1886.30 | 358.8 | 2.51 | 9.0... 9.0 | 1 <sup>n</sup> | LM       |
| 1892.56 | 360.2 | 2.17 | 8.2...10.2 | 1 <sup>n</sup> | Lv       |
| 1898.72 | 362.5 | 2.26 | 8.0...10.7 | 3 <sup>n</sup> | Bd       |

Discovered with the 6 inch. Witl.out change.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (1)...Cin<sup>4</sup>...Cin<sup>6</sup>...  
 LM...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)  
 ...Boothroyd ( )...]

$\beta$  1252. Lalande 33818

R.A. 18<sup>h</sup> 15<sup>m</sup> 55<sup>s</sup> }  
 Decl. — 11° 55' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1876.70 | 182.4 | 1.21 | 8.0... 9.0 | 3 <sup>n</sup> | $\Delta$ |
| 1891.46 | 182.7 | 1.23 | 8.4... 9.1 | 3 <sup>n</sup> | $\beta$  |
| 1898.49 | 181.3 | 1.29 | 8.4... 9.7 | 3 <sup>n</sup> | D        |

Discovered with the 18½-inch June 22, 1875, but inadvertently omitted from my published catalogues of that time. There seems to have been no change.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1, p. 347)...  
 Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  640. *Herculis* 443

R.A. 18<sup>h</sup> 16<sup>m</sup> 3<sup>s</sup> }  
 Decl. + 27° 28' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1878.91 | 346.2 | 2.37 | 7.5...12.2 | 2 <sup>n</sup> | $\beta$    |
| 1884.91 | 340.6 | 2.49 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1892.38 | 341.1 | 2.20 | 8.0...11.5 | 1 <sup>n</sup> | $\beta$    |
| 1893.66 | 338.4 | 2.38 | 7 ... 13   | 1 <sup>n</sup> | Ho         |

Discovered with the 18½-inch. Later measures are needed. Lalande 33880.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3142)... $\beta$  (*Pub. L. O.* 11)...Hough (3234)...H $\Sigma$  ( )...]

$\beta$  641. Lalande 33897

R.A. 18<sup>h</sup> 16<sup>m</sup> 42<sup>s</sup> }  
 Decl. + 21° 27' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1878.68 | 356.4 | 1.07 | 8.2... 9.0 | 1 <sup>n</sup> | $\Delta$   |
| 1880.12 | 349.2 | 1.00 | 7.1... 9.0 | 5 <sup>n</sup> | $\beta$    |
| 1884.22 | 347.4 | 1.01 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1886.29 | 345.0 | 1.10 | 7.3... 9.1 | 8 <sup>n</sup> | En         |
| 1890.45 | 345.9 | 1.01 | 7.3... 9.0 | 3 <sup>n</sup> | $\beta$    |
| 1890.71 | 357.1 | 1.02 | ...        | 2 <sup>n</sup> | Maw        |
| 1891.01 | 351.6 | 0.87 | ...        | 4 <sup>n</sup> | Sp         |
| 1891.79 | 355.9 | 0.94 | ...        | 1 <sup>n</sup> | Maw        |
| 1892.81 | 357.5 | 0.62 | 7.5... 9.0 | 1 <sup>n</sup> | High-ton   |
| 1894.77 | 355.0 | ...  | ...        | 1 <sup>n</sup> | High-ton   |
| 1894.77 | 358.4 | ...  | ...        | 1 <sup>n</sup> | Sea-brake  |
| 1896.61 | 336.5 | 1.31 | ...        | 1 <sup>n</sup> | Dyson      |
| 1896.62 | 346.5 | 0.92 | ...        | 4 <sup>n</sup> | Lew        |
| 1897.53 | 349.5 | 1.04 | ...        | 2 <sup>n</sup> | Lew        |
| 1897.70 | 342.3 | 0.97 | ...        | 3 <sup>n</sup> | A          |

Discovered with the 18½-inch. Apparently there is change in angle.

[ $\beta$  (x)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...  
Engelmann (2786)...Sp (III)...Seabroke and Highton  
(*Mem. R. A. S.* LI)...Maw (*Mem. R. A. S.* L)...Aitken  
(*A. J.* 429)...Lewis and Dyson (*Mon. Not.* LIX, 400)...  
H $\Sigma$  ( )...]

 $\beta$  49. O. Arg. S. 18155

R.A. 18<sup>h</sup> 17<sup>m</sup> 3<sup>s</sup> }  
Decl. — 19° 38' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.19 | 49.1 | 7.82 | 8.0...11.3 | 3 <sup>n</sup> | $\Delta$ |
| 1877.66 | 47.2 | 7.86 | 8.0...11.0 | 1 <sup>n</sup> | Cin      |
| 1880.52 | 44.8 | ...  | ...        | 1 <sup>n</sup> | Cin      |
| 1892.55 | 46.0 | 8.39 | 8.3...10.7 | 3 <sup>n</sup> | Lv       |
| 1897.70 | 45.5 | 8.31 | 7.5...11.8 | 2 <sup>n</sup> | See      |
| 1898.47 | 46.5 | 8.10 | 8.0...10.0 | 3 <sup>n</sup> | A        |
| 1898.50 | 44.6 | 8.08 | 8.4... 9.8 | 3 <sup>n</sup> | D        |

Discovered with the 6-inch. AITKEN measures from A two more distant stars:

|       |       |         |           |
|-------|-------|---------|-----------|
| 301.3 | 21.73 | ...12.5 | } 1898.47 |
| 148.3 | 24.20 | ...12.0 |           |

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (1)...Cin<sup>4</sup>...Cin<sup>6</sup>...  
Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...See  
(3496)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken  
(3585)...]

 $\beta$  1203. *Serpentis* 191

R.A. 18<sup>h</sup> 19<sup>m</sup> 57<sup>s</sup> }  
Decl. + 0° 43' }

|         |      |            |            |                |         |
|---------|------|------------|------------|----------------|---------|
| 1890.67 | 67.8 | 0.30       | 7.5... 7.7 | 3 <sup>n</sup> | $\beta$ |
| 1892.40 | 66.8 | 0.32       | 7.0... 7.2 | 1 <sup>n</sup> | $\beta$ |
| 1893.77 | 48.0 | 0.25 $\pm$ | ...        | 1 <sup>n</sup> | Sp      |
| 1896.74 | 72.6 | 0.43       | ...        | 1 <sup>n</sup> | Lew     |
| 1899.46 | 72.0 | 0.31       | 7.0... 7.3 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. Lalande 34015.

[ $\beta$  (xvii)... $\beta$  (3047,3142)... $\beta$  (*Pub. L. O.* II)...Sp (III)...  
Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...]

 $\beta$  965. S.D. (17°) 5196

R.A. 18<sup>h</sup> 20<sup>m</sup> 2<sup>s</sup> }  
Decl. — 17° 15' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1880.60 | 105.6 | 1.57 | 8.1...11.8 | 3 <sup>n</sup> | $\beta$ |
| 1898.60 | 105.3 | 1.60 | 8.1...12.5 | 3 <sup>n</sup> | A       |
| 1898.63 | 106.4 | 1.44 | 8.3...11.8 | 3 <sup>n</sup> | D       |

Discovered with the 18½-inch. Relatively fixed.

[ $\beta$  (xiii)... $\beta^3$ ...Aitken (3585)...Doolittle (*Pub. Flower Obsy.*  
1)...]

 $\beta$  133. B.A.C. 6261

R.A. 18<sup>h</sup> 20<sup>m</sup> 15<sup>s</sup> }  
Decl. — 26° 42' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1875.66 | 265.3 | 1.80 | 7.5... 7.5 | 4 <sup>n</sup> | Sp  |
| 1876.54 | 85.5  | 1.77 | 7.0... 7.5 | 1 <sup>n</sup> | Cin |
| 1877.53 | 261.9 | 1.96 | 7.0... 7.0 | 1 <sup>n</sup> | Cin |
| 1878.97 | 263.0 | 1.72 | 6.7... 6.7 | 3 <sup>n</sup> | Cin |
| 1888.52 | 264.7 | 1.80 | 5.8... 6.2 | 2 <sup>n</sup> | Lv  |
| 1890.49 | 267.5 | 2.07 | 7.0... 7.1 | 2 <sup>n</sup> | Gl  |
| 1892.64 | 264.4 | 1.79 | 7.5... 7.5 | 2 <sup>n</sup> | T   |
| 1893.65 | 260.5 | 1.37 | 7.0... 7.0 | 2 <sup>n</sup> | Sel |
| 1895.46 | 260.5 | 2.10 | ...        | 2 <sup>n</sup> | Bar |
| 1897.50 | 259.3 | 1.75 | 7½... 7½   | 3 <sup>n</sup> | Sc  |
| 1897.68 | 258.7 | 1.74 | 7.5... 8.0 | 2 <sup>n</sup> | See |

Discovered with the 6-inch. Very little, if any, change. The  $\rho$  star of a small equilateral triangle of 7 m stars, about 1° 20' s of  $\lambda$  *Sagittarii*. GOULD gives this 6.8 m.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)...Sp (II)...Sp (2133)...  
Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Lv<sup>1</sup>...Glasenapp (1)...Tarrant  
(3186)...Sellors (3240)...Barnard (*A. J.* 447)...See  
(3496)...Scott (*Mon. Not.* LIX, 427)...]

 $\beta$  264. D.M. (27°) 3023

R.A. 18<sup>h</sup> 21<sup>m</sup> 43<sup>s</sup> }  
Decl. + 27° 16' }

|         |           |         |          |                |         |
|---------|-----------|---------|----------|----------------|---------|
| 1874.72 | 360 $\pm$ | 8 $\pm$ | 8.5...12 | 1 <sup>n</sup> | $\beta$ |
|---------|-----------|---------|----------|----------------|---------|

This was noted with the above description with the 9.4-inch of the Dartmouth College Observatory. I could not see this with the 12-inch in 1891, nor recently with the 40-inch. There is no doubt of the identity of the star. It is described in the original catalogue as 1<sup>m</sup> 29<sup>s</sup> f  $\Sigma$  2315. It was noted as "excessively faint" with the 9.4-inch, and it is possible that the companion has no real existence.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)...]

 $\beta$  464. W<sup>r</sup> XVIII. 476

R.A. 18<sup>h</sup> 21<sup>m</sup> 45<sup>s</sup> }  
Decl. + 6° 29' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1877.17 | 111.3 | 1.20 | 8.5... 9.5 | 2 <sup>n</sup> | $\Delta$ |
| 1891.61 | 108.2 | 1.03 | 8.6... 9.7 | 3 <sup>n</sup> | $\beta$  |
| 1898.53 | 108.4 | 1.12 | 8.9... 9.8 | 3 <sup>n</sup> | D        |

Discovered with the 6-inch. There is a third star 11 m, 90° : 25". In a low-power field with OΣ 350.

[β (1X)...β (Mon. Not. xxxviii, 78)...β (3114)...β (Pub. L. O. 11)...Δ (1)...Doolittle (Pub. Flower Obsy. 1)...]

**β 134.** O. Arg. N. 18233

R.A. 18<sup>h</sup> 21<sup>m</sup> 59<sup>s</sup> }  
Decl. + 46° 49' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1861.32 | 138.9 | 1.24 | 7.2... 9.2  | 2n | OΣ  |
| 1875.18 | 133.7 | 1.07 | 7.9... 9.8  | 4n | Δ   |
| 1879.47 | 136.1 | 0.95 | 8.0... 10.0 | 1n | β   |
| 1896.52 | 137.3 | 1.15 | 7.7... 9.7  | 3n | Lv  |
| 1896.74 | 127.4 | 1.08 | ...         | 1n | Lew |
| 1898.62 | 135.3 | 1.04 | ...         | 2n | Bow |
| 1898.64 | 138.4 | 1.13 | ...         | 2n | Bry |

Discovered with the 6-inch, but it had been seen before at Poulkowa, and is OΣ 543, one of the subsequently published additions to the Poulkowa Catalogue (*Poulkowa Observations*, Vol. IX). There is no change in the components.

[β (111)...β (Mon. Not. xxxiv, 59)...β<sup>3</sup>...OΣ (*Poulkowa Obsns.* ix)...Δ (1)...Lv (*A. J.* 407)...Lewis, Bowyer and Bryant (*Mon. Not.* LIX, 418)...]

**β 1128.** B.A.C. 6285

R.A. 18<sup>h</sup> 23<sup>m</sup> 12<sup>s</sup> }  
Decl. — 33° 4' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1877.53 | 204.8 | 2.41 | 6.0... 12.0 | 1n | Cin |
| 1889.42 | 198.6 | 3.17 | 6.1... 11.5 | 3n | β   |
| 1892.56 | 201.0 | ...  | 6.0... 11.0 | 1n | Lv  |

When this pair was found with the 12-inch, its identity with one of Howe's, discovered in 1877 at Cincinnati, was overlooked. The *Cape Catalogue* gives the principal star a proper motion of 0".07 in the direction of 180°. If this is correct, and the small star is fixed in space, its distance from the primary should decrease annually by nearly this amount.

[Cin<sup>4</sup>...β (xvi)...β (2956)...β (Pub. L. O. 11)...Howe (Cin<sup>4</sup>)...Lv (*Proc. Haverford Coll. Obsy.* 1892)...]

**β 966.** B.A.C. 6301

R.A. 18<sup>h</sup> 25<sup>m</sup> 25<sup>s</sup> }  
Decl. — 19° 3' }

B and C

|         |       |      |             |    |    |
|---------|-------|------|-------------|----|----|
| 1880.61 | 120.2 | 0.62 | 9.0... 9.5  | 3n | β  |
| 1898.68 | 120.6 | 0.70 | 8.0... 9.5  | 1n | A  |
| 1898.75 | 120.5 | 0.72 | 9.8... 10.2 | 4n | Cg |

A and BC

|         |       |       |           |    |
|---------|-------|-------|-----------|----|
| 1880.58 | 252.8 | 66.34 | 6.7... 3n | β  |
| 1898.68 | 252.9 | 66.82 | 6.5... 1n | A  |
| 1898.75 | 252.7 | 66.62 | 7.0... 3n | Cg |

Discovered with the 18½-inch. This is the principal star in the cluster, MESSIER 25. In HEIS 6-7 m; GOULD, 7¼; B.A.C. 7. There is a wide pair of small stars in the field *sp* measured in Cin<sup>5</sup>; 173.0 : 10.96 : 8.0... 8.5 (1879.39) 1n. GLASENAPP measures a very distant 7.4m star from A, 254.2 : 430.66 (1893.66) 2n.

[β (xiii)...β<sup>3</sup> (pp. 196, 299)...Aitken (3585)...Cogshall ( )...]

**β 247.** Lalande 34253

R.A. 18<sup>h</sup> 25<sup>m</sup> 36<sup>s</sup> }  
Decl. — 9° 27' }

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1875.43 | 167.4 | 7.62 | 7.8... 11.2 | 3n | Δ   |
| 1878.54 | 166.9 | 7.70 | 8.0... 11.5 | 1n | Cin |
| 1880.59 | 169.0 | 7.42 | 7.0... 10.0 | 1n | Cin |
| 1888.56 | 167.9 | 7.99 | 6.5... 10.8 | 2n | Lv  |
| 1891.66 | 166.8 | 7.69 | ...         | 2n | Col |

Discovered with the 6-inch. Without change.

[β (v)...β (Mon. Not. xxxv, 31)...Δ (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...Lv<sup>1</sup>...Collins (*Proc. Haverford Coll. Obsy.* 1891)...]

**β 419.** Lalande 34259

R.A. 18<sup>h</sup> 25<sup>m</sup> 42<sup>s</sup> }  
Decl. — 7° 55' }

|         |      |      |             |    |    |
|---------|------|------|-------------|----|----|
| 1877.03 | 57.6 | 1.22 | 8.5... 9.2  | 3n | Δ  |
| 1888.52 | 56.6 | 1.32 | 8.0... 10.0 | 2n | Lv |
| 1898.51 | 46.9 | 1.54 | 7.6... 8.9  | 3n | D  |

Discovered with the 6-inch. Change?

[β (vii)...β (2103)...Δ (1)...Lv<sup>1</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

**$\beta$  420.** W<sup>2</sup> XVIII. 722

R.A. 18<sup>h</sup> 25<sup>m</sup> 53<sup>s</sup> }  
Decl. + 37° 5' }

## A and B

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1873.13 | 277.0 | 1.45 | 9.7...11.0 | 4 <sup>n</sup> | $\Delta$ |
| 1880.44 | 277.4 | 1.64 | 8.5...10.2 | 2 <sup>n</sup> | $\beta$  |
| 1893.44 | 276.6 | 1.80 | 8.8...10.5 | 3 <sup>n</sup> | W        |

## A and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1880.42 | 198.1 | 21.58 | ...11.0 | 1 <sup>n</sup> | $\beta$ |
| 1893.44 | 200.5 | 21.42 | ...11.5 | 3 <sup>n</sup> | W       |

Discovered with the 6-inch.

[ $\beta$  (VII)... $\beta$  (2103)... $\beta^3$ ... $\Delta$  (1)...Wilson ( )...]

 **$\beta$  642.** S.D. (10°) 4718

R.A. 18<sup>h</sup> 26<sup>m</sup> 45<sup>s</sup> }  
Decl. - 10° 32' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1878.50 | 91.5 | 4.11 | 9.0...11.0 | 1 <sup>n</sup> | $\beta$ |
| 1891.62 | 91.4 | 4.14 | 8.9...10.9 | 3 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. One of the principal stars in the cluster, DREYER 6649.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...]

 **$\beta$  1253.** *Lyrae* 28

R.A. 18<sup>h</sup> 28<sup>m</sup> 15<sup>s</sup> }  
Decl. + 30° 28' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1891.38 | 156.3 | 7.44 | 6.2...13.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.75 | 157.1 | 7.31 | 6.0...13.2 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. This is the naked-eye star in *Lyra*; HEIS 6.5 m; Harvard 5.7. Lalande 34418. KUSTNER gives this star a proper motion of 0".015 in the direction of 350° 2.

[ $\beta$  (XVIII)... $\beta$  (3113)... $\beta$  (Pub. L. O. II)...Aitken (3585)...]

 **$\beta$  643.** Lalande 34438

R.A. 18<sup>h</sup> 29<sup>m</sup> 41<sup>s</sup> }  
Decl. + 4° 50' }

## A and B

|         |       |      |         |                |         |
|---------|-------|------|---------|----------------|---------|
| 1878.23 | 338.2 | 8.86 | ...12.5 | 3 <sup>n</sup> | $\beta$ |
| 1891.67 | 336.3 | 9.27 | ...12.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.49 | 334.5 | 9.39 | ...12.5 | 1 <sup>n</sup> | D       |
| 1898.53 | 335.8 | 9.59 | ...12.5 | 3 <sup>n</sup> | A       |

A and C (=  $\Sigma$  2342)

|         |      |       |            |                |          |
|---------|------|-------|------------|----------------|----------|
| 1830.71 | 11.9 | 26.91 | 5.7... 8.5 | 4 <sup>n</sup> | $\Sigma$ |
| 1865.58 | 9.3  | 28.07 | 6.5... 8.9 | 5 <sup>n</sup> | $\Delta$ |
| 1877.63 | 9.2  | 28.88 | ...        | 7 <sup>n</sup> | Jed      |
| 1891.67 | 7.3  | 29.12 | ... 8.7    | 3 <sup>n</sup> | $\beta$  |
| 1898.49 | 7.1  | 29.35 | 6.5... 8.0 | 1 <sup>n</sup> | D        |
| 1898.53 | 7.0  | 29.28 | 6.0... 8.2 | 3 <sup>n</sup> | A        |

The nearest companion was detected with the 18½-inch. The change in STRUVE'S star is evidently due to the proper motion of A. The measures of AC in 1830 and 1898 give this as 0".05 in the direction of 144°, and this movement accounts for the change in AB. There was a time when these two stars were separated by a distance of about 2".

[ $\beta$  (X)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3114)... $\beta$  (Pub. L. O. II)... $\beta$  (Ast. & A.-P. XIII, 16)...Doolittle (Pub. Flower Obsy. I)...Aitken (3585)...]

There are many measures of the wide pair, of which enough are given to show the character and extent of the relative motion. All the measures will be found in the following :

[Madler (*Fixstern-Systeme* I) (*Dorpat Obsns.* XI, XIII, XV) ...Herschel (*Mem. R. A. S.* VI, XXXVIII)... $\Delta$  (1573)... $\Delta$  (II) ...Jedrzejewicz (2369)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLVIII)...Glasenapp (III)...]

 **$\beta$  135.** Lalande 34476

R.A. 18<sup>h</sup> 31<sup>m</sup> 16<sup>s</sup> }  
Decl. - 14° 6' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.08 | 184.0 | 2.45 | 6.7...11.5 | 4 <sup>n</sup> | $\Delta$ |
| 1878.49 | 186.6 | ...  | 6.7...11.5 | 1 <sup>n</sup> | Cin      |
| 1879.59 | 183.9 | 2.27 | 7.0...12.0 | 1 <sup>n</sup> | $\beta$  |
| 1882.47 | 187.3 | 2.49 | 7.0...11.0 | 1 <sup>n</sup> | W        |
| 1886.44 | 185.8 | ...  | 7.5...12.5 | 1 <sup>n</sup> | LM       |
| 1892.52 | 187.1 | ...  | 8.0...12.0 | 1 <sup>n</sup> | Lv       |
| 1893.54 | 187.6 | 2.24 | 7.0...12.5 | 2 <sup>n</sup> | Lv       |
| 1893.67 | 188.8 | 2.26 | 7.0...12.0 | 2 <sup>n</sup> | W        |

Discovered with the 6-inch. Very difficult with that aperture. Probably without material change. The distance in my single measure in 1879 is erroneously reduced in  $\beta^3$ . It should be as given above.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\Delta$  (I)...Cin<sup>5</sup>... Wilson (Cin<sup>10</sup>)...LM...Lv (*A. J.* 278, 382) (*Proc. Harvard Coll. Obsy.* 1892)...Wilson ( )...]

**β 967.** S.D. (14°) 5152

R.A. 18<sup>h</sup> 34<sup>m</sup> 5<sup>s</sup> }  
Decl. - 14° 36'

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1880.54 | 195.8 | "    | 8.0...11.1 | 4 <sup>n</sup> | β  |
| 1888.45 | 196.9 | ...  | 8.0...11.2 | 1 <sup>n</sup> | Lv |
| 1893.54 | 191.1 | 2.33 | 7.8...11.8 | 3 <sup>n</sup> | Lv |
| 1893.60 | 200.2 | 2.25 | 8.5...11.0 | 1 <sup>n</sup> | W  |
| 1898.50 | 194.4 | 2.21 | 7.9...10.5 | 3 <sup>n</sup> | D  |
| 1898.73 | 198.3 | 2.43 | 8.2...12.5 | 3 <sup>n</sup> | Bd |

Discovered with the 18½ inch. Probably unchanged. The magnitude in S.D. is 8.3.

[β (XIII)...β<sup>3</sup>...Lv<sup>2</sup>...Lv (A. J. 382)...Wilson ( )...Doolittle (Pub. Flower Obsy. 1)...Boothroyd ( )...]

**β 50.** D.M. (39°) 3475

R.A. 18<sup>h</sup> 34<sup>m</sup> 9<sup>s</sup> }  
Decl. + 39° 29'

A and B

|         |     |   |       |            |                |   |
|---------|-----|---|-------|------------|----------------|---|
| 1892.38 | 6.9 | " | 21.96 | 8.5...13.0 | 1 <sup>n</sup> | β |
| 1899.42 | 8.7 | " | 21.36 | 9.5...12.5 | 1 <sup>n</sup> | β |

A and C

|         |       |   |       |     |                |   |
|---------|-------|---|-------|-----|----------------|---|
| 1892.38 | 330.0 | " | 73.06 | ... | 1 <sup>n</sup> | β |
| 1899.42 | 329.9 | " | 73.52 | ... | 1 <sup>n</sup> | β |

C and D

|         |       |   |      |            |                |   |
|---------|-------|---|------|------------|----------------|---|
| 1892.38 | 167.2 | " | 5.85 | 9.5...11.0 | 1 <sup>n</sup> | β |
| 1899.42 | 168.0 | " | 6.44 | 10...11    | 1 <sup>n</sup> | β |

Distant double companion noted with the 6-inch. Of no special interest as a double star.

[β (1)...β (Mon. Not. xxxiii, 351)...β (3142)...β (Pub. L. O. II)...]

**β 136.** W<sup>1</sup> XVIII. 893

R.A. 18<sup>h</sup> 37<sup>m</sup> 0<sup>s</sup> }  
Decl. + 5° 37'

|         |     |   |      |            |                |    |
|---------|-----|---|------|------------|----------------|----|
| 1874.84 | 8.0 | " | 4.39 | 9.2... 9.7 | 3 <sup>n</sup> | Δ  |
| 1892.54 | 7.7 | " | 4.68 | 9.0... 9.2 | 2 <sup>n</sup> | Lv |
| 1899.44 | 6.8 | " | 4.60 | 8.7... 9.0 | 1 <sup>n</sup> | β  |

Faint pair noted with the 6-inch. In D.M. 8.6m. It is 49<sup>s</sup> *p* and 6' *s* of OΣ 361.

[β (III)...β (Mon. Not. xxxiv, 59)...Δ (1)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...]

**β 645.** *Herculis* 475

R.A. 18<sup>h</sup> 38<sup>m</sup> 1<sup>m</sup> }  
Decl. + 19° 21'

|         |       |   |      |            |                |    |
|---------|-------|---|------|------------|----------------|----|
| 1877.52 | 304.0 | " | 9.9  | 7.0...12.0 | 1 <sup>n</sup> | β  |
| 1877.74 | 307.3 | " | 9.03 | 7.0...12.0 | 1 <sup>n</sup> | Δ  |
| 1883.57 | 305.0 | " | 9.22 | ...        | 2 <sup>n</sup> | HΣ |
| 1896.58 | 303.6 | " | 9.53 | 7.3...11.8 | 3 <sup>n</sup> | Lv |
| 1898.69 | 304.9 | " | 9.92 | 7.7...11.7 | 3 <sup>n</sup> | D  |

Discovered with the 18½-inch. In my single measure the distance was noted as uncertain, and Δ found it very difficult. On the whole there is no evidence of change. Lalande 34772.

[β (x)...β<sup>1</sup>...Δ (1)...Lv (A. J. 407)...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...]

**β 1254.** W<sup>1</sup> XVIII. 935

R.A. 18<sup>h</sup> 38<sup>m</sup> 52<sup>s</sup> }  
Decl. - 13° 48'

|         |      |   |      |            |                |    |
|---------|------|---|------|------------|----------------|----|
| 1875    | 80±  | " | 2.5± | 8.0...12.0 | 2 <sup>n</sup> | β  |
| 1889.67 | 74.5 | " | 2.43 | 8.0...12.0 | 2 <sup>n</sup> | Ho |
| 1891.50 | 78.2 | " | 2.67 | 8.2...11.0 | 6 <sup>n</sup> | β  |
| 1897.58 | 73.7 | " | 2.35 | 8.0...11.0 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch in 1875, but inadvertently omitted from the catalogues of new pairs of that time. It was found independently and subsequently published by HOUGH (= Ho 438).

[β (xviii)...β (3113)...β (Pub. L. O. II)...Hough (3234) ...Aitken (3466)...]

**β 968.** ζ *Lyrae*

R.A. 18<sup>h</sup> 40<sup>m</sup> 38<sup>s</sup> }  
Decl. + 37° 29'

A and B

|         |      |   |       |         |                |   |
|---------|------|---|-------|---------|----------------|---|
| 1889.43 | 48.7 | " | 26.93 | ...15.7 | 2 <sup>n</sup> | β |
| 1898.63 | 50.7 | " | 27.04 | ...14.7 | 3 <sup>n</sup> | A |

A and C

|         |       |   |       |         |                |   |
|---------|-------|---|-------|---------|----------------|---|
| 1880.50 | 275.4 | " | 43.37 | ...13.2 | 2 <sup>n</sup> | β |
| 1898.63 | 273.1 | " | 45.55 | ...14.0 | 3 <sup>n</sup> | A |

A and D (=  $\Sigma$  38 App. 1)

|         |       |       |            |        |            |
|---------|-------|-------|------------|--------|------------|
| 1835.23 | 149.7 | 43.71 | 4.2... 5.5 | 5 $n$  | $\Sigma$   |
| 1840.71 | 150.0 | 43.79 | ...        | 3 $n$  | O $\Sigma$ |
| 1868.20 | 149.6 | 43.69 | 4.1... 5.8 | 6 $n$  | $\Delta$   |
| 1878.23 | 149.6 | 44.11 | ...        | 10 $n$ | Jed        |
| 1880.49 | 149.6 | 43.48 | ...        | 2 $n$  | $\beta$    |
| 1889.43 | 149.3 | 43.73 | ...        | 2 $n$  | $\beta$    |

## A and E

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1880.49 | 304.1 | 61.66 | ... 11.4 | 1 $n$ | $\beta$ |
| 1898.63 | 302.8 | 61.79 | ... 13.0 | 3 $n$ | A       |

The small stars, C and E, were discovered with the 18½-inch, and subsequently a still fainter and nearer companion was detected with the 36-inch.

There is no suggestion of motion in the old companion (= H<sup>1</sup> V. 2 = Sh 279 =  $\Sigma$ 38 App I = O $\Sigma$  (App) 173) since the measures of STRUVE in 1835. AUWERS gives the proper motions of these stars:

$$A = 0.027 \text{ in } 37.1$$

$$D = 0.029 \text{ in } 23.8$$

The measures indicate a common proper motion. It will have to be determined hereafter whether or not the faint stars share in this movement.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (2957)... $\beta$  (Pub. L. O. II)... $\beta$  (Observatory IV, 18)...Aitken (3585)...]

A few only of the measures of AD are given. All will be found in the following references:

[O $\Sigma$  (Poulkowa Obsns. x)... $\Delta$  (II)...Dawes (Mem. R. A. S. xxxv)...Herschel (Mem. R. A. S. v)...Plummer (Oxford Obsns. No. 1)...Radcliffe Obsns. xxi, xxv, xxvii, xxxv, xxxviii...Ball (Dunsink Obsns., Part v)...Hall (Wash. Obsns. 1886) (II)...Hunt (Observatory III, 605)...Jedrzejewicz (2340)...Tarrant (2866)...Franz (3080)...Maiebekto (Double Star Measures 1892)...Glaserapp (II, III, IV)...]

 $\beta$  465. D.M. (56°) 2130

$$\text{R.A. } 18^{\text{h}} 41^{\text{m}} 39^{\text{s}} \}$$

$$\text{Decl. } + 56^{\circ} 45' \}$$

|         |       |      |             |       |          |
|---------|-------|------|-------------|-------|----------|
| 1877.29 | 292.8 | 3.15 | 9.0... 11.0 | 2 $n$ | $\Delta$ |
| 1891.59 | 295.4 | 3.12 | 8.4... 10.5 | 3 $n$ | $\beta$  |
| 1895.64 | 292.8 | 3.13 | 8.1... 10.4 | 3 $n$ | A        |

## Discovered with the 6-inch. Fixed.

[ $\beta$  (IX)... $\beta$  (Mon. Not. xxxviii, 78)... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...Aitken (Ast. Soc. Pac. VII, 305)...]

 $\beta$  51. D.M. (39°) 3523

$$\text{R.A. } 18^{\text{h}} 41^{\text{m}} 42^{\text{s}} \}$$

$$\text{Decl. } + 39^{\circ} 34' \}$$

## B and C

|         |       |      |              |       |   |
|---------|-------|------|--------------|-------|---|
| 1898.56 | 297.5 | 6.13 | 10.2... 11.2 | 3 $n$ | D |
|---------|-------|------|--------------|-------|---|

## A and B

|         |       |       |        |       |   |
|---------|-------|-------|--------|-------|---|
| 1898.56 | 185.2 | 74.65 | 9.0... | 3 $n$ | D |
|---------|-------|-------|--------|-------|---|

Unimportant triple a short distance  $f \epsilon$  Lyrae; noted with the 6-inch.

[ $\beta$  (1)... $\beta$  (Mon. Not. xxxiii, 351)...Doolittle (Pub. Flower Obsy. 1)...]

 $\beta$  969. S.D. (8°) 4726

$$\text{R.A. } 18^{\text{h}} 43^{\text{m}} 49^{\text{s}} \}$$

$$\text{Decl. } - 8^{\circ} 3' \}$$

|         |       |       |             |       |         |
|---------|-------|-------|-------------|-------|---------|
| 1880.51 | 236.6 | 14.33 | 7.0... 11.9 | 4 $n$ | $\beta$ |
| 1892.38 | 238.0 | 14.11 | 7.0... 11.8 | 1 $n$ | $\beta$ |
| 1892.56 | 238.3 | 14.79 | 7.5... 11.6 | 2 $n$ | Lv      |
| 1898.70 | 237.6 | 14.26 | 7.2... 11.5 | 3 $n$ | Cg      |

Discovered with the 18½-inch. Probably fixed. The principal star is No. 219 of Schjellerup's Catalogue of Red Stars.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (Pub. L. O. II)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Cogshall (...)]

 $\beta$  970. S.D. (8°) 4729

$$\text{R.A. } 18^{\text{h}} 44^{\text{m}} 15^{\text{s}} \}$$

$$\text{Decl. } - 8^{\circ} 8' \}$$

|         |       |      |             |       |         |
|---------|-------|------|-------------|-------|---------|
| 1880.58 | 107.3 | 1.43 | 8.3... 11.2 | 4 $n$ | $\beta$ |
| 1892.38 | 107.9 | 1.54 | 8.3... 10.7 | 1 $n$ | $\beta$ |
| 1898.72 | 106.8 | 1.44 | 8.5... 11.7 | 3 $n$ | Cg      |

Discovered with the 18½-inch. In S.D. 8.8 m. It is closely  $f$  the last pair.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3142)... $\beta$  (Pub. L. O. II)...Cogshall (...)]

$\beta$  971. *Draconis* 205

R.A. 18<sup>h</sup> 44<sup>m</sup> 24<sup>s</sup> }  
Decl. + 49° 18' }

|         |       |                 |            |                |         |
|---------|-------|-----------------|------------|----------------|---------|
| 1879.39 | 350.1 | "               | 8.0... 8.0 | 1 <sup>n</sup> | Cin     |
| 1879.88 | 354.7 | 0.54            | 6.5... 8.5 | 2 <sup>n</sup> | $\beta$ |
| 1891.48 | 364.5 | 0.36            | 6.8... 9.2 | 3 <sup>n</sup> | $\beta$ |
| 1893.54 | 107.0 | 0.25±           | ...        | 2 <sup>n</sup> | Lv      |
| 1894.61 |       | Single, 36-inch |            | 2 <sup>n</sup> | Bar     |
| 1897.43 | 11.6  | 0.30            | ...        | 1 <sup>n</sup> | Lew     |
| 1898.70 | 5.2   | 0.36            | 6.5... 9.0 | 1 <sup>n</sup> | A       |

Discovered with the 18½-inch. It is certainly a binary, and in rapid motion. In 1891 it had become a difficult pair with the 36-inch, and appeared to be rapidly closing. Three years later BARNARD found it single with the same instrument. Under fair conditions 1898.56 I could not see any certain elongation with the 40-inch. The single observation of AITKEN is noted as "very difficult and uncertain." The difference in magnitude of the components makes it a much more difficult pair than it would at first seem to be. The measures indicate that the plane of the orbit is nearly in the line of sight. This is B.A.C. 6421 = Lalande 35119.

( $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Cin<sup>5</sup>...Lv (*A. J. 382*)...Barnard (*A. J. 447*)...Lewis (*Mon. Not. LIX, 400*)...Aitken ( )...]

$\beta$  265. Lalande 35060

R.A. 18<sup>h</sup> 44<sup>m</sup> 38<sup>s</sup> }  
Decl. + 11° 23' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1875.29 | 235.9 | 1.46 | 7.1... 9.1 | 4 <sup>n</sup> | $\Delta$   |
| 1877.28 | 228.4 | 1.04 | 9... 10    | 3 <sup>n</sup> | H1         |
| 1879.55 | 235.1 | 1.36 | 7.0... 9.2 | 2 <sup>n</sup> | O $\Sigma$ |
| 1881.60 | 232.4 | 1.34 | 7.7... 9.3 | 3 <sup>n</sup> | $\beta$    |
| 1884.61 | 227.8 | 1.40 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1885.55 | 229.1 | 1.31 | ...        | 3 <sup>n</sup> | H1         |
| 1888.58 | 233.2 | 1.33 | 7.5... 9.8 | 2 <sup>n</sup> | Lv         |
| 1889.38 | 234.2 | 1.46 | ...        | 3 <sup>n</sup> | Maw        |
| 1898.65 | 233.3 | 1.38 | ...        | 2 <sup>n</sup> | Hu         |
| 1898.72 | 235.0 | 1.25 | 7.8... 9.8 | 3 <sup>n</sup> | Bd         |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The measures show no motion.

( $\beta$  (v)... $\beta$  (*Mon. Not. xxxv, 31*)... $\beta^4$ ... $\Delta$  (1)...Hall (I, II)...H $\Sigma$  ( )...O $\Sigma$  (*Poulkowa Obsns. x*)...Lv<sup>1</sup>...Maw (*Mem. R. A. S. L, 75*)...Hussey ( )...Boothroyd ( )...]

293.  $\beta$  *Lyrae*

R.A. 18<sup>h</sup> 45<sup>m</sup> 39<sup>s</sup> }  
Decl. + 33° 13' }

A and C

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1878.36 | 248.0 | 46.30 | ... 13   | 2 <sup>n</sup> | $\beta$ |
| 1898.65 | 247.6 | 47.13 | ... 13.2 | 3 <sup>n</sup> | A       |

A and B (=  $\Sigma$  39 App. 1)

|         |       |       |            |                 |          |
|---------|-------|-------|------------|-----------------|----------|
| 1835.23 | 149.8 | 45.77 | 3.0... 6.7 | 5 <sup>n</sup>  | $\Sigma$ |
| 1877.64 | 149.1 | 45.85 | ...        | 12 <sup>n</sup> | H1       |
| 1895.08 | 149.0 | 45.70 | ... 7.1    | 4 <sup>n</sup>  | Gl       |

A and D

|         |      |       |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1898.65 | 68.3 | 64.26 | ... 14.3 | 3 <sup>n</sup> | A |
|---------|------|-------|----------|----------------|---|

A and E

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1879.33 | 317.7 | 66.25 | ... 9.2 | 3 <sup>n</sup> | $\beta$ |
| 1898.65 | 317.8 | 67.22 | ... 9.7 | 3 <sup>n</sup> | A       |

A and F

|         |      |       |         |                |         |
|---------|------|-------|---------|----------------|---------|
| 1879.33 | 18.8 | 85.78 | ... 9.0 | 3 <sup>n</sup> | $\beta$ |
| 1898.66 | 19.0 | 86.28 | ... 9.0 | 2 <sup>n</sup> | A       |

The faint star, C, was noted with the Washington 26-inch; and the still fainter companion, D, was added by AITKEN with the 36-inch. AUWERS gives the proper motion of  $\beta$  *Lyrae*, 0".009 in the direction of 303°.6. Between 1835 and 1877 this would increase the distance of the HERSCHEL star about 0".6. As the line of motion is nearly identical with the direction of B, the position-angle would remain unchanged. The measures of these stars do not appear to show any trace of relative motion, and it is therefore probable that they have the same proper motion.

( $\beta$  (v)... $\beta$  (*Mon. Not. xxxv, 31*)... $\beta^1$ ... $\beta^3$ ...Aitken (3585)...]

The measures of AB (= H<sup>1</sup> V. 3 = Sh 281 =  $\Sigma$  39, App I = O $\Sigma$  (App) 275) will be found in the following:

[Herschel (*Mem. R. A. S. IV*)...Dawes (*Mem. R. A. S. xxxv*)...Radcliffe *Obsns. xxii, xxvi, xxviii*... $\Delta$  (11)...Ball (*Dunsink Obsns. Part v*)...Hall (I, p. 20)...Hunt (*Observatory III, 605*)...Engelmann (2662)...Tarrant (2866)...Jedrzejewicz (2340)...Franz (3080)...Glaserapp (I, II, III, IV)...]

**β 1033. v<sup>1</sup> Sagittarii**

R.A. 18<sup>h</sup> 46<sup>m</sup> 56<sup>s</sup> }  
Decl. - 22° 53' }

A and B

|         |       |      |              |                |     |
|---------|-------|------|--------------|----------------|-----|
| 1888.68 | 104.0 | 1.86 | 5.5 ... 11.0 | 1 <sup>n</sup> | β   |
| 1897.62 | 97.0  | 2.36 | 5 ... 13.9   | 2 <sup>n</sup> | See |
| 1898.48 | 96.0  | 2.54 | ... 10.9     | 4 <sup>n</sup> | A   |
| 1898.54 | 106.4 | 2.32 | ... 12       | 1 <sup>n</sup> | β   |

A and C (= H 5072)

|         |      |       |              |                |     |
|---------|------|-------|--------------|----------------|-----|
| 1837.5  | 60.3 | ...   | ...          |                | H   |
| 1877.66 | 59.5 | ...   | ...          | 1 <sup>n</sup> | Cin |
| 1878.52 | 57.8 | 29.00 | 4.5 ... 10.5 | 1 <sup>n</sup> | Cin |
| 1897.65 | 59.2 | 28.22 | ... 12.8     | 1 <sup>n</sup> | See |
| 1898.58 | 59.6 | 28.22 | ... 10.5     | 3 <sup>n</sup> | β   |

The close star was discovered with the 36-inch. The distance in the first measure by an error in reducing was printed in β (xiv) 1".37. It should have been as given above. The proper motion of the principal star is 0".043 in the direction of 243°.8 (AUWERS). This in the interval covered by the measures would diminish the angle of B 7° and increase the distance 0".3 if that star was fixed in space.

The foregoing are all the measures of the Herschel companion. The angle appears to have remained constant, but this would not be affected by the proper motion of A. The distance of C, if fixed in space, should be 2".6 more than at the time of HERSCHEL'S observation.

[β (xiv)...β (2875)...β (Pub. L. O. II)...See (3496)... Aitken (3585)...Cin<sup>4</sup>...Cin<sup>5</sup>...]

**β 421. W<sup>2</sup> XVIII. 1452**

R.A. 18<sup>h</sup> 48<sup>m</sup> 3<sup>s</sup> }  
Decl. + 43° 15' }

A and B

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1877.16 | 289.9 | 1.00 | 9.1 ... 9.3 | 4 <sup>n</sup> | Δ  |
| 1893.43 | 292.4 | 1.09 | 9.0 ... 9.4 | 2 <sup>n</sup> | W  |
| 1893.49 | 288.5 | 0.90 | 9.0 ... 9.2 | 2 <sup>n</sup> | Lv |
| 1898.48 | 290.8 | 1.02 | 9.2 ... 9.6 | 3 <sup>n</sup> | D  |

AB and C

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1893.43 | 230.8 | 39.05 | ... 9.2 | 2 <sup>n</sup> | W |
| 1898.48 | 229.9 | 39.04 | ... 9.1 | 3 <sup>n</sup> | D |

Discovered with the 6-inch. So far without change.

[β (vii)...β (2103)...Δ (i)...Wilson ( )...Lv (A.J. 382) ...Doolittle (Pub. Flower Obsy. I)...]

**β 646. I 13 Herculis**

R.A. 18<sup>h</sup> 49<sup>m</sup> 41<sup>s</sup> }  
Decl. + 22° 30' }

B and C

|         |       |      |               |                |    |
|---------|-------|------|---------------|----------------|----|
| 1877.53 | 159.2 | 7.0  | 12.5 ... 12.5 | 1 <sup>n</sup> | β  |
| 1892.71 | 332.4 | 6.48 | 12.0 ... 12.1 | 2 <sup>n</sup> | Ho |
| 1898.69 | 150.8 | ...  | 13.0 ... 13.5 | 1 <sup>n</sup> | D  |

A and B

|         |      |       |       |                |    |
|---------|------|-------|-------|----------------|----|
| 1878.68 | 34.2 | 35.48 | 6 ... | 1 <sup>n</sup> | β  |
| 1892.70 | 31.9 | 35.29 | 6 ... | 1 <sup>n</sup> | Ho |
| 1898.69 | 33.1 | 35.63 | ...   | 1 <sup>n</sup> | D  |

A and C

|         |      |       |     |                |   |
|---------|------|-------|-----|----------------|---|
| 1878.68 | 24.9 | 40.68 | ... | 1 <sup>n</sup> | β |
|---------|------|-------|-----|----------------|---|

Discovered with the 18½-inch. This star has a proper motion of 0".024 in the direction of 305°.8 (AUWERS).

[β (x). :β<sup>2</sup>...Hough (3234)...Doolittle (Pub. Flower Obsy. I)...]

**β 137. W<sup>2</sup> XVIII. 1503**

R.A. 18<sup>h</sup> 49<sup>m</sup> 48<sup>s</sup> }  
Decl. + 37° 14' }

A and B

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1875.33 | 123.8 | 1.15 | 8.2 ... 8.7 | 4 <sup>n</sup> | Δ   |
| 1875.68 | 123.9 | 1.15 | 8.2 ... 8.7 | 4 <sup>n</sup> | Sp  |
| 1880.47 | 126.9 | 1.10 | 8.3 ... 8.5 | 1 <sup>n</sup> | β   |
| 1883.57 | 130.2 | 1.45 | 8.0 ... 8.4 | 6 <sup>n</sup> | En  |
| 1888.77 | 127.8 | 1.17 | 8.0 ... 8.5 | 6 <sup>n</sup> | T   |
| 1891.49 | 130.0 | 1.14 | 8.3 ... 8.5 | 3 <sup>n</sup> | β   |
| 1896.60 | 132.3 | 1.34 | ...         | 3 <sup>n</sup> | Lew |
| 1896.77 | 136.7 | 1.47 | ...         | 1 <sup>n</sup> | Bow |
| 1897.44 | 128.2 | 1.47 | ...         | 1 <sup>n</sup> | Bow |
| 1897.46 | 130.6 | 1.24 | ...         | 2 <sup>n</sup> | Lew |
| 1898.47 | 127.9 | 1.29 | ...         | 1 <sup>n</sup> | Lew |
| 1898.59 | 131.9 | 1.13 | 8.8 ... 9.4 | 3 <sup>n</sup> | D   |
| 1898.62 | 127.3 | 1.29 | ...         | 1 <sup>n</sup> | Bow |

A and C

|         |       |       |          |    |         |
|---------|-------|-------|----------|----|---------|
| 1880.47 | 142.0 | 17.92 | ... 11.5 | 1n | $\beta$ |
| 1884.64 | 141.9 | 17.68 | ... 11.5 | 1n | En      |
| 1896.46 | 141.0 | 18.20 | ...      | 1n | Lew     |
| 1897.47 | 140.6 | 19.15 | ...      | 1n | Lew     |
| 1898.59 | 141.6 | 18.68 | ... 11.5 | 3n | D       |

Discovered with the 6-inch. There is no change in AB unless it is a slight advance in the angle.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Sp (2133)...Sp (II)...Engelmann (2678)...Tarrant (2991)...Doolittle (*Pub. Flower Obsy.* 1)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

$\beta$  972. Schj. 7042

R.A. 18<sup>h</sup> 49<sup>m</sup> 59<sup>s</sup> }  
Decl. — 0° 43' }

A and B

|         |     |      |             |    |         |
|---------|-----|------|-------------|----|---------|
| 1880.42 | 4.7 | 1.09 | 8.9... 9.6  | 5n | $\beta$ |
| 1892.70 | 5.3 | ...  | 8.5... 9.0  | 1n | Ho      |
| 1893.49 | 5.4 | 0.94 | 8.6... 9.4  | 2n | Lv      |
| 1893.65 | 3.0 | 1.20 | 9.0... 10.0 | 2n | W       |

A and C

|         |      |       |         |    |         |
|---------|------|-------|---------|----|---------|
| 1880.42 | 14.4 | 73.58 | ... 9.1 | 4n | $\beta$ |
| 1893.49 | 14.2 | 73.48 | ... 9.0 | 2n | Lv      |
| 1893.65 | 14.2 | 73.48 | ... 9.5 | 2n | W       |

Discovered with the 18½-inch.

[ $\beta$  (XIII)... $\beta^3$ ...Hough (3234)...Lv (*A. J.* 382)...Wilson ( )...]

$\beta$  647. D.M. (13°) 3816

R.A. 18<sup>h</sup> 50<sup>m</sup> 29<sup>s</sup> }  
Decl. + 13° 27' }

A and B

|         |      |      |            |    |          |
|---------|------|------|------------|----|----------|
| 1877.52 | 14.1 | 1±   | 9.0... 9.0 | 1n | $\beta$  |
| 1877.72 | 11.5 | 1.01 | 9.0... 9.2 | 2n | $\Delta$ |
| 1892.58 | 8.0  | 0.81 | 9.0... 9.0 | 1n | Ho       |
| 1898.57 | 10.3 | 1.16 | 9.0... 9.5 | 4n | A        |

AB and C

|         |       |       |         |    |          |
|---------|-------|-------|---------|----|----------|
| 1877.72 | 215.8 | 19.56 | ... 9.2 | 2n | $\Delta$ |
| 1885.56 | 217.2 | 19.30 | ...     | 3n | deB      |
| 1892.58 | 216.5 | 19.25 | ... 9.0 | 1n | Ho       |
| 1898.57 | 217.7 | 19.09 | ... 9.0 | 3n | A        |

Discovered with the 18½-inch. Change in distance of C?

[ $\beta$  (x)... $\beta'$ ... $\Delta$  (1)...Hough (3234)...de Ball (2753)...Aitken (3585)...]

$\beta$  1255. B.A.C. 6476

R.A. 18<sup>h</sup> 51<sup>m</sup> 37<sup>s</sup> }  
Decl. + 48° 43' }

|         |      |      |             |    |         |
|---------|------|------|-------------|----|---------|
| 1891.58 | 88.0 | 1.56 | 5.8... 12.5 | 3n | $\beta$ |
| 1898.56 | 88.8 | 1.56 | 6.0... 13.0 | 1n | $\beta$ |
| 1898.64 | 89.3 | 1.78 | 6.0... 12.5 | 3n | A       |

Discovered with the 36-inch. A naked-eye star in *Draco*. HEIS 6m; Harvard 5.9. The measures of LEWIS (*Mon. Not.* LIX, 420) evidently belong to some other pair.

[ $\beta$  (XVIII)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* II)...Aitken (3585)...]

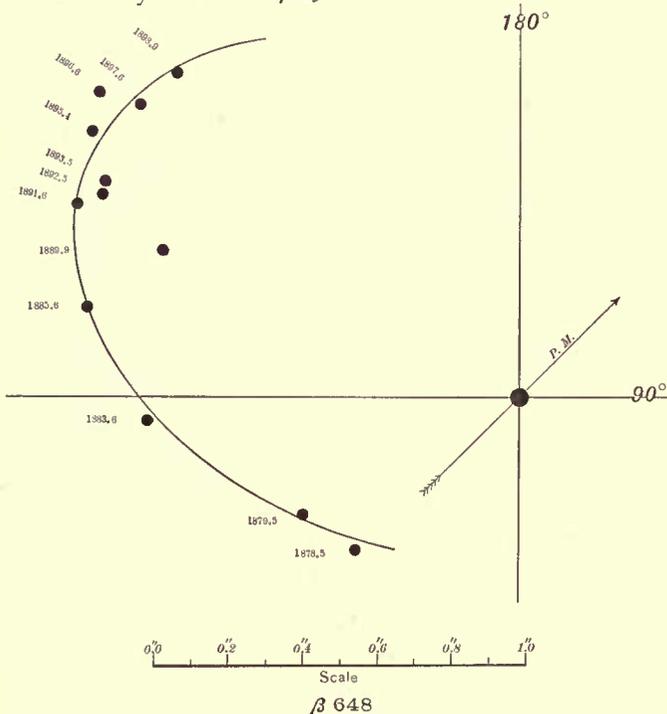
$\beta$  648. B.A.C. 6480

R.A. 18<sup>h</sup> 52<sup>m</sup> 30<sup>s</sup> }  
Decl. + 32° 45' }

|         |       |      |             |    |            |
|---------|-------|------|-------------|----|------------|
| 1878.47 | 312.5 | 0.60 | 6.0... 9.5  | 2n | $\beta$    |
| 1879.47 | 298.3 | 0.66 | 6.5... 9.0  | 1n | $\beta$    |
| 1883.64 | 273.4 | 1.00 | ...         | 2n | H $\Sigma$ |
| 1885.61 | 258.0 | 1.19 | ...         | 1n | H $\Sigma$ |
| 1889.87 | 247.4 | 1.04 | ...         | 1n | Sp         |
| 1891.33 | 247.7 | 1.26 | 6.0... 10.3 | 3n | $\beta$    |
| 1891.63 | 249.6 | 1.10 | 6.0... 9.5  | 3n | T          |
| 1891.84 | 241.4 | 1.37 | ...         | 1n | H $\Sigma$ |
| 1892.38 | 245.6 | 1.29 | 6.0... 9.2  | 5n | $\beta$    |
| 1892.70 | 242.5 | 1.21 | ...         | 4n | Sp         |
| 1893.43 | 246.1 | 1.26 | 6.0... 8.8  | 2n | W          |
| 1893.49 | 240.2 | 1.40 | 6.0... 8.8  | 2n | Lv         |
| 1893.77 | 240.8 | 1.12 | ...         | 1n | Sp         |
| 1894.78 | 237.9 | 1.22 | ...         | 4n | Sp         |
| 1895.90 | 237.9 | 1.49 | 6.0... 9.8  | 3n | Lew        |
| 1896.45 | 238.7 | 1.62 | ...         | 1n | $\beta$    |
| 1896.47 | 225.1 | 1.33 | ...         | 1n | Dy         |
| 1896.49 | 231.5 | 1.34 | ...         | 3n | A          |
| 1896.57 | 233.4 | 1.45 | 6.0... 8.8  | 3n | Lv         |
| 1896.62 | 233.2 | 1.27 | ...         | 4n | Lew        |
| 1896.77 | 232.6 | 1.30 | ...         | 3n | Sp         |
| 1897.44 | 229.1 | 1.36 | ...         | 1n | Bow        |
| 1897.54 | 231.2 | 1.14 | ...         | 4n | Lew        |
| 1897.70 | 229.8 | 1.33 | ...         | 3n | A          |
| 1897.74 | 235.5 | 1.40 | ...         | 2n | Br         |

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1898.40 | 227.7 | 1.33 | 6.2... 9.2 | 3 <sup>n</sup> | A   |
| 1898.54 | 230.2 | 1.50 | ...        | 1 <sup>n</sup> | Lew |
| 1898.67 | 228.3 | 1.24 | ...        | 2 <sup>n</sup> | Bry |
| 1898.92 | 228.2 | 1.21 | ... 9.5    | 2 <sup>n</sup> | β   |
| 1899.34 | 223.3 | 1.26 | 6.0... 9.0 | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. At that time it was a very difficult object, but in recent years the distance has considerably increased, and it has been measurable with moderate apertures. It was certain at the beginning that this was a binary system, since the two stars must have the same proper motion, as otherwise it would have been recorded as a double star long before. The principal star has an annual proper motion of 0".231 in the direction of 134°8 (PORTER). The maximum distance of the companion appears to have been reached, and the change in angle is now slow. It will be impossible to form any idea of the apparent orbit for some time to come, but there can be no doubt that this will be a most interesting physical system for investigation in the future. This is a naked-eye star near γ Lyrae.



[β (x)...β<sup>1</sup>...β (3114,3142)...β (Pub. L. O. II)...β (Observatory, Dec. 1891)...Sp (III)...Tarrant (3186)...Wilson ( )...Gaudibert (*L'Astronomie*, Sept. 1892)...Lv (*A. J.* 382, 407)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Aitken (3396,3585) (*A. J.* 429)...Lewis, Bowyer and Dyson (*Mon. Not.* LIX, 400)...Aitken ( )...HΣ ( )...Brown ( )...]

β 649. D.M. (32°) 3285

R.A. 18<sup>h</sup> 54<sup>m</sup> 24<sup>s</sup> }  
Decl. + 32° 18' }

|         |      |      |             |                |     |
|---------|------|------|-------------|----------------|-----|
| 1878.46 | 12.8 | 1.57 | 8.5... 11.7 | 2 <sup>n</sup> | β   |
| 1891.37 | 7.3  | 1.59 | 8.2... 10.6 | 3 <sup>n</sup> | β   |
| 1897.75 | 7.9  | 1.44 | ...         | 2 <sup>n</sup> | Lew |
| 1898.70 | 2.8  | 1.76 | ...         | 1 <sup>n</sup> | Bry |

Discovered with the 18½-inch. This pair is 13' s of γ Lyrae.

[β (x)...β<sup>1</sup>...β (3114)...β (Pub. L. O. II)...Lewis and Bryant (*Mon. Not.* LIX, 400)...]

β 973. D.M. (8°) 3945

R.A. 18<sup>h</sup> 55<sup>m</sup> 58<sup>s</sup> }  
Decl. + 8° 35' }

A and B

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1880.13 | 350.7 | 1.43 | 9.1... 12.0 | 5 <sup>n</sup> | β  |
| 1890.61 | 350.0 | 1.60 | 9.0... 11.6 | 3 <sup>n</sup> | β  |
| 1898.73 | 350.1 | 1.72 | 8.3... 12.5 | 3 <sup>n</sup> | Bd |

C and D (= Howe)

|         |       |      |              |                |     |
|---------|-------|------|--------------|----------------|-----|
| 1879.31 | 249.3 | ...  | 11.0... 12.0 | 1 <sup>n</sup> | Cin |
| 1880.13 | 262.7 | 2.90 | 11.4... 12.0 | 5 <sup>n</sup> | β   |
| 1890.61 | 260.1 | 3.24 | 11.0... 11.2 | 3 <sup>n</sup> | β   |
| 1898.73 | 261.2 | 3.77 | 11.8... 12.1 | 3 <sup>n</sup> | Bd  |

A and C

|         |      |       |     |                |    |
|---------|------|-------|-----|----------------|----|
| 1880.58 | 20.7 | 10.73 | ... | 3 <sup>n</sup> | β  |
| 1890.61 | 19.8 | 11.06 | ... | 3 <sup>n</sup> | β  |
| 1898.73 | 20.7 | 11.10 | ... | 3 <sup>n</sup> | Bd |

A and D (= Σ 2435)

|         |      |       |             |                |     |
|---------|------|-------|-------------|----------------|-----|
| 1827.67 | 12.3 | 10.25 | 8.5... 11.5 | 2 <sup>n</sup> | Σ   |
| 1847.66 | 12.3 | ...   | ...         | 1 <sup>n</sup> | Ma  |
| 1876.58 | 8.8  | 10.38 | ...         | 1 <sup>n</sup> | OΣ  |
| 1879.31 | 12.6 | 9.23  | ...         | 1 <sup>n</sup> | Cin |
| 1880.16 | 5.9  | 9.84  | ...         | 3 <sup>n</sup> | β   |
| 1890.60 | 12.2 | 10.10 | ...         | 2 <sup>n</sup> | β   |
| 1898.73 | 4.2  | 10.07 | ...         | 3 <sup>n</sup> | Bd  |

The smaller component of Σ 2435 was discovered to be double by HOWE at Cincinnati. In measuring this with the 18½-inch I found that the principal star was also double. There are but few measures of the STRUVE pair. In 1864 DEMBOWSKI was unable to see the companion. In 1873

I examined it with the 6-inch, and saw it without difficulty, and noted it as "certainly much brighter than 11.5m." It was called "extremely difficult" by OΣ in 1876.

So far there is no evidence of relative motion in either of the new pairs. All the measures of AD are given above.

[β (XIII)...β<sup>3</sup>...β (3048)...β (*Pub. L. O. 11*)...β (*Ast. Reg. XIX, 120*)...Cin<sup>5</sup>...Boothroyd ( )...Madler (*Fixstern-Systeme 11*)...Herschel (*Mem. R. A. S. xxxviii*)...Δ (1736)...OΣ (*Poulkowa Obsns. x*)...]

β 974. Schj. 7133

R.A. 18<sup>h</sup> 58<sup>m</sup> 53<sup>s</sup> }  
Decl. — 6° 21' }

|         |      |      |        |     |                |    |
|---------|------|------|--------|-----|----------------|----|
| 1880.60 | 87.8 | 0.72 | 9.4... | 9.8 | 3 <sup>n</sup> | β  |
| 1891.40 | 84.4 | 0.96 | 9.0... | 9.2 | 2 <sup>n</sup> | β  |
| 1898.69 | 87.5 | 0.91 | 8.2... | 9.8 | 3 <sup>n</sup> | Bd |

Discovered with the 18½-inch. There is a 12 m star about 25" distant in 100°.

[β (XIII)...β<sup>3</sup>...β (3114)...β (*Pub. L. O. 11*)...Boothroyd ( )...]

β 52. W<sup>a</sup> XVIII. 1804

R.A. 18<sup>h</sup> 58<sup>m</sup> 54<sup>s</sup> }  
Decl. + 25° 51' }

B and C

|         |       |      |         |      |                |    |
|---------|-------|------|---------|------|----------------|----|
| 1896.61 | 171.0 | 8.65 | 9.6...  | 11.5 | 3 <sup>n</sup> | Lv |
| 1898.73 | 171.5 | 8.90 | 10.3... | 11.2 | 5 <sup>n</sup> | D  |

A and B

|         |       |       |        |  |                |    |
|---------|-------|-------|--------|--|----------------|----|
| 1896.61 | 299.8 | 51.91 | 8.2... |  | 3 <sup>n</sup> | Lv |
| 1898.73 | 299.8 | 51.66 | 8.6... |  | 5 <sup>n</sup> | D  |

Discovered with the 6-inch. The distances are too great to make it an object of any interest. In the field with Σ 2444.

[β (1)...β (*Mon. Not. xxxiii, 351*)...Lv (*A. J. 407*)...Doolittle (*Pub. Flower Obsy. 1*)...]

β 1285. Lalande 35740

R.A. 18<sup>h</sup> 59<sup>m</sup> 31<sup>s</sup> }  
Decl. + 33° 58' }

A and B

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1899.31 | 295.1 | 11.10 | 7.1... | 13.3 | 3 <sup>n</sup> | β |
|---------|-------|-------|--------|------|----------------|---|

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1899.44 | 208.4 | 39.84 | ... | 10.5 | 1 <sup>n</sup> | β |
|---------|-------|-------|-----|------|----------------|---|

In my Mt. Hamilton observing book of May 27, 1892, I find this star noted with the 36-inch, "possibly a close pair. There is a faint star 10" or 12" p." I have looked at this a number of times with the 40-inch, and measured the distant companions as given above, but cannot say whether or not the large star is a close pair. Further observations with a large aperture are necessary to settle this point. ATKEN found the principal star single 1899.44 with the 36-inch on a good night with power of 1000.

β 466. W<sup>a</sup> XVIII. 1503

R.A. 18<sup>h</sup> 59<sup>m</sup> 34<sup>s</sup> }  
Decl. + 10° 39' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1877.73 | 165.1 | 1.71 | 9.2... | 10.0 | 2 <sup>n</sup> | Δ |
| 1891.77 | 165.9 | 1.84 | 8.5... | 9.0  | 2 <sup>n</sup> | β |

Discovered with the 6-inch.

[β (IX)...β (*Mon. Not. xxxviii, 78*)...β (3114)...β (*Pub. L. O. 11*)...Δ (1)...]

β 287. ζ *Aquilae*

R.A. 18<sup>h</sup> 59<sup>m</sup> 54<sup>s</sup> }  
Decl. + 13° 41' }

|         |      |      |        |     |      |                |     |
|---------|------|------|--------|-----|------|----------------|-----|
| 1874.60 | 58.9 | 5.53 | 3      | ... | 12   | 1 <sup>n</sup> | New |
| 1878.54 | 59.6 | 4.92 |        | ... | 12   | 3 <sup>n</sup> | β   |
| 1878.90 | 59.7 | 5.95 | 3.2... |     | 12   | 3 <sup>n</sup> | OΣ  |
| 1879.08 | 61.1 | 5.55 | 3      | ... | 15   | 3 <sup>n</sup> | H1  |
| 1879.53 | 60.1 | 4.74 |        | ... | 13   | 4 <sup>n</sup> | β   |
| 1885.68 | 62.4 | 5.64 |        | ... |      | 2 <sup>n</sup> | H1  |
| 1886.89 | 59.5 | 5.75 |        | ... |      | 8 <sup>n</sup> | HΣ  |
| 1889.43 | 57.3 | 5.63 |        | ... | 13   | 3 <sup>n</sup> | β   |
| 1894.38 | 57.0 | 6.18 |        | ... |      | 1 <sup>n</sup> | Bar |
| 1896.64 | 56.8 | 5.87 |        | ... |      | 4 <sup>n</sup> | Lew |
| 1898.61 | 59.0 | 5.98 |        | ... | 13.2 | 3 <sup>n</sup> | D   |

Discovered with the 26 inch at the Naval Observatory. AUWERS gives the proper motion of ζ *Aquilae*, 0".0967 in the direction of 203°.1. If the small star was stationary, in twenty years its position-angle would diminish 10°, and the distance increase 1".7 by virtue of the proper motion of A.

It is obvious from the measures that the two are moving together, as there has been no sensible relative change.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)...Newcombe (*Wash. Obsns.* 1874)...O $\Sigma$  (*Poulkowa Obsns.* x)...Hall (I, II)...II $\Sigma$  ( )...Barnard (*A. J.* 447)...Doolittle (*Pub. Flower Obsy.* I)...Lewis (*Mon. Not.* LIX, 400)...]

$\beta$  359. W<sup>2</sup> XVIII. 1849

R.A. 19<sup>h</sup> 0<sup>m</sup> 7<sup>s</sup> }  
Decl. + 23° 15' }

|         |      |      |             |       |          |
|---------|------|------|-------------|-------|----------|
| 1876.97 | 82.6 | 4.29 | 8.8... 10.0 | 6 $n$ | $\Delta$ |
| 1891.77 | 86.4 | 3.84 | 8.4... 9.3  | 2 $n$ | $\beta$  |
| 1898.73 | 81.7 | 4.20 | 8.9... 9.7  | 4 $n$ | D        |

Discovered with the 6-inch.

[ $\beta$  (VI)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Doolittle (*Pub. Flower Obsy.* I)...]

$\beta$  1204. *Aquilae* 56

R.A. 19<sup>h</sup> 6<sup>m</sup> 1<sup>s</sup> }  
Decl. + 2° 25' }

A and B

|         |     |           |            |       |         |
|---------|-----|-----------|------------|-------|---------|
| 1890.56 | 3.8 | 0.44      | 7.7... 8.5 | 3 $n$ | $\beta$ |
| 1893.24 | 5.7 | 0.3 $\pm$ | ...        | 2 $n$ | Sp      |
| 1898.74 | 8.6 | 0.38      | 7.5... 8.0 | 2 $n$ | A       |

A and C

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1890.57 | 195.0 | 12.89 | ... 14.0 | 4 $n$ | $\beta$ |
| 1898.76 | 197.1 | 13.03 | ... 14.2 | 3 $n$ | A       |

A and D

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1890.61 | 159.9 | 21.23 | ... 14.8 | 3 $n$ | $\beta$ |
| 1898.76 | 160.6 | 21.24 | ... 14.8 | 2 $n$ | A       |

A and E

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1890.57 | 317.4 | 26.30 | ... 14.2 | 2 $n$ | $\beta$ |
| 1898.76 | 315.6 | 26.65 | ... 14.5 | 2 $n$ | A       |

A and F

|         |       |       |          |       |         |
|---------|-------|-------|----------|-------|---------|
| 1890.57 | 292.5 | 27.77 | ... 14.0 | 3 $n$ | $\beta$ |
| 1898.76 | 291.1 | 27.82 | ... 14.0 | 2 $n$ | A       |

A and G (=  $\Sigma$  2476)

|         |       |       |             |       |                |
|---------|-------|-------|-------------|-------|----------------|
| 1828.65 | 209.3 | 26.47 | 6.7... 11   | 1 $n$ | H <sup>2</sup> |
| 1830.61 | 214.7 | 31.41 | 6.2... 11.0 | 2 $n$ | $\Sigma$       |
| 1843.70 | 214.3 | 32.38 | ...         | 1 $n$ | Ma             |
| 1866.70 | 214.1 | 31.88 | 6.2... 11.2 | 3 $n$ | $\Delta$       |
| 1879.58 | 213.2 | 31.42 | 7.0... 10.7 | 2 $n$ | Cin            |
| 1890.55 | 213.8 | 31.36 | 7.1... 10.2 | 2 $n$ | $\beta$        |
| 1898.76 | 214.0 | 31.52 | ... 10.2    | 3 $n$ | A              |

The principal star of  $\Sigma$  2476 was found to be a close pair with the 36-inch. That instrument shows four other stars nearer the STRUVE companion. There is no change in this star since the first measures by STRUVE. All the measures are given above. The principal star is Lalande 36008.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* II)...Aitken (3585)...Sp (III)...Herschel (*Mem. R. A. S.* v)...Madler (*Fixstern-Systeme* I) (*Dorpat Obsns.* XI)... $\Delta$  (II)...Cin<sup>5</sup>...]

$\beta$  138. Lalande 36013

R.A. 19<sup>h</sup> 6<sup>m</sup> 37<sup>s</sup> }  
Decl. - 14° 39' }

|         |       |      |             |       |          |
|---------|-------|------|-------------|-------|----------|
| 1875.07 | 278.3 | 1.54 | 7.5... 10.9 | 4 $n$ | $\Delta$ |
| 1877.57 | 280.2 | 1.26 | 7.5... 10.0 | 1 $n$ | Cin      |
| 1880.59 | 281.7 | 1.09 | 8.0... 10.0 | 1 $n$ | Cin      |
| 1892.58 | 280.5 | 0.79 | 8.0... 10.0 | 1 $n$ | Ho       |
| 1893.75 | 289.8 | 1.14 | 8.0... 10.0 | 3 $n$ | W        |
| 1898.57 | 288.6 | 1.27 | 7.2... 10.2 | 3 $n$ | A        |
| 1898.71 | 277.2 | 1.05 | 7.1... 10.8 | 2 $n$ | D        |

Discovered with the 6-inch. The measures are not very accordant, and further observations are needed to show whether or not there is any motion.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (I)...Cin<sup>4</sup>...Cin<sup>6</sup>...Hough (3234)...Wilson ( )...Aitken (3585)...Doolittle (*Pub. Flower Obsy.* I)...]

$\beta$  139. *Aquilae* 59

R.A. 19<sup>h</sup> 7<sup>m</sup> 12<sup>s</sup> }  
Decl. + 16° 39' }

A and B

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1874.70 | 140.7 | 0.79 | ...        | 2 $n$ | New      |
| 1875.58 | 137.4 | 0.59 | 6.7... 8.0 | 5 $n$ | Sp       |
| 1875.88 | 139.5 | 0.72 | 6.7... 8.0 | 6 $n$ | $\Delta$ |
| 1883.66 | 140.9 | 0.56 | 8.0... 8.2 | 2 $n$ | Ho       |
| 1887.63 | 140.2 | 0.53 | ...        | 4 $n$ | Sp       |
| 1888.73 | 140.5 | 0.61 | ...        | 3 $n$ | Sp       |
| 1888.76 | 140.0 | 0.58 | 7.0... 8.0 | 4 $n$ | T        |
| 1898.57 | 140.9 | 0.84 | 7.2... 8.1 | 4 $n$ | A        |
| 1898.85 | 140.2 | 0.61 | ...        | 1 $n$ | Maw      |

AB and C (= OΣ (App.) 177)

|         |       |        |        |     |                |    |
|---------|-------|--------|--------|-----|----------------|----|
| 1874.96 | 288.3 | 120.76 | ...    | 7.5 | 3 <sup>n</sup> | Δ  |
| 1891.08 | 287.1 | 118.07 | 6.7... | 7.7 | 4 <sup>n</sup> | Fr |
| 1898.56 | 286.5 | 116.54 | ...    | 7.0 | 2 <sup>n</sup> | A  |

The principal star of this very wide pair of bright stars was found to be a close double with the 6-inch. The measures, so far, show no change. There are several other faint stars nearer than C; one a 13<sup>m</sup> star from AB, 103.6 : 27.75 (1899.44). The change in C is due to proper motion. All the measures are given. AUWERS gives the proper motions of the two bright stars:

|    |       |    |       |   |         |       |
|----|-------|----|-------|---|---------|-------|
| AB | 0.030 | in | 270.0 | = | Lalande | 36081 |
| C  | 0.223 | in | 148.5 | = | Lalande | 36074 |

[β (III)...β (Mon. Not. xxxiv, 59)...Newcomb (*Wash. Obsns* 1874)...Sp (II, app)...Sp (2133)...Δ (I)...Δ (2086)...Hough (2978)...Sp (III)...Tarrant (2991)...Franz. (3464)...Rechenberg (3482)...Maw (*Mem. R. A. S.* LIII)...Aitken (3585)...]

β 422. O. Arg. S. 19281

R.A. 19<sup>h</sup> 7<sup>m</sup> 43<sup>s</sup> }  
Decl. - 18° 16' }

|         |      |       |        |      |                |     |
|---------|------|-------|--------|------|----------------|-----|
| 1879.54 | 44.1 | ...   | 8.0... | 12.0 | 1 <sup>n</sup> | Cin |
| 1891.57 | 44.6 | 12.40 | 8.2... | 11.8 | 3 <sup>n</sup> | β   |
| 1898.54 | 42.0 | 12.61 | 7.6... | 9.9  | 3 <sup>n</sup> | D   |

Discovered with the 6-inch.

[β (VII)...β (2103,3114)...β (Pub. L. O. II)...Cin<sup>5</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

β 975. Lalande 36263

R.A. 19<sup>h</sup> 10<sup>m</sup> 4<sup>s</sup> }  
Decl. + 34° 21' }

B and C

|         |       |      |         |      |                |    |
|---------|-------|------|---------|------|----------------|----|
| 1880.59 | 221.8 | 0.77 | ...     | 9.4  | 3 <sup>n</sup> | β  |
| 1881.63 | 220.3 | 0.82 | 10.0... | 10.2 | 3 <sup>n</sup> | Ho |
| 1890.63 | 222.3 | 0.83 | 9.3...  | 10.2 | 3 <sup>n</sup> | β  |

A and BC (= OΣ 367 rej.)

|         |       |       |        |        |                |    |
|---------|-------|-------|--------|--------|----------------|----|
| 1843.66 | 229.5 | 33.73 | ...    |        | 1 <sup>n</sup> | Ma |
| 1866.86 | 228.1 | 33.57 | 6.8... | 9.3    | 3 <sup>n</sup> | Δ  |
| 1880.59 | 228.0 | 33.42 | 7.4... | 8.9    | 2 <sup>n</sup> | β  |
| 1881.62 | 226.6 | 33.54 | 8      | ... 10 | 1 <sup>n</sup> | Ho |
| 1890.63 | 227.3 | 33.34 | 7.5... |        | 1 <sup>n</sup> | β  |

The close pair was discovered with the 18½-inch. There seems to be no material change in this or in OΣ 367 rej. This was excluded from the last edition of the *Poulkowa Catalogue* by reason of the distance between the components. All the measures of these stars are given above. HOUGH measures a 12<sup>m</sup> star from A, 68.4 : 22.95 (1881.26) 1<sup>n</sup>.

[β (XIII)...β<sup>3</sup>...β (2341,3048)...β (Pub. L. O. II)...Hough (2978)...Madler (*Dorpat Obsns.* XI)...Δ (I)...]

β 140. Lalande 36185

R.A. 19<sup>h</sup> 10<sup>m</sup> 12<sup>s</sup> }  
Decl. - 11° 11' }

B and C

|         |       |      |         |      |                |     |
|---------|-------|------|---------|------|----------------|-----|
| 1879.54 | 206.9 | ...  | ...     | 11.0 | 1 <sup>n</sup> | Cin |
| 1891.56 | 209.3 | 7.18 | 11.0... | 11.2 | 2 <sup>n</sup> | β   |
| 1896.66 | 208.6 | 7.66 | 10.9... | 11.6 | 3 <sup>n</sup> | Lv  |
| 1898.59 | 209.6 | 7.13 | ...     |      | 2 <sup>n</sup> | β   |
| 1898.66 | 209.8 | 7.35 | 10.7... | 11.2 | 3 <sup>n</sup> | D   |

A and B

|         |       |       |        |      |                |     |
|---------|-------|-------|--------|------|----------------|-----|
| 1879.54 | 317.9 | 33.98 | 8.0... | 12.0 | 1 <sup>n</sup> | Cin |
| 1891.55 | 326.9 | 36.87 | 7.6... |      | 3 <sup>n</sup> | β   |
| 1896.66 | 324.9 | 37.30 | ...    |      | 3 <sup>n</sup> | Lv  |
| 1898.59 | 325.5 | 37.26 | ...    |      | 2 <sup>n</sup> | β   |
| 1898.66 | 325.9 | 37.46 | 7.2... |      | 3 <sup>n</sup> | D   |

Discovered with the 6-inch. There appears to be no change in either companion. There is evidently an error in the first distance of AB. With a correction of one revolution in reading the micrometer, the distance would become 37".34.

[β (III)...β (Mon. Not. xxxiv, 59)...β (3114)...β (Pub. L. O. II)...Cin<sup>5</sup>...Lv (A. J. 407)...Doolittle (*Pub. Flower Obsy.* 1)...]

β 1256. W. XIX. 265

R.A. 19<sup>h</sup> 12<sup>m</sup> 36<sup>s</sup> }  
Decl. + 6° 7' }

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1891.56 | 37.1 | 0.64 | 8.3... | 8.3 | 3 <sup>n</sup> | β   |
| 1893.77 | 38.2 | 0.5± | ...    |     | 1 <sup>n</sup> | Sp  |
| 1898.59 | 36.8 | 0.71 | 8.4... | 8.9 | 3 <sup>n</sup> | A   |
| 1898.74 | 36.1 | 0.60 | ...    |     | 1 <sup>n</sup> | Bry |

Discovered with the 36-inch. The planetary nebula, Dreyer 6781, is 12' n.

[β (XVIII)...β (3113)...Sp (III)...Aitken (3585)...Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  248. 2 *Vulpeculae*

R.A.  $19^{\text{h}} 12^{\text{m}} 39^{\text{s}}$  }  
Decl.  $+ 22^{\circ} 49'$  }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1876.11 | 125.0 | 1.86 | 5.7... 9.5 | 6 <sup>n</sup> | $\Delta$   |
| 1879.43 | 127.8 | 1.89 | 6.0... 9.5 | 1 <sup>n</sup> | $\beta$    |
| 1879.58 | 124.2 | 1.79 | 5.8... 9.3 | 4 <sup>n</sup> | O $\Sigma$ |
| 1881.64 | 124.7 | 1.78 | 6 ... 10   | 2 <sup>n</sup> | Ho         |
| 1883.82 | 120.0 | 1.8  | ...        | 1 <sup>n</sup> | Perry      |
| 1884.11 | 130.5 | 2.08 | 6.1... 9.2 | 6 <sup>n</sup> | En         |
| 1885.26 | 128.1 | 1.94 | ...        | 5 <sup>n</sup> | H $\Sigma$ |
| 1887.76 | 134.2 | 2.12 | 5.7... 9.3 | 6 <sup>n</sup> | T          |
| 1888.68 | 125.1 | 1.69 | ...        | 2 <sup>n</sup> | Maw        |
| 1888.72 | 128.2 | 2.00 | 5.5... 9.5 | 5 <sup>n</sup> | T          |
| 1889.51 | 125.9 | 1.70 | ...        | 6 <sup>n</sup> | Sp         |
| 1890.63 | 125.4 | 1.86 | ...        | 3 <sup>n</sup> | $\beta$    |
| 1891.71 | 126.8 | 1.92 | ...        | 2 <sup>n</sup> | Col        |
| 1896.85 | 129.6 | 1.84 | ...        | 2 <sup>n</sup> | Maw        |
| 1898.73 | 127.7 | 1.97 | ...        | 3 <sup>n</sup> | D          |

Discovered with the 6-inch. A fine pair with a moderate aperture, but so far the measures do not show any relative change. The authorities assign no proper motion to the principal star.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)... $\Delta$  (2086)...O $\Sigma$  (*Pub. Poulkova Obsy.* x)...Hough (2978)...Perry (*Eng. Mech.* xxxvi, 65; xxxix, 11)...H $\Sigma$  ( )...Engelmann (2678)...Tarrant (2899,2991)...Maw (*Mem. R. A. S. L.*)...Sp (111)...Collins (*Proc. Haverford Coll. Obsy.* 1891)...Doolittle (*Pub. Flower Obsy.* 1)...Maw (*Mem. R. A. S. L.*111)...]

 $\beta$  360. Rümker 7334

R.A.  $19^{\text{h}} 14^{\text{m}} 19^{\text{s}}$  }  
Decl.  $+ 35^{\circ} 0'$  }

## A and B

|         |      |      |             |                |          |
|---------|------|------|-------------|----------------|----------|
| 1876.61 | 72.2 | 6.27 | 8.4... 10.0 | 4 <sup>n</sup> | $\Delta$ |
| 1891.77 | 71.8 | 6.48 | 8.4... 9.7  | 2 <sup>n</sup> | $\beta$  |
| 1899.44 | 70.7 | 6.58 | 8.5... 8.8  | 1 <sup>n</sup> | $\beta$  |

## A and C

|         |       |       |          |                |          |
|---------|-------|-------|----------|----------------|----------|
| 1876.61 | 343.4 | 36.57 | ... 10.6 | 4 <sup>n</sup> | $\Delta$ |
| 1891.77 | 342.1 | 36.45 | ... 11.5 | 2 <sup>n</sup> | $\beta$  |
| 1899.44 | 343.1 | 36.94 | ... 8.9  | 1 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Unchanged. The principal star is D.M. ( $34^{\circ}$ ) 3494; magnitude 8.2.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...]

 $\beta$  141. Lalande 36553

R.A.  $19^{\text{h}} 16^{\text{m}} 50^{\text{s}}$  }  
Decl.  $+ 22^{\circ} 17'$  }

## A and B

|         |      |      |            |                |            |
|---------|------|------|------------|----------------|------------|
| 1875.71 | 81.4 | 0.70 | 7.5... 9.0 | 4 <sup>n</sup> | Sp         |
| 1875.97 | 80.6 | 0.71 | 7.5... 9.1 | 6 <sup>n</sup> | $\Delta$   |
| 1876.56 | 76.7 | 0.77 | 7.5... 8.5 | 1 <sup>n</sup> | O $\Sigma$ |
| 1885.71 | 85.6 | 0.84 | ...        | 6 <sup>n</sup> | H $\Sigma$ |
| 1887.71 | 82.5 | 0.69 | ...        | 2 <sup>n</sup> | Sp         |
| 1888.72 | 78.5 | 0.64 | ...        | 3 <sup>n</sup> | Sp         |
| 1890.64 | 79.2 | 0.80 | 7.5... 8.5 | 3 <sup>n</sup> | $\beta$    |
| 1897.57 | 81.6 | 0.84 | ...        | 1 <sup>n</sup> | Lew        |
| 1897.95 | 78.9 | 0.86 | ...        | 1 <sup>n</sup> | Bry        |
| 1898.59 | 80.0 | 0.86 | 7.2... 8.5 | 3 <sup>n</sup> | A          |

## C and D

|         |       |      |              |                |     |
|---------|-------|------|--------------|----------------|-----|
| 1897.57 | 183.0 | 5.75 | 10.2... 10.5 | 1 <sup>n</sup> | Lew |
| 1897.95 | 181.7 | 5.39 | ...          | 1 <sup>n</sup> | Bry |
| 1898.59 | 177.2 | 4.90 | 12.0... 12.7 | 3 <sup>n</sup> | A   |

## AB and C (= H 2867)

|         |       |          |          |                |          |
|---------|-------|----------|----------|----------------|----------|
| 1830    | 329.5 | 20 $\pm$ | 9 ... 15 | 1 <sup>n</sup> | H        |
| 1875.27 | 335.2 | 26.53    | ... 11.5 | 1 <sup>n</sup> | $\Delta$ |
| 1898.59 | 333.8 | 28.75    | ...      | 2 <sup>n</sup> | A        |

## AB and E

|         |      |       |          |                |          |
|---------|------|-------|----------|----------------|----------|
| 1877.78 | 90.5 | 50.75 | ... 11.0 | 1 <sup>n</sup> | $\Delta$ |
| 1898.59 | 90.5 | 50.28 | ... 9.7  | 3 <sup>n</sup> | A        |

## AB and F

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1898.64 | 214.4 | 50.22 | ... 12.5 | 1 <sup>n</sup> | A |
|---------|-------|-------|----------|----------------|---|

The principal star of H 2867 was found to be a close pair with the 6-inch; and the 36-inch shows a faint attendant to the other star.

[ $\beta$  (111)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Sp (11 app; 111)...O $\Sigma$  (*Poulkova Obsns.* x)...Aitken (3585)...Lewis and Bryant (*Mon. Not.* lxx, 400)...]

 $\beta$  1129. Groombridge 2829

R.A.  $19^{\text{h}} 18^{\text{m}} 51^{\text{s}}$  }  
Decl.  $+ 52^{\circ} 9'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1889.48 | 344.3 | 0.34 | 6.3... 6.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.62 | 340.0 | 0.44 | 6.5... 6.5 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. The *Ast. Gess. Catalogue* gives the proper motion of this star

0".054 in the direction of  $36^{\circ}2$ . If that is substantially correct, this is a physical system. If either component was fixed, this movement of the other star would change the position-angle in the above interval not less than  $80^{\circ}$ . The magnitude in D.M. is 7.1.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Aitken (3585)...]

$\beta$  423. O. Arg. S. 19560

R.A.  $19^{\text{h}} 20^{\text{m}} 18^{\text{s}}$  }  
Decl.  $-29^{\circ} 44'$  }

|         |       |      |          |     |            |     |
|---------|-------|------|----------|-----|------------|-----|
| 1878.63 | 122.3 | 1.25 | 7.5...   | 8.5 | 2 <i>n</i> | Cin |
| 1886.78 | 124.3 | 1.27 | ...      |     | 1 <i>n</i> | LM  |
| 1893.68 | 125.4 | 1.09 | 9 ... 10 |     | 2 <i>n</i> | Sel |
| 1897.70 | 124.9 | 1.31 | 7.1...   | 8.6 | 1 <i>n</i> | See |
| 1898.63 | 126.5 | 1.26 | 8.7...   | 9.2 | 3 <i>n</i> | D   |

Discovered with the 6-inch. Apparently without material change.

[ $\beta$  (vii)... $\beta$  (2103)...Cin<sup>4</sup>...Cin<sup>6</sup>...LM...Sellors (3240)... See (3496)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  142. (=Schj. 28). *Aquilae* 106

R.A.  $19^{\text{h}} 21^{\text{m}} 30^{\text{s}}$  }  
Decl.  $-12^{\circ} 23'$  }

|         |       |      |        |     |            |          |
|---------|-------|------|--------|-----|------------|----------|
| 1874.08 | 317.7 | 1.37 | 7.9... | 8.2 | 5 <i>n</i> | $\Delta$ |
| 1878.89 | 319.6 | 1.37 | 7.8... | 8.0 | 3 <i>n</i> | Cin      |
| 1879.16 | 319.5 | 1.58 | 8.0... | 8.2 | 4 <i>n</i> | Sp       |
| 1882.54 | 324.3 | 1.68 | 7.7... | 8.0 | 4 <i>n</i> | W        |
| 1883.62 | 325.8 | 1.10 | 7.0... | 7.2 | 3 <i>n</i> | Ho       |
| 1886.54 | 327.6 | 1.68 | 8.0... | 8.2 | 1 <i>n</i> | LM       |
| 1888.54 | 328.3 | 1.60 | 7.8... | 7.9 | 3 <i>n</i> | Lv       |
| 1888.70 | 326.3 | 1.47 | 7.7... | 8.0 | 3 <i>n</i> | T        |
| 1893.49 | 330.8 | 1.53 | 7.4... | 7.9 | 3 <i>n</i> | Lv       |
| 1896.50 | 333.8 | 1.56 | 7.7... | 8.0 | 2 <i>n</i> | Lv       |
| 1896.51 | 331.4 | 1.62 | 7.5... | 7.6 | 2 <i>n</i> | Soulé    |
| 1897.69 | 332.7 | 1.53 | ...    |     | 4 <i>n</i> | Scott    |
| 1898.65 | 333.5 | 1.55 | ...    |     | 2 <i>n</i> | Scott    |

Found with the 6-inch, and given in  $\beta$  (iii) before I was aware of the fact that it had been discovered and published long before by SCHJELLERUP. It is given here in order to say that hereafter it should be referred to as Schj. 28, which is the number in his list of new pairs in A.N. 1485. There has been some confusion in regard to his numbers from the fact of two lists having been printed

which are not identical. The other list is unnumbered, and is found in the introduction to his *Catalogue of 10,000 Stars*. Each list contains some stars not found in the other, but all the doubles of any consequence are given in A.N., and as those stars have a current number, that list was probably intended by the author to be used for future reference. Two of the pairs given in the catalogue and repeated in the A.N. list are identical with double stars in HERSCHEL and STRUVE, and it was doubtless the purpose to exclude all previously known pairs, but that has not been entirely done. No. 1 is H 658; No. 5 is  $\Sigma$  1077; and Nos. 15 to 18 inclusive are respectively  $\Sigma$  3090,  $\Sigma$  3094,  $\Sigma$  3096, and  $\Sigma$  3101.

The measures of the pair given above show slow, direct angular movement. This star is Lalande 36712.

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (i)...Cin<sup>5</sup>...Sp (ii) ...Wilson (Cin<sup>10</sup>)...Hough (2978)...LM...Lv<sup>1</sup>...Lv (*Sid. Mess.* viii, 77) (*A. J.* 382,407)...Tarrant (2991)... Soulé (*A. J.* 410)...Scott (*Mon. Not.* LIX, 427)...]

$\beta$  1286. W<sup>2</sup> XIX. 629

R.A.  $19^{\text{h}} 21^{\text{m}} 39^{\text{s}}$  }  
Decl.  $+35^{\circ} 41'$  }

B and C

|         |      |      |        |      |            |         |
|---------|------|------|--------|------|------------|---------|
| 1899.48 | 67.4 | 1.59 | 9.3... | 12.5 | 3 <i>n</i> | $\beta$ |
|---------|------|------|--------|------|------------|---------|

A and B

|         |       |      |        |  |            |         |
|---------|-------|------|--------|--|------------|---------|
| 1899.48 | 118.5 | 5.90 | 8.6... |  | 3 <i>n</i> | $\beta$ |
|---------|-------|------|--------|--|------------|---------|

Discovered with the 40-inch in looking for the next pair ( $\beta$  424), which is closely *nf*. This star is noted "duplex 10" in WEISSE. As the distance is now less than 6", there may be some change from proper motion or otherwise.

$\beta$  424. W<sup>2</sup> XIX. 676

R.A.  $19^{\text{h}} 23^{\text{m}} 5^{\text{s}}$  }  
Decl.  $+35^{\circ} 49'$  }

|         |      |      |        |      |            |          |
|---------|------|------|--------|------|------------|----------|
| 1877.14 | 38.0 | 2.76 | 8.7... | 10.1 | 4 <i>n</i> | $\Delta$ |
| 1891.77 | 40.1 | 2.60 | 8.7... | 9.3  | 2 <i>n</i> | $\beta$  |
| 1899.44 | 39.5 | 2.62 | 8.6... | 9.1  | 2 <i>n</i> | $\beta$  |

Discovered with the 6-inch. Without change.

[ $\beta$  (vii)... $\beta$  (2103,3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (i)...]

**β 651.** D.M. (27°) 3409

R.A. 19<sup>h</sup> 25<sup>m</sup> 44<sup>s</sup> }  
Decl. + 28° 2' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1878.47 | 291.5 | 6.36 | 8.5...12.5 | 1 <sup>n</sup> | β |
| 1892.38 | 288.6 | 6.44 | 8.4...11.4 | 2 <sup>n</sup> | β |

Discovered with the 18½-inch. This is 19.5 *n* of β Cygni.

[β (x)...β<sup>1</sup>...β (3142)...β (Pub. L. O. II)...]

**β 650.** Lalande 36058

R.A. 19<sup>h</sup> 26<sup>m</sup> 20<sup>s</sup> }  
Decl. + 6° 15' }

## A and B

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1877.52 | 142.0 | 7.4± | 8.5...11.8 | 1 <sup>n</sup> | β |
| 1891.49 | 143.7 | 6.61 | 8.1...11.6 | 2 <sup>n</sup> | β |
| 1898.52 | 145.4 | 6.43 | 8.7...11.2 | 3 <sup>n</sup> | D |

## A and C

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1877.52 | 332.6 | 10±   | ...     | 1 <sup>n</sup> | β |
| 1891.49 | 332.3 | 11.61 | ...13   | 2 <sup>n</sup> | β |
| 1898.52 | 331.8 | 11.59 | ...12.3 | 3 <sup>n</sup> | D |

## A and D

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1877.52 | 252.8 | 25±   | ...     | 1 <sup>n</sup> | β |
| 1891.49 | 254.5 | 26.63 | ...10   | 2 <sup>n</sup> | β |
| 1898.52 | 253.3 | 26.67 | ...10.1 | 3 <sup>n</sup> | D |

Discovered with the 18½-inch. In the first instance the principal star was erroneously identified with Lalande 36918. The correct place is given above.

[β (x)...β<sup>1</sup>...β (3114)...β (Pub. L. O. II)...Doolittle (Pub. Flower Obsy. 1)...]

**β 976.** *Aquilae* 122

R.A. 19<sup>h</sup> 26<sup>m</sup> 27<sup>s</sup> }  
Decl. + 9° 5' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1880.59 | 105.0 | 2.01 | 7.0...10.8 | 4 <sup>n</sup> | β  |
| 1889.87 | 106.0 | 2.18 | ...        | 1 <sup>n</sup> | Sp |
| 1891.42 | 104.3 | 2.16 | 7.2...10.7 | 3 <sup>n</sup> | β  |

Discovered with the 18½-inch. Lalande 36963.

[β (XIII)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Sp (III)...]

**β 143.** Lalande 37049

R.A. 19<sup>h</sup> 26<sup>m</sup> 39<sup>s</sup> }  
Decl. + 49° 15' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.61 | 192.7 | 2.20 | 8.0... 9.1 | 4 <sup>n</sup> | Δ  |
| 1893.51 | 192.9 | 2.15 | 7.8... 8.7 | 3 <sup>n</sup> | Lv |
| 1898.45 | 193.2 | 2.21 | 9.0... 9.6 | 3 <sup>n</sup> | D  |

Discovered with the 6-inch. Probably fixed.

β (III)...β (Mon. Not. xxxiv, 59)...Δ (1)...Lv (A. J. 382)  
...Doolittle (Pub. Flower Obsy. 1)...]

**β 438.** D.M. (36°) 3588

R.A. 19<sup>h</sup> 27<sup>m</sup> 3<sup>s</sup> }  
Decl. + 36° 27' }

## A and B

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1879.46 | 40.9 | 4.37 | ...13      | 1 <sup>n</sup> | β |
| 1891.53 | 40.5 | 4.05 | 7.9...12.7 | 2 <sup>n</sup> | β |

## A and C

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1878.47 | 238.5 | 21.09 | ...13   | 1 <sup>n</sup> | β |
| 1891.52 | 236.7 | 21.52 | ...12.8 | 2 <sup>n</sup> | β |

## A and D (= Σ 2538)

|         |       |       |            |                |     |
|---------|-------|-------|------------|----------------|-----|
| 1830.85 | 245.2 | 53.04 | 8.2... 8.3 | 2 <sup>n</sup> | Σ   |
| 1866.35 | 247.4 | 52.86 | 8.1... 8.4 | 3 <sup>n</sup> | Δ   |
| 1886.57 | 246.1 | 52.91 | 7.9... 8.3 | 3 <sup>n</sup> | Per |
| 1891.53 | 246.0 | 53.04 | ...        | 2 <sup>n</sup> | β   |

## D and E

|         |      |      |         |                |     |
|---------|------|------|---------|----------------|-----|
| 1830.87 | 52.5 | 6.08 | ... 8.7 | 3 <sup>n</sup> | Σ   |
| 1866.35 | 53.3 | 6.08 | ... 8.6 | 3 <sup>n</sup> | Δ   |
| 1886.57 | 51.3 | 6.05 | ... 8.5 | 3 <sup>n</sup> | Per |
| 1891.51 | 53.8 | 6.06 | ... 8.0 | 2 <sup>n</sup> | β   |

## A and E

|         |       |       |     |                |    |
|---------|-------|-------|-----|----------------|----|
| 1862.64 | 247.4 | 46.81 | ... | 1 <sup>n</sup> | Δ  |
| 1883.70 | 246.8 | 47.13 | ... | 1 <sup>n</sup> | En |
| 1891.51 | 247.9 | 46.94 | ... | 2 <sup>n</sup> | β  |

The faint attendant to the principal star of the triple, Σ 2538 (= S 719), and the little star between the two pairs were discovered with the 18½-inch. There is no change in the relation of the original components. A few only of the measures are given to show their relative fixity.

[β (VIII)...β (Am. Jour. Sci. July 1877)...β<sup>1</sup>...β<sup>3</sup>...β (3114)  
...β (Pub. L. O. II)...]

The following include all the observations of the old stars:

[Herschel (*Mem. R. A. S.* IV, v)... Madler (*Dorpat Obsns.* XI) (*Fixstern-Systeme* I)... OΣ (*Poulkova Obsns.* IX; X, pp. 42, 183)... Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII, XLVIII)... Secchi (*Cat. 1321 Stars*)... Perrotin (*Annals Nice Obsy.* II)... A (II)... Engelmann (2677)... Glasenapp (III)...]

β 652. Piazzì XIX. 169

R.A. 19<sup>h</sup> 27<sup>m</sup> 16<sup>s</sup> }  
Decl. + 28° 1' }

A and B

|         |       |      |          |                |    |
|---------|-------|------|----------|----------------|----|
| 1878.97 | 328.6 | 4.33 | ... 13.0 | 2 <sup>n</sup> | β  |
| 1884.24 | 325.3 | 5.29 | ...      | 3 <sup>n</sup> | HΣ |
| 1892.38 | 325.3 | 5.17 | ... 13.3 | 3 <sup>n</sup> | β  |

A and C (= Σ 2539)

|         |     |      |            |                |   |
|---------|-----|------|------------|----------------|---|
| 1830.69 | 5.2 | 5.36 | 7.9... 9.7 | 4 <sup>n</sup> | Σ |
| 1867.03 | 2.4 | 5.38 | 7.5... 9.3 | 3 <sup>n</sup> | Δ |
| 1878.73 | 3.8 | 5.60 | 8.0... 9.0 | 4 <sup>n</sup> | β |
| 1887.78 | 2.8 | 5.34 | 7.5... 9.3 | 4 <sup>n</sup> | T |
| 1892.38 | 3.5 | 5.40 | 8.0... 8.7 | 3 <sup>n</sup> | β |

The faint companion to the principal star of Σ 2539 (= H<sup>1</sup> II. 99 = S 718) was discovered with the 18½-inch. There is no change in AC since the first measures of STRUVE.

[β (x)...β<sup>1</sup>...β<sup>3</sup>...β (*A. J.* 268)...β (3142)...β (*Pub. L. O.* II)...HΣ (...)]

A few of the measures of Σ 2539 are given above. All will be found in the original double-star catalogue referred to, and in the following:

[Madler (*Fixstern Systeme* II) (*Dorpat Obsns.* XI, XIII)... Secchi (*Catalogo di 1321 Stelle Doppie*)... Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII, XLIII)... A (II)... Tarrant (2898)... Lewis, etc. (*Mon. Not.* LIX, 421)...]

β 653. μ *Aquilae*

R.A. 19<sup>h</sup> 28<sup>m</sup> 14<sup>s</sup> }  
Decl. + 7° 8' }

A and B

|         |       |       |           |                |    |
|---------|-------|-------|-----------|----------------|----|
| 1878.07 | 274.9 | 21.42 | 4.5... 13 | 1 <sup>n</sup> | β  |
| 1891.43 | 276.6 | 24.98 | ...       | 2 <sup>n</sup> | β  |
| 1896.49 | 278.2 | 26.56 | 4.5... 13 | 2 <sup>n</sup> | Lv |
| 1898.57 | 278.3 | 27.29 | 5 ...     | 3 <sup>n</sup> | A  |

A and C

|         |       |       |        |                |    |
|---------|-------|-------|--------|----------------|----|
| 1878.62 | 285.7 | 21.18 | ... 13 | 2 <sup>n</sup> | β  |
| 1891.43 | 288.4 | 25.12 | ...    | 2 <sup>n</sup> | β  |
| 1896.49 | 289.0 | 26.58 | ... 13 | 2 <sup>n</sup> | Lv |
| 1898.57 | 288.9 | 27.13 | ...    | 3 <sup>n</sup> | A  |

B and C

|         |       |       |              |                |   |
|---------|-------|-------|--------------|----------------|---|
| 1877.51 | 194.4 | 5.2 ± | ...          | 1 <sup>n</sup> | β |
| 1891.43 | 195.7 | 5.06  | 12.2... 12.3 | 2 <sup>n</sup> | β |
| 1898.57 | 196.4 | 5.22  | 11.3... 11.8 | 3 <sup>n</sup> | A |

These faint companions were discovered with the 18½-inch. The change in the distance from the primary is the result of the proper motion of A, which is given, 0".233 in the direction of 124°.7 (AUWERS). There seems to be no relative change in BC. ENGELHARDT (*Obsns. Astron.* II, III) has measured two distant stars:

|         |       |        |          |                |     |
|---------|-------|--------|----------|----------------|-----|
| 1887.65 | 349.7 | 59.60  | ... 12.5 | 1 <sup>n</sup> | Eng |
| 1899.55 | 347.5 | 60.94  | ...      | 1 <sup>n</sup> | β   |
| 1887.65 | 71.9  | 183.06 | ... 9.6  | 2 <sup>n</sup> | Eng |
| 1894.71 | 71.3  | 182.15 | ...      | 2 <sup>n</sup> | Eng |
| 1899.55 | 70.9  | 180.78 | ...      | 1 <sup>n</sup> | β   |

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* II)...Lv (*A. J.* 407)... Aitken (3585)...]

β 1130. 9 *Vulpeculae*

R.A. 19<sup>h</sup> 29<sup>m</sup> 19<sup>s</sup> }  
Decl. + 19° 31' }

|         |      |      |             |                |   |
|---------|------|------|-------------|----------------|---|
| 1889.43 | 31.3 | 9.53 | 5.5... 14.0 | 3 <sup>n</sup> | β |
| 1898.57 | 31.7 | 9.19 | ... 13.3    | 3 <sup>n</sup> | β |
| 1898.77 | 33.0 | 9.30 | 5 ... 14.2  | 3 <sup>n</sup> | A |

The faint companion was discovered with the 36-inch. AUWERS gives the proper motion of A, 0".027 in the direction of 313°.8. The interval between the measures is too short to say whether or not the companion is moving with it.

[β (xvi)...β (2956)...β (*Pub. L. O.* II)... Aitken (3585)...]

β 654. 52 *Sagittarii*

R.A. 19<sup>h</sup> 29<sup>m</sup> 24<sup>s</sup> }  
Decl. - 25° 9' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1878.57 | 160.8 | 2.93 | 5.0... 10.8 | 3 <sup>n</sup> | β   |
| 1878.72 | 163.2 | 2.64 | 4.2... 9.7  | 2 <sup>n</sup> | Cin |
| 1889.42 | 159.1 | 3.00 | 5.1... 11.5 | 4 <sup>n</sup> | β   |

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1897.69 | 164.3 | 2.89 | 4.8...11.8 | 3 <sup>n</sup> | See |
| 1898.73 | 163.0 | 3.02 | ...10.1    | 4 <sup>n</sup> | D   |

Discovered with the 18½-inch. The large star has a proper motion of 0.024 in the direction of 114.3 (AUWERS). Further measures are necessary to show whether this belongs to both components.

[β (x)...β<sup>2</sup>...β (2957)...β (Pub. L. O. II)...Cin<sup>5</sup>...See (3496)...Doolittle (Pub. Flower Obsy. 1)...]

β 53. D.M. (11°) 3902

R.A. 19<sup>h</sup> 29<sup>m</sup> 48 }  
Decl. + 11° 11' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1875.07 | 246.8 | 1.40 | 9.5...10.2 | 4 <sup>n</sup> | Δ |
| 1891.72 | 249.6 | 1.43 | 8.8... 9.7 | 3 <sup>n</sup> | β |

Discovered with the 6-inch.

[β (I)...β (Mon. Not. xxxiii, 351)...β (3114)...β (Pub. L. O. II)...Δ (I)...]

β 655. D.M. (63°) 1533

R.A. 19<sup>h</sup> 29<sup>m</sup> 55<sup>s</sup> }  
Decl. + 63° 3' }

C and D

|         |       |      |         |                |   |
|---------|-------|------|---------|----------------|---|
| 1878.48 | 152.6 | 1.93 | ...12.5 | 1 <sup>n</sup> | β |
|---------|-------|------|---------|----------------|---|

A and B (= Σ 2549)

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1832.24 | 291.3 | 21.12 | 7.7... 8.9 | 4 <sup>n</sup> | Σ  |
| 1847.39 | 291.8 | 21.90 | ...        | 1 <sup>n</sup> | Ma |
| 1864.61 | 289.6 | 22.32 | 7.1... 8.8 | 4 <sup>n</sup> | Δ  |
| 1878.48 | 289.4 | 22.86 | ...        | 1 <sup>n</sup> | β  |
| 1884.65 | 288.6 | 22.75 | 6.7... 7.9 | 4 <sup>n</sup> | Fr |
| 1895.64 | 288.3 | 23.58 | 7.7... 8.9 | 2 <sup>n</sup> | Gl |
| 1896.57 | 288.6 | 23.75 | 8.0... 8.9 | 2 <sup>n</sup> | Lv |
| 1898.59 | 288.2 | 24.00 | ... 8.2    | 2 <sup>n</sup> | A  |
| 1898.60 | 288.6 | 24.02 | ...        | 1 <sup>n</sup> | β  |

A and C (= Σ 2549)

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1832.24 | 278.8 | 47.48 | ... 7.7    | 4 <sup>n</sup> | Σ  |
| 1864.61 | 277.2 | 48.98 | 7.1... 7.3 | 4 <sup>n</sup> | Δ  |
| 1878.48 | 276.7 | 49.79 | ...        | 1 <sup>n</sup> | β  |
| 1884.65 | 276.1 | 49.71 | 6.8... 6.6 | 5 <sup>n</sup> | Fr |
| 1895.64 | 275.4 | 50.36 | 7.7... 7.3 | 2 <sup>n</sup> | Gl |
| 1896.57 | 275.2 | 50.62 | ... 8.2    | 2 <sup>n</sup> | Lv |
| 1898.59 | 275.2 | 50.61 | 7 ... 7    | 2 <sup>n</sup> | A  |
| 1898.60 | 275.6 | 50.22 | ...        | 1 <sup>n</sup> | β  |

C and B

|         |      |       |     |                |    |
|---------|------|-------|-----|----------------|----|
| 1832.24 | 89.0 | 26.88 | ... | 4 <sup>n</sup> | Σ  |
| 1864.61 | 87.1 | 27.45 | ... | 4 <sup>n</sup> | Δ  |
| 1878.48 | 85.9 | 27.63 | ... | 1 <sup>n</sup> | β  |
| 1895.64 | 84.0 | 27.93 | ... | 2 <sup>n</sup> | Gl |
| 1898.59 | 84.9 | 27.86 | ... | 2 <sup>n</sup> | A  |

The preceding star of the wide triple was found to be double with the 18½-inch. There has been some change in the components of Σ 2549, probably from proper motion. At least two of the three principal stars have some movement, as the distance of CB is evidently increasing. A, B, and C are respectively Nos. 10572, 10571, and 10570 of *Krueger's A. G. Catalogue*.

[β (x)...β<sup>1</sup>...]

The complete measures of the wide stars are given. The observations will be found as follows:

[Madler (*Fixstern-Systeme* II)...Δ (1474)...Δ (II)... Franz (2649)...Lv (*A. J.* 407)...Glasenapp (IV)...Nobile (*Rend. Accad. Sci. Napoli*, Jan. 1875)...Aitken ( )...]

β 1257. Lalande 37156

R.A. 19<sup>h</sup> 30<sup>m</sup> 27<sup>s</sup> }  
Decl. + 10° 50' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1891.72 | 175.5 | 3.72 | 6.8...13.2 | 3 <sup>n</sup> | β |
| 1898.74 | 178.6 | 4.08 | 7.0...13.2 | 2 <sup>n</sup> | A |

Discovered with the 36-inch. In D.M. 6.8 m.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Aitken (3585)...]

β 761. Lacaille 8174

R.A. 19<sup>h</sup> 31<sup>m</sup> 45<sup>s</sup> }  
Decl. - 39° 42' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.68 | 197.4 | 2±   | 8.0...10.5 | 3 <sup>n</sup> | β   |
| 1886.71 | 198.7 | 2.55 | 7 ... 11   | 1 <sup>n</sup> | Pol |
| 1889.42 | 198.2 | 2.45 | 7.7...10.2 | 3 <sup>n</sup> | β   |
| 1896.63 | 196.0 | 2.33 | ...        | 3 <sup>n</sup> | See |

Discovered with the 6-inch on Mt. Hamilton in 1879. The measures show no motion.

[β (xi)...β<sup>2</sup>...β (2957)...β (Pub. L. O. I, II)...Pollock (*Pub. Sydney Obsy.* 1891) (*Mon. Not.* XLVII, 473) (*Mem. R. A. S. L.*)...See (3496)...]

**β 249.** Lalande 37227

R.A. 19<sup>h</sup> 32<sup>m</sup> 13<sup>s</sup> }  
Decl. + 0° 4' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1875.56 | 141.7 | 1.29 | 7.2... | 9.3  | 5 <sup>n</sup> | Δ  |
| 1876.61 | 149.1 | 1.55 | 7.5... | 10.0 | 1 <sup>n</sup> | OΣ |
| 1879.17 | 141.5 | 1.20 | 7.2... | 9.2  | 1 <sup>n</sup> | Sp |
| 1884.25 | 137.8 | 1.76 | ...    |      | 3 <sup>n</sup> | HΣ |
| 1891.72 | 137.4 | 1.23 | 7.4... | 9.3  | 3 <sup>n</sup> | β  |

Discovered with the 6-inch. Little or no change  
A distant companion in 45°.

[β (v)...β (*Mon. Not.* xxxv, 31)...β (3114)...β (*Pub. L. O.* 11)...Δ (1)...OΣ (*Poulkova Obsns.* x)...Sp (11)...HΣ ( )...]

**β 144.** D.M. (30°) 3664

R.A. 19<sup>h</sup> 33<sup>m</sup> 3<sup>s</sup> }  
Decl. + 30° 5' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1875.37 | 351.0 | 6.34 | 8.9... | 8.9 | 4 <sup>n</sup> | Δ   |
| 1880.43 | 352.1 | 6.24 | 8.7... | 8.8 | 1 <sup>n</sup> | β   |
| 1883.76 | 350.9 | 6.48 | 9.1... | 9.1 | 6 <sup>n</sup> | En  |
| 1888.77 | 351.0 | 6.57 | ...    |     | 2 <sup>n</sup> | Maw |

Discovered with the 6-inch. Fixed.

[β (11)...β (*Mon. Not.* xxxiv, 59)...β<sup>3</sup>...Δ (1)...Engelmann (2678)...Maw (*Mem. R. A. S.* 1, 75)...]

**β 1131.** θ *Cygni*

R.A. 19<sup>h</sup> 33<sup>m</sup> 13<sup>s</sup> }  
Decl. + 49° 56' }

A and B

|         |      |      |   |         |                |   |
|---------|------|------|---|---------|----------------|---|
| 1889.37 | 43.9 | 3.62 | 5 | ...14.3 | 3 <sup>n</sup> | β |
| 1892.38 | 47.0 | 3.79 |   | ...14.5 | 1 <sup>n</sup> | β |
| 1898.46 | 49.2 | 3.37 |   | ...     | 1 <sup>n</sup> | β |
| 1898.63 | 46.9 | 3.71 | 5 | ...14.5 | 3 <sup>n</sup> | A |

A and C

|         |       |       |  |         |                |    |
|---------|-------|-------|--|---------|----------------|----|
| 1852.69 | 186.1 | 29.90 |  | ...11.0 | 1 <sup>n</sup> | OΣ |
| 1882.62 | 183.8 | 37.27 |  | ...     | 1 <sup>n</sup> | OΣ |
| 1898.45 | 182.8 | 42.16 |  | ...10.3 | 3 <sup>n</sup> | β  |
| 1899.55 | 183.0 | 42.30 |  | ...     | 1 <sup>n</sup> | β  |

The close star was discovered with the 36-inch. It is a difficult object and beyond the reach of all but large refractors. AUWERS gives the proper motion of θ *Cygni*, 0".244 in the direction of 351°.8.

It is evident from the measures that the faint companion is moving with it, and we certainly have a most interesting physical system. So far the relative change is small. The change in C is accounted for by the proper motion of A, which is nearly in the opposite direction, and therefore principally affects the distance.

[β (xvi)...β (2912,2956,3142)...β (*Pub. L. O.* 11)...Aitken (3585)...OΣ (*Poulkova Obsns.* x, 105)...]

**β 1287**

R.A. 19<sup>h</sup> 34<sup>m</sup> 5<sup>s</sup> }  
Decl. — 16° 36' }

|         |       |      |    |       |                |   |
|---------|-------|------|----|-------|----------------|---|
| 1899.44 | 144.0 | 1.07 | 10 | ...10 | 1 <sup>n</sup> | β |
|---------|-------|------|----|-------|----------------|---|

A close pair of small stars found with the 40-inch. This star is not given in S.D. It is 245".5 from 54 *Sagittarii* in the direction of 111°.7 (1899.44).

**β 977.** Lalande 37329

R.A. 19<sup>h</sup> 34<sup>m</sup> 19<sup>s</sup> }  
Decl. + 4° 4' }

|         |      |      |        |      |                |   |
|---------|------|------|--------|------|----------------|---|
| 1880.70 | 58.9 | 3.78 | 8.3... | 12.3 | 3 <sup>n</sup> | β |
| 1891.63 | 56.7 | 4.14 | 8.1... | 11.7 | 2 <sup>n</sup> | β |
| 1898.62 | 52.0 | 3.76 | 8.2... | 13.5 | 1 <sup>n</sup> | D |

Discovered with the 18½-inch.

β (xiii)...β<sup>3</sup>...β (3114)...β (*Pub. L. O.* 11)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 54.** W<sup>2</sup> X1X. 1088

R.A. 19<sup>h</sup> 34<sup>m</sup> 49<sup>s</sup> }  
Decl. + 29° 28' }

A and C

|         |       |       |  |         |                |    |
|---------|-------|-------|--|---------|----------------|----|
| 1876.61 | 303.5 | 21.86 |  | ...11.5 | 1 <sup>n</sup> | OΣ |
| 1878.47 | 303.4 | 20.95 |  | ...11.0 | 1 <sup>n</sup> | β  |
| 1880.43 | 301.5 | 21.12 |  | ...10.5 | 1 <sup>n</sup> | β  |

A and B (= Σ 2557)

|         |       |       |        |      |                |    |
|---------|-------|-------|--------|------|----------------|----|
| 1831.78 | 104.7 | 11.42 | 7.3... | 9.8  | 3 <sup>n</sup> | Σ  |
| 1843.77 | 105.7 | 11.17 |        | ...  | 2 <sup>n</sup> | Ma |
| 1868.32 | 104.4 | 11.16 | 7.2... | 10.0 | 3 <sup>n</sup> | Δ  |
| 1876.61 | 104.2 | 11.22 |        | ...  | 1 <sup>n</sup> | OΣ |
| 1879.45 | 103.6 | 10.94 |        | ...  | 2 <sup>n</sup> | β  |

The more distant star, C, was added with the 6-inch. Neither of the companions is likely to be of much interest. The above are all the measures of AB. The measures of  $\Delta$  (1573) belong to H 2888, another double of the same RA, and exactly  $10^\circ$  s.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^2$ ... $\beta^3$ ...Madler (*Fixstern Systeme* 1) (*Dorpat Obsns.* xi)... $\Delta$  (ii)... $\Delta$  (1573, 1736)...O $\Sigma$  (*Poulkova Obsns.* x)...]

$\beta$  1288. 55 *Sagittarii*

R.A.  $19^h 35^m 39^s$  }  
Decl.  $-16^\circ 24'$  }

In looking over my Mt. Hamilton observing books I find that on June 7, 1889, I examined this star with the 12-inch, and recorded it as a close equal pair, with magnitudes  $5\frac{1}{2}$  and  $5\frac{1}{2}$ , and "distance less than  $0''.2$ ." The angle was measured with the highest power of that instrument, giving  $340^\circ.7$ . This observation was overlooked by me, and the star not subsequently examined either with the 12 or 36-inch. As I have no reason to doubt the substantial correctness of the original observation, I give this star a place here, with the confident expectation that it will be hereafter verified. PROFESSOR AITKEN has examined it with the 36-inch several times this year (1899) at my request. At one time there was a slight suspicion of possible elongation, but if double it was too close for even that instrument.

$\beta$  656. Lalande 37475

R.A.  $19^h 35^m 48^s$  }  
Decl.  $+51^\circ 33'$  }

|         |       |      |        |     |            |            |
|---------|-------|------|--------|-----|------------|------------|
| 1878.17 | 257.6 | 0.50 | 8.0... | 9.2 | 3 <i>n</i> | $\beta$    |
| 1878.33 | 259.1 | 0.51 | 8.3... | 9.0 | 3 <i>n</i> | $\Delta$   |
| 1884.57 | 256.3 | 0.73 | ...    |     | 2 <i>n</i> | H $\Sigma$ |
| 1890.47 | 257.9 | 0.69 | ...    |     | 5 <i>n</i> | Sp         |
| 1898.48 | 256.0 | 0.78 | 8.4... | 9.1 | 5 <i>n</i> | D          |

Discovered with the  $18\frac{1}{2}$ -inch. ROGERS (*A. G. Catalogue*) gives the star a proper motion of  $0''.046$  in the direction of  $90^\circ.0$ . The measures show no relative motion.

[ $\beta$  (x)... $\beta^2$ ... $\Delta$  (i)...Sp (iii)...Doolittle (*Pub. Flower Obsy.* 1)...H $\Sigma$  ( )...]

$\beta$  145. Lalande 37464

R.A.  $19^h 36^m 31^s$  }  
Decl.  $+30^\circ 26'$  }

A and B

|         |       |      |        |     |            |            |
|---------|-------|------|--------|-----|------------|------------|
| 1875.13 | 268.2 | 0.87 | 6.8... | 9.5 | 4 <i>n</i> | $\Delta$   |
| 1878.63 | 258.1 | 0.93 | 7.2... | 9.7 | 2 <i>n</i> | O $\Sigma$ |
| 1885.53 | 264.9 | 1.05 | ...    |     | 1 <i>n</i> | H $\Sigma$ |
| 1888.78 | 266.4 | 0.73 | ...    |     | 4 <i>n</i> | Sp         |
| 1893.50 | 266.1 | 0.87 | 7.2... | 9.7 | 3 <i>n</i> | W          |

AB and C

|         |      |      |        |      |            |            |
|---------|------|------|--------|------|------------|------------|
| 1878.43 | 32.6 | 8.51 | 7.5... | 13.0 | 1 <i>n</i> | $\beta$    |
| 1879.66 | 24.5 | 9.62 | ...    | 11.8 | 2 <i>n</i> | O $\Sigma$ |
| 1885.53 | 28.5 | 9.08 | ...    |      | 1 <i>n</i> | H $\Sigma$ |
| 1893.50 | 28.7 | 9.30 | ...    | 12.8 | 2 <i>n</i> | W          |

AB and D

|         |       |       |     |      |            |            |
|---------|-------|-------|-----|------|------------|------------|
| 1876.70 | 155.9 | 27.39 | ... | 10.5 | 1 <i>n</i> | O $\Sigma$ |
| 1878.43 | 157.3 | 26.67 | ... | 10.8 | 1 <i>n</i> | $\beta$    |
| 1885.53 | 156.9 | 26.80 | ... |      | 1 <i>n</i> | H $\Sigma$ |
| 1893.50 | 157.6 | 26.76 | ... | 11.0 | 2 <i>n</i> | W          |

Discovered with the 6-inch.

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^3$ ... $\Delta$  (i)...O $\Sigma$  (*Poulkova Obsns.* x)...Wilson ( )...]

$\beta$  827. Lalande 37470

R.A.  $19^h 38^m 7^s$  }  
Decl.  $-11^\circ 29'$  }

|         |       |      |        |     |            |         |
|---------|-------|------|--------|-----|------------|---------|
| 1881.62 | 268.0 | 0.87 | 8.3... | 9.1 | 3 <i>n</i> | $\beta$ |
| 1888.05 | 269.9 | 0.98 | 8.5... | 9.5 | 3 <i>n</i> | Com     |
| 1893.76 | 264.5 | 1.02 | 8.5... | 9.7 | 3 <i>n</i> | W       |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. The measures credited to this star by COLLINS (*Proc. Haverford Coll. Obsy.* 1891) belong to a new pair  $15' n$  of  $\beta$  827. It is somewhat similar to this in angle and magnitudes. COLLINS gives  $251^\circ.8 : 1''.34 : 8.5...9.5$  (1891.72) 2*n*.

[ $\beta$  (xii)... $\beta^2$ ...Comstock (*Pub. Washburn Obsy.* vi)...Wilson ( )...]

$\beta$  1132. W<sup>2</sup> XIX. 1204

R.A.  $19^h 38^m 11^s$  }  
Decl.  $+26^\circ 39'$  }

|         |       |      |        |     |            |         |
|---------|-------|------|--------|-----|------------|---------|
| 1889.56 | 227.3 | 0.49 | 8.3... | 8.7 | 3 <i>n</i> | $\beta$ |
| 1897.68 | 227.1 | 0.47 | ...    |     | 2 <i>n</i> | Lew     |
| 1898.82 | 225.2 | 0.42 | 8.3... | 9.0 | 2 <i>n</i> | A       |

Discovered with the 36-inch.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O. II*)...Lewis (*Mon. Not.* LIX, 400)...Aitken (3585)...]

$\beta$  657. W<sup>2</sup> XIX. 1209

R.A. 19<sup>h</sup> 38<sup>m</sup> 40<sup>s</sup> }  
Decl. + 22° 21' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1877.74 | 140.1 | 0.93 | 9.2...10.0 | 2n | $\Delta$ |
| 1878.78 | 144.4 | 0.90 | 9.2...10.7 | 1n | $\beta$  |
| 1892.71 | 328.2 | 0.80 | 9.0...10.0 | 2n | Ho       |
| 1898.65 | 147.7 | 0.84 | 9.0...10.0 | 3n | A        |

Discovered with the 18½-inch. The change, if any, is slow.

[ $\beta$  (x)... $\beta^1$ ... $\Delta$  (1)...Hough (3234)...Aitken (3585)...]

$\beta$  658. B.A.C. 6762

R.A. 19<sup>h</sup> 39<sup>m</sup> 1<sup>s</sup> }  
Decl. + 26° 51' }

|         |       |       |            |    |            |
|---------|-------|-------|------------|----|------------|
| 1878.53 | 295.2 | 0.57  | 6.5...10.0 | 1n | $\beta$    |
| 1882.62 | 295.9 | 0.63  | 7.0...10.0 | 1n | O $\Sigma$ |
| 1882.68 | 286.5 | 0.51  | 6.5...10.0 | 1n | Perry      |
| 1889.16 | 290.8 | 0.56  | ...        | 9n | H $\Sigma$ |
| 1889.56 | 299.9 | 0.50  | 6.7... 9.7 | 3n | $\beta$    |
| 1889.86 | 297.4 | 0.45± | ...        | 3n | Sp         |
| 1897.63 | 291.1 | 0.50  | ...        | 3n | Lew        |
| 1898.72 | 310.9 | 0.59± | 6.0...10.5 | 2n | D          |

Discovered with the 18½-inch. Relative change is not very certain, but the components evidently have the same movement in space. The proper motion of the principal star is 0.062 in the direction of 195° (AUWERS), and this is therefore a physical system.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O. II*)...O $\Sigma$  (*Poulkowa Obsns. x*)...Perry (*Eng. Mech.* XXXVI, 65)...Sp (III)...Doolittle (*Pub. Flower Obsy. 1*)...Lewis (*Mon. Not.* LIX, 400)...H $\Sigma$  ( )...]

$\beta$  467. O. Arg. S. 19936

R.A. 19<sup>h</sup> 39<sup>m</sup> 24<sup>s</sup> }  
Decl. - 21° 49' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1879.61 | 135.0 | 2.61 | 7.7...10.0 | 2n | Cin |
| 1886.72 | 131.2 | 3.04 | 7.8...10.7 | 3n | LM  |
| 1892.52 | 134.2 | 3.13 | 8.0...11.0 | 1n | Lv  |
| 1897.75 | 136.7 | 3.27 | 7.5...10.8 | 1n | See |
| 1898.62 | 133.4 | 3.07 | 7.5...10.7 | 3n | D   |

Discovered with the 6-inch. Probably without change.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* XXXVII, 78)...Cin<sup>5</sup>...LM...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...See (3496)...Doolittle (*Pub. Flower Obsy. 1*)...]

$\beta$  468. Lalande 37571

R.A. 19<sup>h</sup> 39<sup>m</sup> 58<sup>s</sup> }  
Decl. + 3° 57' }

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1876.97 | 182.4 | 9.55 | 7.0...11.3 | 3n | $\Delta$   |
| 1878.58 | 181.1 | 9.77 | 7.0...10.5 | 1n | O $\Sigma$ |
| 1884.60 | 182.2 | 9.72 | ...        | 2n | H $\Sigma$ |
| 1891.63 | 183.0 | 9.81 | 6.6...11.0 | 2n | $\beta$    |
| 1899.42 | 183.0 | 9.58 | 6.7...11.5 | 2n | $\beta$    |

Discovered with the 6-inch.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* XXXVIII, 78)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...O $\Sigma$  (*Poulkowa Obsns. x*)...]

$\beta$  146. Lalande 37544

R.A. 19<sup>h</sup> 40<sup>m</sup> 6<sup>s</sup> }  
Decl. - 20° 10' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1873.50 | 290±  | 1±   | 9.0...10.5 |    | $\beta$ |
| 1879.57 | 301.8 | 0.91 | 8.3... 9.0 | 1n | $\beta$ |
| 1879.64 | 295.7 | 1.00 | 8.0...10.0 | 1n | Cin     |
| 1891.73 | 308.4 | 0.91 | 8.1... 9.2 | 3n | $\beta$ |
| 1893.70 | 315.1 | 1.07 | 8.0... 9.3 | 3n | W       |
| 1897.74 | 305.8 | 1.09 | 8.1... 9.2 | 3n | A       |

Discovered with the 6-inch. In a low-power field with 56 *Sagittarii*, 43<sup>s</sup> *f* and 7.4 *s* of that star.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* XXXIV, 59)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Wilson ( )...Aitken (*A. J.* 429)...]

$\beta$  55.

R.A. 19<sup>h</sup> 40<sup>m</sup> 30<sup>s</sup> }  
Decl. + 10° 16' }

A and B

|         |      |      |            |    |         |
|---------|------|------|------------|----|---------|
| 1891.73 | 28.3 | 3.69 | 9.6... 9.7 | 2n | $\beta$ |
| 1898.57 | 30.2 | 3.67 | ...        | 1n | $\beta$ |

A and C

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1898.57 | 260.6 | 33.26 | ... 9.6 | 1n | $\beta$ |
|---------|-------|-------|---------|----|---------|

A pair of small stars about 3' *s* of  $\gamma$  *Aquilae*. Not in the D.M.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

**$\beta$  828.** D.M. ( $5^\circ$ ) 4290

R.A.  $19^h 41^m 3^s$  }  
Decl.  $+ 5^\circ 52'$  }

|         |        |        |                  |      |         |
|---------|--------|--------|------------------|------|---------|
| 1881.64 | $10.1$ | $2.87$ | $8.3 \dots 10.2$ | $3n$ | $\beta$ |
| 1887.92 | $5.6$  | $3.02$ | $8.0 \dots 10.0$ | $4n$ | Com     |
| 1891.73 | $9.0$  | $2.74$ | $8.3 \dots 10.2$ | $3n$ | $\beta$ |
| 1899.42 | $9.4$  | $2.57$ | $8.3 \dots 10.5$ | $2n$ | $\beta$ |

Discovered with  $15\frac{1}{2}$ -inch at the Washburn Observatory. Without change.

[ $\beta$  (xii)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Comstock (*Pub. Washburn Obsy. VI*)...]

 **$\beta$  147.** D.M. ( $31^\circ$ ) 3770

R.A.  $19^h 42^m 16^s$  }  
Decl.  $+ 31^\circ 48'$  }

|         |         |        |                  |      |          |
|---------|---------|--------|------------------|------|----------|
| 1875.37 | $298.8$ | $8.66$ | $8.7 \dots 10.6$ | $4n$ | $\Delta$ |
| 1877.67 | $300.4$ | $8.55$ | $8.5 \dots 10.0$ | $2n$ | Sp       |
| 1893.54 | $297.6$ | $8.86$ | $8.3 \dots 9.3$  | $3n$ | Lv       |
| 1898.60 | $297.4$ | $8.70$ | $8.2 \dots 9.5$  | $3n$ | D        |

Discovered with the 6-inch. No motion.

[ $\beta$  (iii)... $\beta$  (*Mon. Not. xxxiv, 59*)... $\Delta$  (i)...Sp (ii, p. 137)...Lv (*A. J. 382*)...Doolittle (*Pub. Flower Obsy. 1*)...]

 **$\beta$  829.** D.M. ( $5^\circ$ ) 4299

R.A.  $19^h 43^m 2^s$  }  
Decl.  $+ 5^\circ 27'$  }

|         |         |        |                  |      |         |
|---------|---------|--------|------------------|------|---------|
| 1881.65 | $312.0$ | $0.72$ | $8.4 \dots 8.8$  | $3n$ | $\beta$ |
| 1887.71 | $314.2$ | $0.93$ | $8.5 \dots 10.0$ | $3n$ | Com     |
| 1892.52 | $319.0$ | $0.80$ | $8.0 \dots 8.6$  | $2n$ | Lv      |
| 1892.70 | $306.6$ | $0.60$ | $8.5 \dots 8.7$  | $1n$ | Ho      |
| 1896.54 | $308.6$ | $0.72$ | $8.0 \dots 8.7$  | $4n$ | Lv      |
| 1898.64 | $308.9$ | $0.83$ | $8.2 \dots 8.6$  | $3n$ | A       |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. The measures are not consistent in angle, but there is probably no material change.

[ $\beta$  (xii)... $\beta^2$ ...Comstock (*Pub. Washburn Obsy. VI*)...Lv (*A. J. 278,407*) (*Proc. Haverford Coll. Obsy. 1892*)...Hough (3234)...Aitken (3585)...]

 **$\beta$  361.** W<sup>2</sup> XIX. 1429

R.A.  $19^h 45^m 7^s$  }  
Decl.  $+ 22^\circ 22'$  }

|         |         |        |                 |      |          |
|---------|---------|--------|-----------------|------|----------|
| 1875.89 | $350.0$ | $3.49$ | $9.2 \dots 9.9$ | $4n$ | $\Delta$ |
| 1892.52 | $350.0$ | $3.96$ | $9.0 \dots 9.1$ | $2n$ | Lv       |

Discovered with the 6-inch. In a low-power field with 12 *Vulpeculae*.

[ $\beta$  (vi)... $\beta$  (2062)... $\Delta$  (i)...Lv (*A. J. 278*) (*Proc. Haverford Coll. Obsy. 1892*)...]

 **$\beta$  148.** Lalande 37779

R.A.  $19^h 45^m 27^s$  }  
Decl.  $- 10^\circ 40'$  }

A and B

|         |         |        |                 |      |          |
|---------|---------|--------|-----------------|------|----------|
| 1875.26 | $333.2$ | $0.91$ | $7.9 \dots 8.3$ | $4n$ | $\Delta$ |
| 1879.25 | $331.2$ | $0.87$ | $7.8 \dots 8.4$ | $1n$ | Cin      |
| 1888.51 | $325.9$ | $0.79$ | $8.0 \dots 8.5$ | $1n$ | Lv       |
| 1891.63 | $323.3$ | $0.78$ | $7.4 \dots 7.7$ | $2n$ | $\beta$  |
| 1893.66 | $322.5$ | $0.78$ | $7.8 \dots 8.5$ | $4n$ | W        |
| 1898.75 | $321.4$ | $0.95$ | $7.9 \dots 8.4$ | $3n$ | D        |

A and C

|         |        |         |              |      |         |
|---------|--------|---------|--------------|------|---------|
| 1891.63 | $64.7$ | $26.32$ | $\dots 13.5$ | $2n$ | $\beta$ |
| 1893.62 | $63.3$ | $26.51$ | $\dots 12.0$ | $1n$ | W       |
| 1898.75 | $64.0$ | $27.13$ | $\dots 12.6$ | $3n$ | D       |

Discovered with the 6-inch. There seems to be slow retrograde motion in the angle of the close pair.

[ $\beta$  (iii)... $\beta$  (*Mon. Not. xxxiv, 59*)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (i)...Cin<sup>5</sup>...Lv<sup>1</sup>...Wilson ( )...Doolittle (*Pub. Flower Obsy. 1*)...]

 **$\beta$  978.** W<sup>2</sup> XIX. 1470

R.A.  $19^h 46^m 22^s$  }  
Decl.  $+ 23^\circ 13'$  }

|         |         |        |                 |      |         |
|---------|---------|--------|-----------------|------|---------|
| 1880.48 | $234.2$ | $0.94$ | $8.3 \dots 8.4$ | $3n$ | $\beta$ |
| 1889.84 | $235.6$ | $0.99$ | $\dots$         | $4n$ | Sp      |
| 1898.64 | $233.8$ | $1.05$ | $8.5 \dots 8.5$ | $3n$ | A       |

Discovered with the  $18\frac{1}{2}$ -inch.

[ $\beta$  (xiii)... $\beta^3$ ...Sp (iii)...Aitken (3585)...]

 **$\beta$  979.** W<sup>2</sup> XIX. 1496

R.A.  $19^h 46^m 57^s$  }  
Decl.  $+ 22^\circ 58'$  }

|         |         |        |                  |      |         |
|---------|---------|--------|------------------|------|---------|
| 1880.49 | $338.7$ | $2.24$ | $8.3 \dots 11.1$ | $3n$ | $\beta$ |
| 1893.53 | $335.9$ | $2.25$ | $8.1 \dots 11.5$ | $4n$ | Lv      |

Discovered with the  $18\frac{1}{2}$ -inch.

[ $\beta$  (xiii)... $\beta^3$ ...Lv (*A. J. 382*)...]

**β 659.** Rümker 7844

R.A. 19<sup>h</sup> 48<sup>m</sup> 48<sup>s</sup> }  
Decl. + 6° 50' }

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1878.62 | 316.0 | 12.32 | 6.5...12.5 | 1 <sup>n</sup> | β  |
| 1884.58 | 314.2 | 12.13 | ...        | 2 <sup>n</sup> | HΣ |
| 1891.50 | 315.6 | 12.39 | 6.6...12.5 | 5 <sup>n</sup> | β  |
| 1898.68 | 314.5 | 12.47 | 6.7...12.3 | 3 <sup>n</sup> | D  |

Discovered with the 18½ inch. The change, if any, is small. This is D.M. (6°) 4351, 7.0 m.

[β (x)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...]

**β 830.** Lalande 37916

R.A. 19<sup>h</sup> 49<sup>m</sup> 05<sup>s</sup> }  
Decl. — 1° 9' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.74 | 106.4 | 2.72 | 8.0...11.2 | 2 <sup>n</sup> | β   |
| 1886.80 | 106.3 | 2.69 | 7.7...12.0 | 2 <sup>n</sup> | Ho  |
| 1886.87 | 105.6 | 2.90 | ...        | 2 <sup>n</sup> | UL  |
| 1887.81 | 106.0 | 2.81 | 8.2...11.8 | 3 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (xii)...β<sup>2</sup>...Hough (2978)...Updegraff and Lamb (Pub. Washburn Obsy. v)...Comstock (Pub. Washburn Obsy. vi)...]

**β 980.** η Cygni

R.A. 19<sup>h</sup> 51<sup>m</sup> 48<sup>s</sup> }  
Decl. + 34° 46' }

A and B

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1879.89 | 209.6 | 7.07 | 5 ... 13   | 5 <sup>n</sup> | β  |
| 1887.27 | 207.3 | 7.44 | ...        | 5 <sup>n</sup> | HΣ |
| 1889.51 | 210.4 | 7.21 | 4 ... 13   | 4 <sup>n</sup> | β  |
| 1898.56 | 208.2 | 7.23 | ... 13     | 2 <sup>n</sup> | β  |
| 1898.91 | 209.0 | 7.70 | 4 ... 14.2 | 2 <sup>n</sup> | A  |

A and C (= H 1455)

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1828    | 332.0 | 30±   | ... 18   | 1 <sup>n</sup> | H |
| 1879.47 | 325.3 | 46.17 | ... 11.5 | 1 <sup>n</sup> | β |
| 1889.51 | 326.2 | 46.08 | ... 11.0 | 2 <sup>n</sup> | β |
| 1898.56 | 326.2 | 46.00 | ... 12.5 | 2 <sup>n</sup> | β |

A and D (= H 1455)

|         |        |       |          |                |   |
|---------|--------|-------|----------|----------------|---|
| 1828    | 170.0± | 20±   | ... 18   | 1 <sup>n</sup> | H |
| 1879.47 | 170.0  | 49.52 | ... 11.5 | 1 <sup>n</sup> | β |
| 1889.51 | 169.1  | 49.82 | ... 10.7 | 2 <sup>n</sup> | β |
| 1898.56 | 168.0  | 49.65 | ... 12.5 | 2 <sup>n</sup> | β |

A and E

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1898.56 | 247.3 | 61.72 | ... 12.5 | 1 <sup>n</sup> | β |
|---------|-------|-------|----------|----------------|---|

The faint companion was detected with the 18½-inch. AUWERS gives the proper motion of η Cygni as 0".046 in the direction of 231°. This movement would increase the distance of B, if fixed, about 0".4 in the time covered by the measures. The object is not an easy one to measure, and it is impossible at this time to say whether these stars have the same proper motion. The probabilities are that they form a system. The relation will be apparent from the measures of the next few years.

The distant stars, C and D, noted by HERSCHEL (*Fourth Catalogue*), can only be optical companions. All the measures of these stars are given.

[β (xiii)...β<sup>3</sup>...β (2957)...β (Pub. L. O. II)...HΣ ( )... Aitken (3585)...]

**β 831.** D.M. (47°) 2955

R.A. 19<sup>h</sup> 51<sup>m</sup> 59<sup>s</sup> }  
Decl. + 47° 4' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.46 | 128.0 | 0.94 | 8.6... 9.0 | 3 <sup>n</sup> | β   |
| 1888.20 | 128.3 | 0.92 | 8.9... 9.6 | 4 <sup>n</sup> | Com |
| 1898.59 | 128.4 | 1.08 | 8.6... 9.3 | 4 <sup>n</sup> | D   |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (xii)...β<sup>2</sup>...Comstock (Pub. Washburn Obsy. vi)...Doolittle (Pub. Flower Obsy. 1)...]

**β 266.** W<sup>1</sup> XIX. 1282

R.A. 19<sup>h</sup> 52<sup>m</sup> 15<sup>s</sup> }  
Decl. + 11° 5' }

|         |       |       |             |                |    |
|---------|-------|-------|-------------|----------------|----|
| 1875.31 | 167.3 | 15.65 | 7.2... 11.3 | 3 <sup>n</sup> | Δ  |
| 1892.57 | 167.0 | 15.94 | 8.0... 11.0 | 1 <sup>n</sup> | Lv |
| 1898.55 | 166.4 | 15.55 | 7.5... 9.5  | 3 <sup>n</sup> | D  |

Discovered with the 6-inch.

[β (v)...β (Mon. Not. xxxv, 31)...Δ (1)...Lv (A. J. 278) (Proc. Haverford Coll. Obsy. 1892)...Doolittle (Pub. Flower Obsy. 1)...]

**$\beta$  425.** Lalande 38087

R.A.  $19^{\text{h}} 52^{\text{m}} 15^{\text{s}}$  }  
Decl.  $+ 19^{\circ} 58'$  }

## A and B

|         |       |      |        |     |    |          |
|---------|-------|------|--------|-----|----|----------|
| 1876.29 | 241.3 | 1.26 | 8.8... | 9.0 | 3n | $\Delta$ |
| 1879.55 | 241.2 | 1.41 | 83...  | 8.4 | 3n | $\beta$  |
| 1883.46 | 63.7  | 1.70 | 8.4... | 8.6 | 6n | En       |
| 1891.50 | 242.1 | 1.30 | 8.4... | 8.5 | 3n | $\beta$  |
| 1896.61 | 242.1 | 1.28 | ...    |     | 1n | Lew      |
| 1898.58 | 241.5 | 1.32 | ...    |     | 5n | Bow      |
| 1898.66 | 240.9 | 1.39 | 8.5... | 8.5 | 4n | D        |
| 1899.60 | 237.4 | 1.25 | ...    |     | 1n | Bar      |

## A and C

|         |      |       |     |      |    |         |
|---------|------|-------|-----|------|----|---------|
| 1879.55 | 40.4 | 19.81 | ... | 12.0 | 3n | $\beta$ |
| 1898.66 | 39.5 | 19.85 | ... | 10.9 | 4n | D       |

Discovered with the 6-inch. Fixed.

[ $\beta$  (VII)... $\beta$  (2103,3114)... $\beta^1$ ... $\beta^3$ ... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Engelmann (2678)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Doolittle (*Pub. Flower Obsy* 1)...Barnard ( )...]

 **$\beta$  981.** W<sup>2</sup> XIX. 1687

R.A.  $19^{\text{h}} 52^{\text{m}} 40^{\text{s}}$  }  
Decl.  $+ 20^{\circ} 13'$  }

## A and B

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1880.31 | 111.4 | 3.07 | 8.0... | 11.4 | 4n | $\beta$ |
| 1891.51 | 109.7 | 3.32 | 8.2... | 10.0 | 2n | $\beta$ |
| 1898.55 | 109.1 | 2.86 | 8.7... | 11.9 | 3n | D       |

## A and C

|         |      |       |     |      |    |         |
|---------|------|-------|-----|------|----|---------|
| 1880.48 | 58.8 | 32.10 | ... |      | 1n | $\beta$ |
| 1898.55 | 58.5 | 32.61 | ... | 10.7 | 3n | D       |

Discovered with the 18½-inch.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  149.** Lalande 38105

R.A.  $19^{\text{h}} 52^{\text{m}} 47^{\text{s}}$  }  
Decl.  $+ 16^{\circ} 10'$  }

## B and C

|         |       |      |        |      |    |    |
|---------|-------|------|--------|------|----|----|
| 1893.54 | 199.8 | 8.32 | 9.9... | 12.5 | 4n | Lv |
| 1898.64 | 199.5 | 8.38 | 8.5... | 11.5 | 3n | A  |

## A and B

|         |       |        |        |  |    |    |
|---------|-------|--------|--------|--|----|----|
| 1893.54 | 278.6 | 126.57 | 6.5... |  | 3n | Lv |
| 1898.64 | 278.6 | 127.75 | 7.0... |  | 3n | A  |

Distant double companion noted with the 6-inch. Probably unimportant. The principal star has a very small proper motion of 0".005 in the direction of  $324^{\circ}.2$  (*Berlin A. G. Catalogue*).

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)...Lv (*A. J.* 382)...Aitken (3585)...]

 **$\beta$  469.** W<sup>2</sup> XIX. 1757

R.A.  $19^{\text{h}} 54^{\text{m}} 28^{\text{s}}$  }  
Decl.  $+ 24^{\circ} 24'$  }

|         |       |       |        |      |    |          |
|---------|-------|-------|--------|------|----|----------|
| 1877.01 | 175.4 | 14.43 | 8.3... | 10.7 | 3n | $\Delta$ |
| 1891.50 | 177.3 | 14.34 | 8.1... | 10.8 | 3n | $\beta$  |

Discovered with the 6-inch. Too wide to be of any interest as a double star.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...]

 **$\beta$  1133.** Lalande 38224

R.A.  $19^{\text{h}} 54^{\text{m}} 56^{\text{s}}$  }  
Decl.  $+ 31^{\circ} 30'$  }

|         |       |      |        |     |    |         |
|---------|-------|------|--------|-----|----|---------|
| 1889.56 | 338.6 | 0.87 | 6.8... | 9.5 | 3n | $\beta$ |
| 1897.67 | 335.4 | 0.68 | ...    |     | 2n | L       |
| 1897.79 | 335.3 | 0.93 | ...    |     | 3n | A       |
| 1898.73 | 337.4 | 0.73 | ...    |     | 1n | Bow     |

Discovered with the 36-inch.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Aitken (*A. J.* 429)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

 **$\beta$  1258.** D.M. (29°) 3838

R.A.  $19^{\text{h}} 55^{\text{m}} 26^{\text{s}}$  }  
Decl.  $+ 29^{\circ} 35'$  }

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1878.41 | 159.9 | 1.52 | 8.0... | 12.0 | 1n | $\beta$ |
| 1891.49 | 157.4 | 1.45 | 8.0... | 10.8 | 3n | $\beta$ |
| 1897.78 | 153.2 | 1.23 | ...    |      | 1n | L       |
| 1897.79 | 153.9 | 1.56 | 8.0... | 10.8 | 3n | A       |
| 1898.73 | 156.3 | 1.35 | ...    |      | 1n | Bow     |

In attempting to remeasure  $\beta$  439 in 1878, the first observation given above was made. It was

evidently a case of unusual motion in a pair of this kind, or of mistaken identity. The matter was investigated with the 36-inch, and it was found that the measure of 1878 belonged to a new pair  $30^s p$   $\beta$  439. There is no obvious change in the components.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta^1$ ... $\beta$  (*Pub. L. O.* II)...Aitken (*A. J.* 429)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

$\beta$  439. D.M. (29°) 3845

R.A. 19<sup>h</sup> 55<sup>m</sup> 57<sup>s</sup> }  
Decl. + 29° 30' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1876.80 | 249.7 | 2.70 | 8 ...      | 1 <sup>n</sup> | $\beta$ |
| 1891.50 | 248.2 | 3.05 | 7.9...12.7 | 3 <sup>n</sup> | $\beta$ |
| 1897.75 | 241.8 | 3.28 | ...        | 1 <sup>n</sup> | L       |

Discovered with the 18½-inch. The measure in  $\beta^1$ , credited to this pair, really belongs to a new pair in the field *np*. (See  $\beta$  1258.)

[ $\beta$  (viii)... $\beta$  (*Am. Jour. Sci.* July 1877)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Lewis (*Mon. Not.* LIX, 400)...]

$\beta$  1289. W<sup>2</sup> XIX. 1835

R.A. 19<sup>h</sup> 56<sup>m</sup> 38<sup>s</sup> }  
Decl. + 37° 23' }

A and B

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1899.32 | 57.7 | 0.84 | 8.3... 9.2 | 3 <sup>n</sup> | $\beta$ |
|---------|------|------|------------|----------------|---------|

A and C

|         |      |       |         |                |         |
|---------|------|-------|---------|----------------|---------|
| 1899.32 | 90.0 | 21.51 | ... 9.0 | 3 <sup>n</sup> | $\beta$ |
|---------|------|-------|---------|----------------|---------|

The close pair was discovered with the 18½-inch July 13, 1880, but forgotten at the time, and only found upon a recent examination of the old observing records of twenty years ago. The measures given above were made with the 40-inch. C is W<sup>2</sup> XIX. 1838. The distance from the meridian positions of 1825 is 22'.41.

$\beta$  56. Lalande 38343

R.A. 19<sup>h</sup> 58<sup>m</sup> 47<sup>s</sup> }  
Decl. — 4° 39' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1875.43 | 162.2 | 1.61 | 8.2... 9.2 | 4 <sup>n</sup> | $\Delta$ |
| 1879.26 | 164.3 | 1.57 | 7.7... 9.0 | 3 <sup>n</sup> | Cin      |
| 1886.73 | 165.0 | 1.65 | 7.9... 8.9 | 3 <sup>n</sup> | LM       |

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1888.57 | 165.6 | 1.70 | 7.7... 9.0 | 1 <sup>n</sup> | Lv |
| 1892.70 | 168.2 | 2.43 | 7.5... 9.1 | 1 <sup>n</sup> | Gl |
| 1896.52 | 165.7 | 1.55 | 8.0... 8.9 | 3 <sup>n</sup> | Lv |
| 1898.62 | 167.4 | 1.71 | ...        | 1 <sup>n</sup> | Cg |
| 1898.63 | 166.1 | 1.55 | 8.2... 9.5 | 3 <sup>n</sup> | Bd |

Discovered with the 6-inch. Probably fixed.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* XXXIII, 351)... $\Delta$  (1)...Cin<sup>s</sup>...LM...  
...Lv<sup>1</sup>...Lv (*A. J.* 407)...Glaseapp (II)...Boothroyd  
and Cogshall ( )...]

$\beta$  426 and  $\beta$  427. O. Arg. N. 19938

R.A. 19<sup>h</sup> 59<sup>m</sup> 13<sup>s</sup> }  
Decl. + 54° 18' }

A and B (=  $\beta$  426)

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1877.05 | 310.0 | 5.75 | 8.2... 10.2 | 6 <sup>n</sup> | $\Delta$ |
| 1884.49 | 311.5 | 6.02 | 8.3... 10.1 | 6 <sup>n</sup> | En       |
| 1893.49 | 310.1 | 5.71 | 8.1... 10.7 | 3 <sup>n</sup> | Lv       |
| 1898.48 | 308.8 | 5.78 | 8.6... 9.1  | 3 <sup>n</sup> | D        |

C and D (=  $\beta$  427)

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1877.05 | 336.5 | 3.01 | 8.1... 10.0 | 6 <sup>n</sup> | $\Delta$ |
| 1884.49 | 337.3 | 3.18 | 8.3... 10.0 | 6 <sup>n</sup> | En       |
| 1893.49 | 335.7 | 2.93 | 8.3... 10.5 | 3 <sup>n</sup> | Lv       |
| 1898.48 | 333.8 | 2.90 | 8.5... 9.5  | 3 <sup>n</sup> | D        |

A and C

|         |      |        |     |                |          |
|---------|------|--------|-----|----------------|----------|
| 1877.18 | 53.3 | 166.17 | ... | 4 <sup>n</sup> | $\Delta$ |
| 1884.78 | 53.4 | 165.99 | ... | 2 <sup>n</sup> | En       |
| 1898.48 | 53.2 | 164.64 | ... | 3 <sup>n</sup> | D        |

The two pairs, forming a wide quadruple group, were discovered with the 6-inch. All are probably relatively fixed. C is O. Arg. N. 19952.

[ $\beta$  (vii)... $\beta$  (2103)... $\Delta$  (1)...Engelmann (2742)...Lv (*A. J.* 382)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  57. Lalande 38415

R.A. 19<sup>h</sup> 59<sup>m</sup> 55<sup>s</sup> }  
Decl. + 15° 9' }

|         |       |      |             |                |            |
|---------|-------|------|-------------|----------------|------------|
| 1875.10 | 118.0 | 2.33 | 6.2... 10.6 | 4 <sup>n</sup> | $\Delta$   |
| 1876.60 | 120.7 | 2.09 | 6.5... 10.0 | 1 <sup>n</sup> | O $\Sigma$ |
| 1877.70 | 123.4 | 2.50 | ...         | 1 <sup>n</sup> | $\beta$    |
| 1884.31 | 121.8 | 2.53 | ...         | 3 <sup>n</sup> | H $\Sigma$ |
| 1891.50 | 118.3 | 2.60 | 6.7... 11.3 | 3 <sup>n</sup> | $\beta$    |

Discovered with the 6-inch. Without change.  
The magnitude in D.M. is 6.0; Harvard, 6.5.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^t$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)... $O\Sigma$  (*Poulkowa Obsns.* x)... $H\Sigma$  (...)]

**$\beta$  832.** S.D. ( $11^\circ$ ) 5230

R.A. 20<sup>h</sup> 0<sup>m</sup> 5<sup>s</sup> }  
Decl. — 10° 59' }

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1881.65 | 101.8 | 1.34 | 8.6... 8.9 | 3 $n$ | $\beta$ |
| 1886.74 | 101.1 | ...  | 9 ... 9    | 1 $n$ | LM      |
| 1886.87 | 104.0 | 1.36 | ...        | 2 $n$ | UL      |
| 1887.79 | 103.3 | 1.49 | 8.6... 9.5 | 3 $n$ | Com     |
| 1888.51 | 100.2 | 1.34 | 8.7... 9.2 | 1 $n$ | Lv      |
| 1898.68 | 104.2 | 1.80 | 8.7... 9.7 | 3 $n$ | Cg      |

Discovered with the 15½-inch at the Washburn Observatory. The measures show no change.

[ $\beta$  (xii)... $\beta^2$ ...LM...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Lv¹...Comstock (*Pub. Washburn Obsy.* vi)...Cogshall (...)]

**$\beta$  428.** D.M. ( $12^\circ$ ) 4226

R.A. 20<sup>h</sup> 1<sup>m</sup> 5<sup>s</sup> }  
Decl. + 12° 36' }

|         |       |      |            |       |           |
|---------|-------|------|------------|-------|-----------|
| 1876.49 | 343.7 | 0.56 | 7.2... 8.5 | 3 $n$ | $\Delta$  |
| 1878.58 | 353.2 | 1.04 | 7.5... 9.5 | 1 $n$ | $O\Sigma$ |
| 1885.52 | 355.5 | 0.60 | ...        | 2 $n$ | $H\Sigma$ |
| 1892.57 | 351.4 | 0.61 | 7.5... 8.8 | 1 $n$ | Lv        |
| 1893.72 | 350.2 | 0.68 | 7.8... 9.2 | 3 $n$ | W         |
| 1897.73 | 351.6 | 0.73 | ...        | 3 $n$ | Dob       |

Discovered with the 6-inch. Probably unchanged.

[ $\beta$  (vii)... $\beta$  (2103)... $\Delta$  (I)... $O\Sigma$  (*Poulkowa Obsns.* x)... $H\Sigma$  (...)...Lv (*A. J.* 278) (*Proc. Haverford Coll. Obsy.* 1892)...Wilson (...)...Doberck (3466)...]

**$\beta$  429 and  $\beta$  440.** Lalande 38520

R.A. 20<sup>h</sup> 1<sup>m</sup> 27<sup>s</sup> }  
Decl. + 35° 27' }

A and B (=  $\beta$  440)

|         |      |      |             |       |         |
|---------|------|------|-------------|-------|---------|
| 1876.80 | 61.3 | 6.47 | 7.0... 12.0 | 1 $n$ | $\beta$ |
| 1878.53 | 61.1 | 6.63 | 7.0... 12.5 | 1 $n$ | $\beta$ |
| 1892.80 | 60.6 | 6.93 | 7.0... 12.0 | 1 $n$ | Ho      |

A and C (=  $\beta$  429)

|         |      |      |             |       |          |
|---------|------|------|-------------|-------|----------|
| 1876.73 | 25.8 | 7.75 | 7.0... 11.0 | 2 $n$ | $\Delta$ |
| 1878.53 | 25.1 | 8.39 | ... 12.0    | 1 $n$ | $\beta$  |
| 1892.80 | 26.3 | 8.12 | ... 10.0    | 1 $n$ | Ho       |

A and E (=  $\beta$  429)

|         |       |       |          |       |          |
|---------|-------|-------|----------|-------|----------|
| 1876.73 | 106.8 | 28.15 | ... 11.5 | 2 $n$ | $\Delta$ |
| 1892.80 | 106.3 | 27.84 | ... 11.0 | 1 $n$ | Ho       |

A and D (=  $H^1$  III, 113 = Sh 314)

|         |       |       |          |       |          |
|---------|-------|-------|----------|-------|----------|
| 1783.75 | 296.0 | 11.27 | ...      | 1 $n$ | $H^1$    |
| 1823.58 | 301.0 | 10.79 | ... 12   | 1 $n$ | Sh       |
| 1876.73 | 300.7 | 11.11 | ... 9.5  | 2 $n$ | $\Delta$ |
| 1892.80 | 300.3 | 11.34 | ... 10.0 | 1 $n$ | Ho       |

A and F

|         |      |       |         |       |          |
|---------|------|-------|---------|-------|----------|
| 1783.75 | 32.8 | 29.45 | ...     | 1 $n$ | $H^1$    |
| 1823.58 | 28.2 | 36.52 | ...     | 2 $n$ | Sh       |
| 1876.73 | 28.2 | 35.98 | ... 7.7 | 2 $n$ | $\Delta$ |
| 1892.80 | 28.4 | 35.97 | ... 8.0 | 1 $n$ | Ho       |

F and G

|         |       |       |        |       |         |
|---------|-------|-------|--------|-------|---------|
| 1876.80 | 113.0 | 10.12 | ... 12 | 1 $n$ | $\beta$ |
| 1892.80 | 104.5 | 10.25 | ... 12 | 1 $n$ | Ho      |

The near faint companions were discovered with the 18½-inch. A, D, and F make the wide triple,  $H^1$  III, 113 (= Sh 314 =  $\Sigma$  2630 *ref*). These stars are probably unchanged. All the measures are given above.

[ $\beta$  (vii, viii)... $\beta$  (2103) (*Am. Jour. Sci.* July 1877)... $\beta^t$ ... $\Delta$  (I)...Hough (3234)...]

**$\beta$  470.** O. Arg. N. 20079

R.A. 20<sup>h</sup> 3<sup>m</sup> 41<sup>s</sup> }  
Decl. + 63° 25' }

|         |       |      |             |       |          |
|---------|-------|------|-------------|-------|----------|
| 1877.69 | 214.8 | 2.40 | 9.5... 11.0 | 2 $n$ | $\Delta$ |
| 1892.63 | 215.7 | 2.48 | 8.3... 10.5 | 3 $n$ | W        |

Discovered with the 6-inch. In the field 16<sup>s</sup>  $\rho$  and 4'  $n$  of  $\Sigma$  2642.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (I)...Wilson (...)]

**β 833.** Lalande 38625

R.A. 20<sup>h</sup> 5<sup>m</sup> 11<sup>s</sup> }  
Decl. — 6° 30' }

B and C

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1881.74 | 63.7 | 2.30 | 8.8...11.7 | 2 <sup>n</sup> | β   |
| 1884.82 | 58.4 | 2.10 | 8.5...11.5 | 1 <sup>n</sup> | Ho  |
| 1886.86 | 76.0 | 2.52 | ...        | 1 <sup>n</sup> | UL  |
| 1888.08 | 59.2 | 2.45 | 8.5...12.1 | 3 <sup>n</sup> | Com |
| 1898.53 | 59.9 | 2.18 | 8.9...12.5 | 3 <sup>n</sup> | D   |
| 1898.62 | 57.7 | 2.41 | 8.3...11.6 | 3 <sup>n</sup> | A   |
| 1898.73 | 61.1 | 2.13 | ...12.6    | 4 <sup>n</sup> | Bd  |

A and B

|         |      |        |            |                |    |
|---------|------|--------|------------|----------------|----|
| 1881.74 | 63.5 | 118.58 | 8.4...     | 2 <sup>n</sup> | β  |
| 1886.86 | 63.0 | 119.65 | ...        | 3 <sup>n</sup> | UL |
| 1898.60 | 63.1 | 119.74 | 8.0... 8.3 | 3 <sup>n</sup> | A  |
| 1898.72 | 63.1 | 120.66 | 8.0... 8.5 | 3 <sup>n</sup> | Bd |

Discovered with the 15½-inch at the Washburn Observatory. Probably no change. BOOTHROYD measures a 12 m star from A, 357.2 : 43.63 (1898.72) 3<sup>n</sup>.

[β (xii)...β<sup>3</sup>...Hough (2978)...Uplegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken (3585)...Boothroyd ( )...]

**β 1205.** Lalande 38649

R.A. 20<sup>h</sup> 5<sup>m</sup> 47<sup>s</sup> }  
Decl. — 8° 27' }

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1890.65 | 50.0 | 0.56 | 8.1... 9.4 | 3 <sup>n</sup> | β  |
| 1897.71 | 46.6 | 0.70 | ...        | 3 <sup>n</sup> | A  |
| 1897.79 | 48.2 | 0.59 | ...        | 1 <sup>n</sup> | Br |

Discovered with the 12-inch. In S.D. 7.0 m.

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...Aitken (*A. J.* 429)...Brown ( )...]

**β 150.** W<sup>2</sup> XX. 176

R.A. 20<sup>h</sup> 5<sup>m</sup> 56<sup>s</sup> }  
Decl. + 33° 17' }

B and C

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1840.82 | 191.6 | 1.55 | 8.0... 9.5 | 1 <sup>n</sup> | OΣ |
| 1875.45 | 187.1 | 1.66 | 8.1...10.0 | 4 <sup>n</sup> | Δ  |
| 1893.51 | 187.7 | 1.85 | 8.0... 9.8 | 3 <sup>n</sup> | Lv |
| 1898.75 | 187.2 | 1.78 | ... 9.6    | 4 <sup>n</sup> | D  |

A and B (= S 738)

|         |       |       |            |                |     |
|---------|-------|-------|------------|----------------|-----|
| 1824.69 | 112.3 | 41.86 | 8 ... 9    | 1 <sup>n</sup> | S   |
| 1840.82 | 111.7 | 41.24 | 7.5...     | 1 <sup>n</sup> | OΣ  |
| 1875.76 | 110.3 | 41.15 | 7.0...     | 3 <sup>n</sup> | Δ   |
| 1885.91 | 110.3 | 41.40 | ...        | 5 <sup>n</sup> | Eng |
| 1898.74 | 109.2 | 41.26 | 7.1... 7.7 | 2 <sup>n</sup> | D   |

The duplicity of the smaller member of the wide pair, S 738, was discovered with the 6 inch. It had been previously seen, however, and was given as OΣ 541 in the *Poukova Observations*, IX, published after β (111). All the measures of these stars are given above. There is no evidence of change.

[β (111)...β (*Mon. Not.* xxxiv, 59)...Δ (1)...OΣ (*Poukova Observations* IX, X, p. 45)...Lv (*A. J.* 382)...Engelhardt (2785) (*Astron. Obsns.* 11)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 430.** D.M. (35°) 4008

R.A. 20<sup>h</sup> 6<sup>m</sup> 48<sup>s</sup> }  
Decl. + 35° 28' }

A and B

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1877.30 | 18.7 | 1.10 | 9.3...10.2 | 3 <sup>n</sup> | Δ  |
| 1893.51 | 21.1 | 0.98 | 8.9...10.0 | 3 <sup>n</sup> | Lv |
| 1898.76 | 23.8 | 0.97 | 8.7... 9.7 | 4 <sup>n</sup> | D  |

AB and C (= H 1489)

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1828    | 236.3 | 13.±  | 9-10...10  | 1 <sup>n</sup> | H  |
| 1877.61 | 51.3  | 17.09 | 9.3... 9.2 | 2 <sup>n</sup> | Δ  |
| 1893.55 | 52.5  | 17.15 | ... 9.3    | 1 <sup>n</sup> | Lv |
| 1898.76 | 51.6  | 16.87 | ... 9.8    | 4 <sup>n</sup> | D  |

The close pair was discovered with the 6-inch. It is probable there is an error of 180° in the angle of the wide pair by H, as the *p* star is obviously the brightest, and so in D.M., where the respective magnitudes are 9.3 and 9.5.

[β (vii)...β (2103)...Δ (1)...Lv (*A. J.* 382)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 982.** D.M. (25°) 4146

R.A. 20<sup>h</sup> 6<sup>m</sup> 51<sup>s</sup> }  
Decl. + 26° 1' }

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1880.47 | 51.0 | 0.87 | 8.8...10.0 | 2 <sup>n</sup> | β  |
| 1893.51 | 50.1 | 0.81 | 9.1...10.3 | 3 <sup>n</sup> | Lv |

Discovered with the 18½-inch. It is the *sf* star of a wide pair. There is a 6.2 m star 6.5 *n*.

[β (xiii)...β<sup>3</sup>...Lv (*A. J.* 382)...]

**β 762.** Lacaille 8392

R.A. 20<sup>h</sup> 9<sup>m</sup> 19<sup>s</sup> }  
Decl. — 32° 59' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1877.65 | 303.3 | 2.49 | 7.7... 8.0 | 2 <sup>n</sup> | Cin |
| 1887.72 | 303.8 | 2.78 | 8 ... 8    | 4 <sup>n</sup> | Pol |
| 1891.13 | 303.3 | 2.36 | 8.1... 8.3 | 3 <sup>n</sup> | β   |
| 1891.74 | 301.6 | 2.21 | 7 ... 8    | 1 <sup>n</sup> | Sel |
| 1893.68 | 303.1 | 2.25 | 7½... 7½   | 1 <sup>n</sup> | Sel |
| 1896.69 | 301.7 | 2.33 | 7.8... 8.2 | 5 <sup>n</sup> | See |
| 1897.62 | 303.8 | 2.49 | 7 ... 8    | 2 <sup>n</sup> | Sc  |

Discovered with the 6-inch. Without change.

[β (x1)...β<sup>2</sup>...β (3114)...β (Pub. L. O. 11)...Cin<sup>4</sup>...Pollock (Pub. Sydney Obsy. 1891) (Mem. R. A. S. L.)...Sellors (3158,3240)...See (3496)...Scott (Mon. Not. LIX, 427)...]

**β 660.** B.A.C. 6963

R.A. 20<sup>h</sup> 9<sup>m</sup> 40<sup>s</sup> }  
Decl. + 43° 1' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.65 | 318.1 | 9.44 | 7.0... 13.5 | 1 <sup>n</sup> | β  |
| 1884.55 | 320.5 | 9.72 | ...         | 2 <sup>n</sup> | HΣ |
| 1898.57 | 320.2 | 9.60 | 6.5... 13.0 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. In HEIS 6.7 m.

[β (x)...β<sup>2</sup>...Aitken (3585)...HΣ ( )...]

**β 294.** 3 Capricorni

R.A. 20<sup>h</sup> 9<sup>m</sup> 44<sup>s</sup> }  
Decl. — 12° 42' }

B and C

|         |       |      |              |                |   |
|---------|-------|------|--------------|----------------|---|
| 1891.64 | 177.9 | 8.17 | 13.0... 13.5 | 2 <sup>n</sup> | β |
| 1898.56 | 180.4 | 7.49 | 13.5... 14.5 | 2 <sup>n</sup> | A |

A and B

|         |      |       |        |                |   |
|---------|------|-------|--------|----------------|---|
| 1891.64 | 36.2 | 27.14 | 5.7... | 2 <sup>n</sup> | β |
| 1898.56 | 36.0 | 26.54 | 6.5... | 2 <sup>n</sup> | A |

These faint companions were noted with the 26-inch of the Naval Observatory. The large star has a proper motion of 0.020 in the direction of 275.6 (AUWERS).

[β (v)...β (Mon. Not. XXXV, 31)...β (3114)...β (Pub. L. O. 11)...Aitken (3585)...]

**β 983.** B.A.C 6966

R.A. 20<sup>h</sup> 10<sup>m</sup> 11<sup>s</sup> }  
Decl. + 25° 14' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1879.86 | 154.9 | 0.86 | 6.1... 10.2 | 3 <sup>n</sup> | β  |
| 1888.84 | 155.6 | 0.81 | ...         | 5 <sup>n</sup> | Sp |
| 1899.51 | 152.6 | 1.04 | 5.8... 10.3 | 3 <sup>n</sup> | A  |

Discovered with the 18½ inch. In HEIS and ARGELANDER this star is 5 m (*Vulpecula*); Harvard photometry 4.8.

[β (XIII)...β<sup>3</sup>...Sp (III)...Aitken ( )...]

**β 59.** W<sup>2</sup> XX. 213

R.A. 20<sup>h</sup> 10<sup>m</sup> 36<sup>s</sup> }  
Decl. + 4° 45' }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1875.66 | 118.8 | 8.79 | 9.1... 11.0 | 4 <sup>n</sup> | J |
| 1892.65 | 116.5 | 8.72 | 8.8... 11.0 | 3 <sup>n</sup> | W |
| 1898.46 | 116.0 | 8.59 | 9.0... 9.7  | 3 <sup>n</sup> | D |

Discovered with the 6-inch.

[β (t)...β (Mon. Not. XXXIII, 351)...Δ (1)...Wilson ( )...Doolittle (Pub. Flower Obsy. 1)...]

**β 295.** α<sup>1</sup> Capricorni

R.A. 20<sup>h</sup> 11<sup>m</sup> 0<sup>s</sup> }  
Decl. — 12° 53' }

A and B

|         |       |       |          |                |    |
|---------|-------|-------|----------|----------------|----|
| 1875.75 | 181.8 | 40±   | 4 ... 16 | 1 <sup>n</sup> | Hn |
| 1891.83 | 181.9 | 43.46 | ... 13.5 | 2 <sup>n</sup> | β  |
| 1899.43 | 181.5 | 43.46 | ... 13.0 | 2 <sup>n</sup> | β  |

A and C (= H 607)

|         |       |       |            |                |       |
|---------|-------|-------|------------|----------------|-------|
| 1830.56 | 220.1 | 44.14 | 4 ... 9-10 | 1 <sup>n</sup> | Dawes |
| 1879.49 | 221.1 | 44.32 | ... 9.0    | 3 <sup>n</sup> | β     |
| 1881.85 | 221.2 | 44.65 | ...        | 1 <sup>n</sup> | Big   |
| 1890.52 | 220.8 | 44.37 | ... 8.0    | 2 <sup>n</sup> | Gl    |
| 1891.83 | 221.5 | 44.65 | ... 8.9    | 2 <sup>n</sup> | β     |
| 1899.43 | 221.1 | 44.84 | ... 9.5    | 2 <sup>n</sup> | β     |

The faint star was added with the Washington 26-inch. All the measures of AC are given. AUWERS gives the proper motion of the large star, 0.028 in the direction of 335.8.

[β (v)...β (Mon. Not. XXXV, 31)...β (3114)...β (Pub. L. O. 11)...Holden (Wash. Obsns. 1875)...Dawes (Mem. R. A. S. XIX)...Bigourdan (Paris Obsns. 1883)...Glasenapp (1)...]

**β 442.** W<sup>2</sup> XX. 417

R.A. 20<sup>h</sup> 12<sup>m</sup> 4<sup>s</sup> }  
Decl. + 37° 13' }

A and B

|         |       |       |            |    |     |
|---------|-------|-------|------------|----|-----|
| 1876.77 | 104.1 | 18.47 | 8.0... 8.5 | 1n | β   |
| 1879.43 | 103.7 | 19.02 | 8.0... 9.5 | 1n | Cin |
| 1898.60 | 102.2 | 18.83 | ...        | 1n | β   |

B and C

|         |      |       |            |    |     |
|---------|------|-------|------------|----|-----|
| 1876.77 | 48.6 | 17.69 | ... 8.5    | 1n | β   |
| 1879.47 | 48.5 | 17.41 | 7.0... 8.5 | 2n | Cin |
| 1898.76 | 50.6 | 16.82 | ...        | 1n | β   |

A and a

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1876.77 | 157.5 | 4.40 | ...         | 1n | β   |
| 1879.47 | 155.3 | 4.01 | 8.7... 10.2 | 2n | Cin |
| 1898.60 | 156.9 | 3.88 | ...         | 1n | β   |

A and b

|         |       |      |     |    |   |
|---------|-------|------|-----|----|---|
| 1876.77 | 157±  | 7±   | ... | 1n | β |
| 1888.60 | 156.7 | 9.01 | ... | 1n | β |

A and c

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1876.77 | 332.5 | 19.55 | ...      | 1n | β   |
| 1879.43 | 331.2 | 18.88 | ... 10.5 | 1n | Cin |
| 1898.60 | 333.2 | 19.01 | ...      | 1n | β   |

B and d

|         |       |      |        |    |   |
|---------|-------|------|--------|----|---|
| 1898.76 | 128.1 | 3.68 | ... 14 | 1n | β |
|---------|-------|------|--------|----|---|

B and e

|         |       |      |        |    |     |
|---------|-------|------|--------|----|-----|
| 1876.77 | 164.3 | 8.12 | ...    | 1n | β   |
| 1879.43 | 165.3 | 5±   | ... 13 | 1n | Cin |
| 1898.60 | 163.7 | 6.77 | ...    | 1n | β   |

C and f

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1879.43 | 109.4 | 11.26 | ... 11.0 | 1n | Cin |
| 1898.60 | 110.3 | 12.65 | ...      | 1n | β   |

C and g

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1879.43 | 116.1 | 20.52 | ... 11.0 | 1n | Cin |
| 1898.60 | 116.2 | 20.83 | ...      | 1n | β   |

C and h

|         |       |       |          |    |     |
|---------|-------|-------|----------|----|-----|
| 1879.43 | 305.6 | 15±   | ... 13.0 | 1n | Cin |
| 1898.60 | 306.1 | 15.57 | ...      | 1n | β   |

A multiple star or group, discovered with the 18½-inch, except the extremely faint star *d*, which was detected with the 40-inch in measuring the other stars. This is probably only a perspective group.

[β (viii)...β (*Am. Jour. Sci.* July 1877)...Cin<sup>5</sup>...]

**β 984.** D.M. (25°) 4184

R.A. 20<sup>h</sup> 12<sup>m</sup> 31<sup>s</sup> }  
Decl. + 26° 0' }

|         |       |      |            |    |    |
|---------|-------|------|------------|----|----|
| 1880.47 | 204.1 | 0.86 | 7.9... 8.2 | 2n | β  |
| 1883.70 | 199.8 | 0.63 | 8.0... 8.0 | 3n | Ho |
| 1888.49 | 203.1 | ...  | ...        | 1n | Lv |
| 1890.85 | 207.5 | 0.73 | ...        | 7n | Sp |

Discovered with the 18½-inch.

[β (xiii)...β<sup>3</sup>...Hough (2978)...Lv<sup>1</sup>...Sp (iii)...]

**β 441.** Lalande 39013

R.A. 20<sup>h</sup> 12<sup>m</sup> 37<sup>s</sup> }  
Decl. + 28° 46' }

|         |      |      |             |    |        |
|---------|------|------|-------------|----|--------|
| 1876.80 | 65.4 | 5.87 | 7.0... 11.5 | 1n | β      |
| 1877.68 | 67.6 | 5.74 | 6.7... 11.5 | 2n | Δ      |
| 1878.58 | 67.5 | 6.07 | 7.0... 10.0 | 1n | OΣ     |
| 1880.47 | 65.7 | 5.67 | 6.5... 11.5 | 1n | β      |
| 1883.62 | 65.5 | 6.10 | ...         | 2n | HΣ     |
| 1893.51 | 65.6 | 5.93 | 6.3... 11.5 | 3n | Lv     |
| 1896.80 | 66.3 | 5.70 | ...         | 3n | Morgan |

Discovered with the 18½-inch. Without change.

[β (viii)...β (*Am. Jour. Sci.* July 1877)...β<sup>3</sup>...Δ (1)...HΣ ( )...OΣ (*Poulkowa Obsns.* x)...Lv (*A. J.* 382)...Morgan (*A. J.* 439)...]

**β 661.** Cygni 166

R.A. 20<sup>h</sup> 12<sup>m</sup> 39<sup>s</sup> }  
Decl. + 40° 0' }

|         |      |       |             |    |    |
|---------|------|-------|-------------|----|----|
| 1878.52 | 67.0 | 12.60 | 6.2... 12.5 | 2n | β  |
| 1884.56 | 66.5 | 12.81 | ...         | 2n | HΣ |
| 1891.50 | 65.1 | 12.99 | 5.8... 12.2 | 3n | β  |

Discovered with the 18½-inch. The Harvard photometric magnitude is 5.5. B.A.C. 6986.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* II)...HΣ ( )...]

**$\beta$  985.** W<sup>2</sup> XX. 448

R.A. 20<sup>h</sup> 13<sup>m</sup> 12<sup>s</sup> }  
Decl. + 25° 16' }

A and B

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1880.66 | 148.7 | 5.03 | 7.5...13.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.83 | 146.8 | 4.72 | 6.8...13.5 | 2 <sup>n</sup> | A       |

C and D

|         |      |      |         |                |   |
|---------|------|------|---------|----------------|---|
| 1893.59 | 61.8 | 8.89 | ...12.7 | 3 <sup>n</sup> | W |
| 1898.83 | 63.7 | 9.83 | ...13.0 | 2 <sup>n</sup> | A |

A and C (= H 1499)

|         |       |          |            |                |                |
|---------|-------|----------|------------|----------------|----------------|
| 1828    | 358.4 | 15 $\pm$ | 8 ... 13   | 1 <sup>n</sup> | H <sup>2</sup> |
| 1880.66 | 356.0 | 21.39    | ...10.3    | 3 <sup>n</sup> | $\beta$        |
| 1893.58 | 356.4 | 21.54    | 7.5...10.2 | 3 <sup>n</sup> | W              |
| 1898.83 | 355.8 | 21.62    | ...10.0    | 2 <sup>n</sup> | A              |

Discovered with the 18½-inch. All the measures of H 1499 are given here.

[ $\beta$  (xiii)... $\beta^3$ ...Wilson ( )...Aitken (3585)...]

 **$\beta$  662.** S.D. (20°) 5904

R.A. 20<sup>h</sup> 14<sup>m</sup> 0<sup>s</sup> }  
Decl. - 19° 59' }

|         |           |           |            |                |         |
|---------|-----------|-----------|------------|----------------|---------|
| 1878.52 | 300 $\pm$ | 1.7 $\pm$ | 9 ... 10   |                | $\beta$ |
| 1898.74 | 300.6     | 1.61      | 9 ... 11.7 | 3 <sup>n</sup> | Cg      |

Discovered with the 18½-inch. This is the most northern of two small stars 2.7 apart. A 7½ m star 28<sup>s</sup>  $\rho$  and 2.6 s.

[ $\beta$  (x)... $\beta^1$ ...Cogshall ( )...]

 **$\beta$  986.** W<sup>2</sup> XX. 491

R.A. 20<sup>h</sup> 14<sup>m</sup> 10<sup>s</sup> }  
Decl. + 34° 44' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1880.51 | 242.1 | 4.41 | 8.1...11.4 | 5 <sup>n</sup> | $\beta$ |
| 1892.72 | 240.6 | 4.20 | 8.5...11.8 | 3 <sup>n</sup> | W       |

Discovered with the 18½-inch.

[ $\beta$  (xiii)... $\beta^3$ ...Wilson ( )...]

 **$\beta$  1206.** Lalande 39115

R.A. 20<sup>h</sup> 14<sup>m</sup> 36<sup>s</sup> }  
Decl. + 36° 23' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.52 | 363.0 | 1.90 | 7.8...10.8 | 3 <sup>n</sup> | $\beta$ |
| 1897.74 | 359.7 | 1.80 | ...        | 1 <sup>n</sup> | L       |
| 1897.83 | 355.6 | 2.25 | ...        | 1 <sup>n</sup> | A       |
| 1897.99 | 365.6 | 2.14 | ...        | 1 <sup>n</sup> | Br      |

Discovered with the 36-inch.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* 11)...Aitken (*A. J.* 429)  
...Lewis (*Mon. Not.* LIX, 400)...Brown ( )...]

 **$\beta$  431.** W<sup>2</sup> XX. 530

R.A. 20<sup>h</sup> 15<sup>m</sup> 25<sup>s</sup> }  
Decl. + 35° 53' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1877.33 | 220.8 | 0.56 | 8.5... 8.8 | 6 <sup>n</sup> | $\Delta$   |
| 1884.25 | 42.4  | 0.72 | ...        | 3 <sup>n</sup> | H $\Sigma$ |
| 1884.84 | 53.1  | 0.42 | 8.0... 8.5 | 7 <sup>n</sup> | En         |
| 1889.53 | 38.2  | 0.66 | 8.6... 8.6 | 4 <sup>n</sup> | $\beta$    |
| 1898.60 | 38.0  | 0.75 | 8.4... 8.5 | 4 <sup>n</sup> | A          |

Discovered with the 6-inch. Change uncertain.

$\beta$  (vii)... $\beta$  (2103,2957)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Engelmann (2742)...H $\Sigma$  ( )...Aitken (3585)...]

 **$\beta$  763.**  $\kappa^2$  Sagittari

R.A. 20<sup>h</sup> 15<sup>m</sup> 43<sup>s</sup> }  
Decl. - 42° 48' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1887.38 | 213.3 | 0.93 | 7 ... 8    | 1 <sup>n</sup> | Pol     |
| 1889.47 | 211.2 | 1.33 | 6.0... 8.9 | 4 <sup>n</sup> | $\beta$ |
| 1891.04 | 216.0 | 0.88 | 6 ... 9    | 1 <sup>n</sup> | Sel     |
| 1894.71 | 213.4 | 0.73 | 6 ... 8    | 2 <sup>n</sup> | Sel     |
| 1897.78 | 195.1 | 1.40 | 7.0... 8.9 | 1 <sup>n</sup> | See     |
| 1898.58 | 212.9 | 1.00 | 6.0... 8.8 | 3 <sup>n</sup> | A       |

Discovered with the 6-inch at Mt. Hamilton in 1879. The Cordoba magnitude is 5.6. Probably unchanged. SEE measures a 14 m star 209°.3 : 29°.31 (1897.78) 1<sup>n</sup>.

[ $\beta$  (xi)... $\beta^2$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* 11)...Pollock (*Pub. Sydney Obsy.* 1891) (*Mon. Not.* XLVII, 473) (*Mem. R. A. S. L.*)...Sellors (3154,3303)...Aitken (3585)...]

 **$\beta$  1207.** Lalande 39198

R.A. 20<sup>h</sup> 16<sup>m</sup> 25<sup>s</sup> }  
Decl. + 43° 28' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.58 | 217.8 | 5.76 | 7.7...13.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.66 | 215.7 | 5.83 | 7.3...13.5 | 3 <sup>n</sup> | A       |

Discovered with the 36-inch. One of the WOLF-RAYET stars in *Cygnus*.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* 11)...Aitken (3585)...]

**β 1259.** W<sup>a</sup> XX. 563

R.A. 20<sup>h</sup> 16<sup>m</sup> 27<sup>s</sup> }  
Decl. + 30° 13' }

|         |       |      |        |     |                |    |
|---------|-------|------|--------|-----|----------------|----|
| 1891.65 | 171.9 | 0.47 | 8.3... | 8.7 | 3 <sup>n</sup> | β  |
| 1895.01 | 172.9 | 0.37 |        |     | 5 <sup>n</sup> | Sp |
| 1898.60 | 167.5 | 0.63 | 8.6... | 8.7 | 3 <sup>n</sup> | A  |

Discovered with the 36-inch. It is 11<sup>s</sup> *p* a 7 m star.

[β (xviii)...β (3113)...β (*Pub. L. O.* II)...Sp (III)...Aitken (3585)...]

**β 1260.** D.M. (55°) 2368

R.A. 20<sup>h</sup> 16<sup>m</sup> 33<sup>s</sup> }  
Decl. + 55° 19' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1891.57 | 169.4 | 0.47 | 8.2... | 10.8 | 3 <sup>n</sup> | β |
|---------|-------|------|--------|------|----------------|---|

Discovered with the 36-inch. This is 18' *n* of of Σ 2761.

[β (xviii)...β (3113)...β (*Pub. L. O.* II)...]

**β 663.** Lalande 39260

R.A. 20<sup>h</sup> 17<sup>m</sup> 19<sup>s</sup> }  
Decl. + 53° 13' }

A and B

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1891.54 | 313.6 | 6.58 | 6.3... | 15.2 | 2 <sup>n</sup> | β |
| 1898.67 | 311.4 | 7.80 | 6.0... | 15.5 | 1 <sup>n</sup> | A |

A and C

|         |      |      |     |      |                |    |
|---------|------|------|-----|------|----------------|----|
| 1877.57 | 79.4 | 8.3± | ... | 12.5 | 1 <sup>n</sup> | β  |
| 1885.52 | 77.5 | 7.80 | ... |      | 2 <sup>n</sup> | HΣ |
| 1891.53 | 75.2 | 7.67 | ... | 12.5 | 3 <sup>n</sup> | β  |
| 1898.67 | 76.7 | 7.60 | ... | 13.0 | 1 <sup>n</sup> | A  |

The faint star, C, was discovered with the 18½-inch, and in measuring that with the 36-inch a still nearer companion was detected. This is a difficult object with a large aperture. ROGERS (*A. G. C.*) gives the proper motion, 0".092 in the direction of 270°.

[β (x)...β<sup>t</sup>...β (3114)...β (*Pub. L. O.* II)...Aitken (3585)...HΣ ( )...]

**β 665.** γ *Cygni*

R.A. 20<sup>h</sup> 17<sup>m</sup> 55<sup>s</sup> }  
Decl. + 39° 52' }

B and C

|         |       |      |         |      |                |   |
|---------|-------|------|---------|------|----------------|---|
| 1878.52 | 305.1 | 1.41 | 10.0... | 11.0 | 2 <sup>n</sup> | β |
| 1891.53 | 302.0 | 1.78 | 10.4... | 10.4 | 3 <sup>n</sup> | β |
| 1898.55 | 300.2 | 1.86 | 10.0... | 10.0 | 3 <sup>n</sup> | A |

A and BC

|         |       |        |        |  |                |   |
|---------|-------|--------|--------|--|----------------|---|
| 1878.19 | 196.5 | 140.44 | 2.3... |  | 3 <sup>n</sup> | β |
| 1891.53 | 196.4 | 141.13 |        |  | 3 <sup>n</sup> | β |
| 1898.54 | 196.2 | 141.32 |        |  | 1 <sup>n</sup> | A |

The distant double companion was discovered with the 18½-inch. There are several small stars nearer A than this. AUWERS gives the proper motion of γ *Cygni* 0".019 in the direction of 176° 5.

MITCHELL at Cincinnati has a companion which is ascribed to γ *Cygni* (Cin<sup>a</sup>) 233° 3 : 33".80 (1847.54). He gave the colors, A *red*, B *greenish*. There is no doubt that the observation really belongs to β *Cygni*, there being an error of 180° in the position angle. With this correction the measure and description apply perfectly.

[β (x)...β<sup>t</sup>...β (3114)...β (*Pub. L. O.* II)...Aitken (3585)...]

**β 664.** *Aquilae* 264

R.A. 20<sup>h</sup> 18<sup>m</sup> 36<sup>s</sup> }  
Decl. + 5° 7' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1878.62 | 285.1 | 9.66 | 7.0... | 12.5 | 1 <sup>n</sup> | β  |
| 1885.13 | 289.0 | 8.78 |        |      | 4 <sup>n</sup> | HΣ |
| 1893.66 | 290.0 | 8.90 | 7.2... | 13.0 | 3 <sup>n</sup> | W  |
| 1896.71 | 287.0 | 8.76 | 7.5... | 12.2 | 1 <sup>n</sup> | Lv |
| 1898.68 | 288.2 | 8.90 | 7.0... | 12.2 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. Probably without change. Lalande 39236.

[β (x)...β<sup>t</sup>...Lv (*A. J.* 407)...Wilson ( )...Aitken (3585)...HΣ ( )...]

**β 666.** D.M. (53°) 2392

R.A. 20<sup>h</sup> 19<sup>m</sup> 9<sup>s</sup> }  
Decl. + 53° 15' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1877.58 | 121.4 | 1.7± | 8.5... | 11.0 | 1 <sup>n</sup> | β  |
| 1877.86 | 124.7 | 2.00 | 9.0... | 12.0 | 1 <sup>n</sup> | Δ  |
| 1892.82 | 121.6 | 1.58 | 9.0... | 10.5 | 1 <sup>n</sup> | Ho |

Discovered with the 18½-inch.

[β (x)...β<sup>t</sup>...Δ (1)...Hough (3234)...]

**$\beta$  443.** Lalande 39293

R.A. 20<sup>h</sup> 19<sup>m</sup> 12<sup>s</sup> }  
Decl. + 28° 37' }

## A and B

|         |       |       |            |                |            |
|---------|-------|-------|------------|----------------|------------|
| 1878.47 | 134.3 | 12.98 | 7.5...11.5 | 1 <sup>n</sup> | $\beta$    |
| 1878.58 | 132.9 | 13.30 | ...        | 1 <sup>n</sup> | O $\Sigma$ |
| 1892.81 | 133.2 | 13.16 | 7.5...12.0 | 2 <sup>n</sup> | W          |
| 1898.51 | 136.2 | 13.64 | 7.5...11.5 | 2 <sup>n</sup> | $\beta$    |

## A and C

|         |      |       |         |                |         |
|---------|------|-------|---------|----------------|---------|
| 1878.47 | 87.4 | 35.22 | ...12.0 | 1 <sup>n</sup> | $\beta$ |
| 1892.81 | 88.8 | 35.18 | ...10.5 | 2 <sup>n</sup> | W       |
| 1898.51 | 89.2 | 35.38 | ...     | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. The 40-inch shows a faint star in the direction of B, which is nearer than C.

[ $\beta$  (VIII)... $\beta$  (*Am. Jour. Sci.* July 1877)...O $\Sigma$  (*Poulkowa Obsns.* x)...Wilson ( )...]

 **$\beta$  1134.** D.M. (63°) 1618

R.A. 20<sup>h</sup> 19<sup>m</sup> 29<sup>s</sup> }  
Decl. + 63° 36' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1889.48 | 80.8 | 4.32 | 5.8...12.7 | 3 <sup>n</sup> | $\beta$ |
|---------|------|------|------------|----------------|---------|

Discovered with the 36-inch. A naked-eye star in *Cepheus*, but not given as such by HEIS and ARGELANDER. The Harvard photometric magnitude is 5.8.

[ $\beta$  (XVI)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...]

 **$\beta$  432.** W<sup>2</sup> XX. 698

R.A. 20<sup>h</sup> 20<sup>m</sup> 13<sup>s</sup> }  
Decl. + 35° 22' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1877.23 | 195.2 | 1.24 | 8.6... 9.9 | 5 <sup>n</sup> | $\Delta$   |
| 1878.65 | 199.6 | 1.34 | 8.5... 9.5 | 1 <sup>n</sup> | O $\Sigma$ |
| 1892.72 | 197.8 | 1.44 | 8.3... 9.7 | 3 <sup>n</sup> | W          |
| 1897.79 | 192.7 | 1.35 | ...        | 1 <sup>n</sup> | Br         |
| 1898.60 | 196.1 | 1.44 | 8.4... 9.5 | 4 <sup>n</sup> | A          |

Discovered with the 6-inch. Without relative change.

[ $\beta$  (VII)... $\beta$  (2103)... $\Delta$  (1)...Wilson ( )...O $\Sigma$  (*Poulkowa Obsns.* x)...Wilson ( )...Aitken (3585)...Brown ( )...]

 **$\beta$  60.**  $\pi$  Capricorni

R.A. 20<sup>h</sup> 20<sup>m</sup> 27<sup>s</sup> }  
Decl. — 18° 36' }

## A and B

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1846.70 | 145.1 | 2.85 | ...        | 5 <sup>n</sup> | Mh       |
| 1871.80 | 144.9 | 3.15 | 6.0...10.3 | 3 <sup>n</sup> | Kn       |
| 1874.96 | 145.2 | 3.27 | 5.1... 8.7 | 4 <sup>n</sup> | $\Delta$ |
| 1876.64 | 146.2 | 3.47 | 5.0... 9.7 | 3 <sup>n</sup> | Cin      |
| 1877.64 | 144.2 | 3.16 | 4.7... 8.7 | 2 <sup>n</sup> | Cin      |
| 1880.72 | 145.4 | 3.31 | ...        | 2 <sup>n</sup> | Pt       |
| 1887.79 | 145.0 | 3.34 | 5.0... 9.0 | 2 <sup>n</sup> | T        |
| 1888.60 | 146.2 | 3.49 | 5.0... 8.2 | 6 <sup>n</sup> | Lv       |
| 1888.71 | 146.9 | 3.53 | 5.0... 8.5 | 2 <sup>n</sup> | T        |
| 1889.69 | 145.1 | 3.43 | 5 ... 9    | 2 <sup>n</sup> | Hl       |
| 1897.74 | 146.5 | 3.45 | 4.9... 7.8 | 2 <sup>n</sup> | See      |
| 1898.51 | 144.2 | 3.15 | ... 7.8    | 3 <sup>n</sup> | D        |
| 1898.56 | 144.2 | 3.40 | 5.0... 9.3 | 2 <sup>n</sup> | A        |

A and C (=  $\beta$  296)

|         |          |          |         |                  |
|---------|----------|----------|---------|------------------|
| 1874    | 45 $\pm$ | 30 $\pm$ | ...13.5 | $\beta$          |
| 1898.56 | 43.5     | 38.12    | ...14.0 | 2 <sup>n</sup> A |

The close pair was discovered with the 6-inch in 1871, but it had been seen long prior by MITCHELL at Cincinnati, although not published until 1876. The principal star has a proper motion of 0'.017 in the direction of  $\nearrow 133.2$  (AUWERS). If the smaller star was fixed, the distance should increase about 0'.8 in the time covered by the measures. The measures appear to indicate some change in this respect. The distant star was added with the Washington 26-inch.

[ $\beta$  (I, V)... $\beta$  (*Mon. Not.* xxxiii, 351; xxxv, 31)...Mitchell (Cin<sup>2</sup>)... $\Delta$  (1)... $\Delta$  (2081)...Knott (*Mem. R. A. S.* xliii)...Cin<sup>3</sup>...Cin<sup>4</sup>...Pritchett (*Pub. Morrison Obsy.* 1)...Tarrant (2899, 2991)...Lv<sup>1</sup>...Hall (II)...See (3496)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken (3585)...]

 **$\beta$  61.**  $\rho$  Capricorni

R.A. 20<sup>h</sup> 22<sup>m</sup> 1<sup>s</sup> }  
Decl. — 18° 13' }

## A and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1891.49 | 151.4 | 55.21 | ...13.2 | 3 <sup>n</sup> | $\beta$ |
| 1898.63 | 151.3 | 55.16 | ...12.3 | 3 <sup>n</sup> | D       |
| 1899.44 | 151.1 | 55.32 | ...13.0 | 1 <sup>n</sup> | $\beta$ |

A and B (= H<sup>1</sup> II. 51 = Sh 323)

|         |       |      |             |    |    |
|---------|-------|------|-------------|----|----|
| 1823.78 | 177.3 | 4.02 | 5 ... 10    | 2n | Sh |
| 1869.01 | 174.1 | 2.83 | 5.0 ... 7.1 | 4n | Δ  |
| 1872.28 | 172.4 | 2.92 | ...         | 2n | Sp |
| 1898.63 | 172.2 | 2.58 | ... 7.5     | 3n | D  |

A and D (= H<sup>1</sup> VI. 29 = Sh 322)

|         |       |        |         |    |    |
|---------|-------|--------|---------|----|----|
| 1823.78 | 150.7 | 238.02 | 5 ... 7 | 2n | Sh |
| 1899.44 | 150.1 | 246.96 | ... 7   | 1n | β  |

The faint star, C, was noted with the 6-inch. There are many measures of AB, which, taken together, do not show any sensible change. The principal star has a proper motion of 0".040 in the direction of 260°0 (AUWERS). It would appear from the measures that A and B are moving together. The very distant star, D, is Lalande 39364. The Cordoba meridian observations give for AD, 149°.9 : 245".8.

[β (I)...β (Mon. Not. xxxiii, 351)...β (3114)...β (Pub. L. O. II) Doolittle (Pub. Flower Obsy. I)...Herschel (Cape Obsns.)...Mitchell (Cin<sup>2</sup>)...Jacob (Mem. R. A. S. xvii, xviii)...Secchi (Catalogo di 1321 Stelle Doppie) (Mem. Coll. Romano, 1855)...Secchi (1017)...Knott (Mem. R. A. S. xliii)...Δ (I)...Sp (II)...Pritchett (Pub. Morrison Obsy. I)...Cin<sup>3</sup>...Cin<sup>6</sup>...Tarrant (2899)...Lv<sup>1</sup>...LM ...Scott (Brit. Ast. Asso. v, 75; vi, 250)...]

β 62. Lalande 39445

R.A. 20<sup>h</sup> 23<sup>m</sup> 6<sup>s</sup> }  
Decl. + 29° 44' }

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1875.52 | 135.5 | 1.20 | 8.5 ... 9.4 | 4n | Δ |
| 1892.59 | 137.6 | 1.21 | 8.2 ... 9.8 | 2n | W |
| 1898.54 | 136.2 | 1.16 | 8.1 ... 9.2 | 3n | D |

Discovered with the 6-inch.

[β (I)...β (Mon. Not. xxxiii, 351)...Δ (I)...Wilson ( )...Doolittle (Pub. Flower Obsy. I)...]

β 433. D.M. (55°) 2399

R.A. 20<sup>h</sup> 23<sup>m</sup> 36<sup>s</sup> }  
Decl. + 55° 55' }

A and B

|         |       |      |              |    |   |
|---------|-------|------|--------------|----|---|
| 1892.74 | 208.6 | 7.38 | 9.0 ... 11.2 | 2n | W |
| 1898.47 | 206.0 | 7.81 | 8.8 ... 9.9  | 3n | D |

A and C

|         |       |       |          |    |   |
|---------|-------|-------|----------|----|---|
| 1892.74 | 244.8 | 27.09 | ... 10.0 | 2n | W |
| 1898.47 | 244.0 | 27.57 | ... 9.2  | 3n | D |

Discovered with the 6-inch.

[β (VII)...β (2103)...Wilson ( )...Doolittle (Pub. Flower Obsy. I)...]

β 363. Vulpeculae 93

R.A. 20<sup>h</sup> 24<sup>m</sup> 28<sup>s</sup> }  
Decl. + 20° 12' }

|         |      |       |              |    |     |
|---------|------|-------|--------------|----|-----|
| 1878.71 | 62.8 | 21.77 | 7.0 ... 11.0 | 1n | β   |
| 1879.54 | 61.8 | 20.±  | 7.0 ... 12.0 | 1n | Cin |
| 1892.68 | 65.4 | 19.72 | 7.2 ... 12.2 | 2n | W   |

Discovered with the 6-inch. WILSON measures a third star, 197°.5 : 44".14 (1892.68) 2n. The principal star is W<sup>2</sup> XX, 807.

[β (VI)...β (2062)...β<sup>2</sup>...Cin<sup>5</sup>...Wilson ( )...]

β 63. I Delphini

R.A. 20<sup>h</sup> 24<sup>m</sup> 33<sup>s</sup> }  
Decl. + 10° 30' }

A and B

|         |       |      |             |    |     |
|---------|-------|------|-------------|----|-----|
| 1874.70 | 350.0 | 0.64 | ...         | 1n | N   |
| 1874.92 | 343.3 | 0.84 | 6.0 ... 8.0 | 4n | Δ   |
| 1878.46 | 345.0 | ...  | 6.0 ... 8.0 | 1n | β   |
| 1878.60 | 338.9 | 0.85 | 6.5 ... 8.5 | 1n | OΣ  |
| 1879.70 | 344.9 | 0.67 | ...         | 1n | β   |
| 1880.19 | 345.4 | 0.88 | 6.4 ... 7.9 | 3n | β   |
| 1884.97 | 346.6 | 0.91 | ...         | 3n | HΣ  |
| 1887.60 | 344.8 | 0.89 | 6.0 ... 8.0 | 3n | T   |
| 1887.84 | 347.4 | 0.79 | 6 ... 10    | 2n | H1  |
| 1888.59 | 347.0 | 0.89 | 5.9 ... 8.0 | 3n | Lv  |
| 1888.62 | 347.9 | 0.67 | ...         | 8n | Sp  |
| 1888.69 | 346.4 | 0.88 | 6.0 ... 8.0 | 2n | T   |
| 1891.69 | 353.0 | 1.06 | ...         | 2n | Maw |
| 1897.82 | 346.5 | 1.11 | ...         | 2n | Br  |
| 1898.48 | 343.6 | 0.93 | 7.3 ... 8.3 | 2n | D   |
| 1898.64 | 346.7 | 0.88 | 6.1 ... 8.5 | 2n | β   |
| 1898.70 | 344.0 | 1.14 | 6.0 ... 8.9 | 4n | A   |
| 1898.85 | 353.9 | 0.93 | ...         | 1n | Maw |

A and C (= β 297)

|         |       |       |          |    |    |
|---------|-------|-------|----------|----|----|
| 1874    | 360.± | 15.±  | ... 13.5 |    | β  |
| 1885.60 | 349.0 | 16.71 | ...      | 1n | HΣ |
| 1898.48 | 352.7 | 15.81 | ... 13.5 | 2n | D  |
| 1898.55 | 346.6 | 16.79 | ... 14.2 | 2n | β  |
| 1898.79 | 346.6 | 17.77 | ... 13.5 | 3n | A  |

The close pair was discovered with the 6-inch, and the distant star added with the Washington 26-inch. So far there appears to be no sensible change in AB. The proper motion of the principal star is very small— $0''.0114$  in the direction of  $345^\circ$ . If this is substantially correct as to amount, the components are moving together, as otherwise the distance would be increased nearly  $0''.3$  in the time covered by the measures.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii)... $\beta^2$ ... $\beta^3$ ...Newcomb (*Wash. Obsns.* 1874)... $\Delta$  (1)... $\Delta$  (2081)...O $\Sigma$  (*Poulkowa Obsns.* x)...Tarrant (2899,2991)...Lv<sup>1</sup>...Hall (ii)...Sp (iii)...Maw (*Mem. R. A. S.* 1, 1111)...Doolittle (*Pub. Flower Obsy.* 1)...Aitken (3585)...Brown ( )...]

**$\beta$  987.** Lalande 39506

R.A.  $20^h 24^m 50^s$  }  
Decl.  $+ 19^\circ 1'$  }

A and B

|         |               |          |                  |            |         |
|---------|---------------|----------|------------------|------------|---------|
| 1880.15 | $127.7^\circ$ | $2.32''$ | $7.2 \dots 11.5$ | 5 <i>n</i> | $\beta$ |
| 1893.59 | $130.7^\circ$ | $2.40''$ | $7.5 \dots 11.7$ | 3 <i>n</i> | W       |

A and C (= S 752)

|         |               |            |                      |            |         |
|---------|---------------|------------|----------------------|------------|---------|
| 1824.98 | $288.6^\circ$ | $105.38''$ | 7 ... $7\frac{1}{4}$ | 3 <i>n</i> | S       |
| 1879.99 | $288.5^\circ$ | $106.17''$ | ... 7.2              | 2 <i>n</i> | $\beta$ |

The close companion to A was discovered with the  $18\frac{1}{2}$ -inch. The foregoing are all the measures of AC. The *Berlin A. G. Catalogue* gives the proper motion of the principal star  $0''.041$  in the direction of  $290^\circ$ .

[ $\beta$  (xiii)... $\beta^3$ ...Wilson ( )...]

**$\beta$  1135.** Lalande 39561

R.A.  $20^h 25^m 10^s$  }  
Decl.  $+ 45^\circ 20'$  }

|         |               |          |                  |            |         |
|---------|---------------|----------|------------------|------------|---------|
| 1889.53 | $338.3^\circ$ | $1.53''$ | $8.3 \dots 10.7$ | 4 <i>n</i> | $\beta$ |
| 1895.78 | $336.8^\circ$ | $1.40''$ | $8.1 \dots 11.4$ | 3 <i>n</i> | A       |
| 1897.78 | $340.4^\circ$ | $1.56''$ | ...              | 1 <i>n</i> | A       |

Discovered with the 12-inch.

$\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Aitken (*A. J.* 429) (*Ast. Soc. Pac.* vii, 305)...]

**$\beta$  668.** B.A.C. 7080

R.A.  $20^h 25^m 49^s$  }  
Decl.  $- 10^\circ 16'$  }

|         |              |          |                  |            |         |
|---------|--------------|----------|------------------|------------|---------|
| 1878.63 | $29.0^\circ$ | $4.64''$ | $6.2 \dots 11.7$ | 3 <i>n</i> | $\beta$ |
| 1881.67 | $26.1^\circ$ | $4.99''$ | $6.5 \dots 12.4$ | 4 <i>n</i> | $\beta$ |
| 1890.57 | $25.0^\circ$ | $4.80''$ | $6.8 \dots 11.2$ | 3 <i>n</i> | $\beta$ |
| 1891.49 | $27.8^\circ$ | $4.64''$ | $6.0 \dots 11.5$ | 3 <i>n</i> | $\beta$ |
| 1898.56 | $27.3^\circ$ | $4.75''$ | $6.5 \dots 12.0$ | 2 <i>n</i> | $\beta$ |
| 1898.57 | $25.6^\circ$ | $4.96''$ | $6.9 \dots 12.2$ | 3 <i>n</i> | A       |
| 1898.70 | $26.3^\circ$ | $4.66''$ | $6.7 \dots 11.3$ | 4 <i>n</i> | D       |

Discovered with the  $18\frac{1}{2}$ -inch. A very interesting physical system from the considerable proper motion of the components. This motion of the principal star is given :

|        |   |   |   |         |                 |
|--------|---|---|---|---------|-----------------|
| Bonn   | - | - | - | $0.309$ | in $67.7^\circ$ |
| Auwers | - | - | - | $0.309$ | in $72.1^\circ$ |
| Porter | - | - | - | $0.305$ | in $66.2^\circ$ |

There has been very little, if any, change in the position of the small star in twenty years. This is a naked-eye star in *Capricornus*. The Harvard photometric magnitude is 5.6.

[ $\beta$  (x)... $\beta^1$ ... $\beta^4$ ... $\beta$  (3048,3114)... $\beta$  (*Pub. L. O.* 11)... Aitken (3585)...Doolittle (*Pub. Flower Obsy.* 1)...]

**$\beta$  669.**  $\omega^2$  Cygni

R.A.  $20^h 26^m 20^s$  }  
Decl.  $+ 48^\circ 33'$  }

A and B

|         |               |           |                  |            |         |
|---------|---------------|-----------|------------------|------------|---------|
| 1878.65 | $342.5^\circ$ | $17.26''$ | $5.5 \dots 13.5$ | 1 <i>n</i> | $\beta$ |
| 1898.51 | $342.2^\circ$ | $18.11''$ | ...              | 3 <i>n</i> | $\beta$ |

A and C

|         |              |           |          |            |         |
|---------|--------------|-----------|----------|------------|---------|
| 1878.65 | $86.3^\circ$ | $56.28''$ | ... 10.0 | 1 <i>n</i> | $\beta$ |
| 1893.65 | $86.6^\circ$ | $55.86''$ | ... 10.9 | 4 <i>n</i> | W       |
| 1898.49 | $86.5^\circ$ | $56.02''$ | ... 8.7  | 2 <i>n</i> | D       |
| 1898.51 | $86.3^\circ$ | $56.39''$ | ...      | 3 <i>n</i> | $\beta$ |

These distant companions were noted with the  $18\frac{1}{2}$ -inch. AUWERS gives the proper motion  $0''.042$  in the direction of  $160^\circ$ . This would increase the distance of B in twenty years about  $0''.8$ , and this change is shown by the measures.

[ $\beta$  (x)... $\beta^1$ ...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 670.** D.M. (13°) 4435

R.A. 20<sup>h</sup> 27<sup>m</sup> 17<sup>s</sup> }  
Decl. + 13° 32' }

|         |      |      |            |    |    |
|---------|------|------|------------|----|----|
| 1877.75 | 58.3 | 0.76 | 8.5... 8.8 | 2n | β  |
| 1877.83 | 53.5 | 0.63 | 8.5... 9.0 | 1n | Δ  |
| 1889.87 | 50.7 | 0.6± | ...        | 5n | Sp |
| 1893.51 | 47.3 | 0.53 | 8.5... 8.9 | 3n | Lv |
| 1896.12 | 44.8 | 0.62 | 8.2... 9.2 | 2n | W  |
| 1897.84 | 48.4 | 0.45 | ...        | 2n | Br |
| 1898.75 | 47.1 | 0.57 | 8.7... 9.2 | 3n | A  |

Discovered with the 18½-inch. The measures suggest angular motion. The southern star of a wide pair.

[β (x)...β¹...Δ (1)...Sp (III)...Lv (A. J. 382)...Aitken (3585)...Wilson ( )...Brown ( )...]

**β 434.** W² XX. 941

R.A. 20<sup>h</sup> 28<sup>m</sup> 5<sup>s</sup> }  
Decl. + 41° 28' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1877.29 | 101.1 | 1.37 | 9.1... 9.9 | 3n | Δ |
| 1892.70 | 100.8 | 1.56 | 9.0... 9.8 | 2n | W |

Discovered with the 6-inch.

[β (VII)...β (2103)...Δ (1)...Wilson ( )...]

**β 1136.** Lalande 39698

R.A. 20<sup>h</sup> 28<sup>m</sup> 6<sup>s</sup> }  
Decl. + 49° 8' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1889.54 | 206.6 | 0.35 | 8.1... 9.7 | 3n | β |
|---------|-------|------|------------|----|---|

Discovered with the 12-inch. Recent measures are wanting.

[β (xvi)...β (2956)...β (Pub. L. O. II)...]

**β 1208.** Lalande 39656

R.A. 20<sup>h</sup> 28<sup>m</sup> 38<sup>s</sup> }  
Decl. + 6° 28' }

|         |       |      |             |    |    |
|---------|-------|------|-------------|----|----|
| 1890.55 | 335.5 | 2.94 | 7.4... 12.2 | 3n | β  |
| 1897.80 | 333.0 | 3.12 | ...         | 1n | Br |
| 1899.45 | 330.8 | 3.02 | 7.2... 13.0 | 2n | A  |

Discovered with the 36-inch.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Brown ( )...Aitken ( )...]

**β 671.** O. Arg. N. 20741

R.A. 20<sup>h</sup> 29<sup>m</sup> 33<sup>s</sup> }  
Decl. + 62° 3' }

|         |       |      |             |    |    |
|---------|-------|------|-------------|----|----|
| 1877.57 | 334.8 | 0.5± | 8.0... 10.0 | 1n | β  |
| 1877.78 | 335.9 | 0.47 | 8.0... 8.5  | 1n | Δ  |
| 1879.49 | 333.9 | 0.42 | 7.5... 9.0  | 1n | β  |
| 1881.57 | 333.2 | 0.49 | 8.0... 11.5 | 1n | β  |
| 1885.53 | 337.9 | 0.6± | ...         | 1n | HΣ |
| 1898.65 | 336.0 | 0.49 | 7.9... 8.7  | 2n | D  |

Discovered with the 18½-inch. No certain change.

[β (x)...β¹...β³...β⁴...Δ (1)...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...]

**β 151.** β Delphini

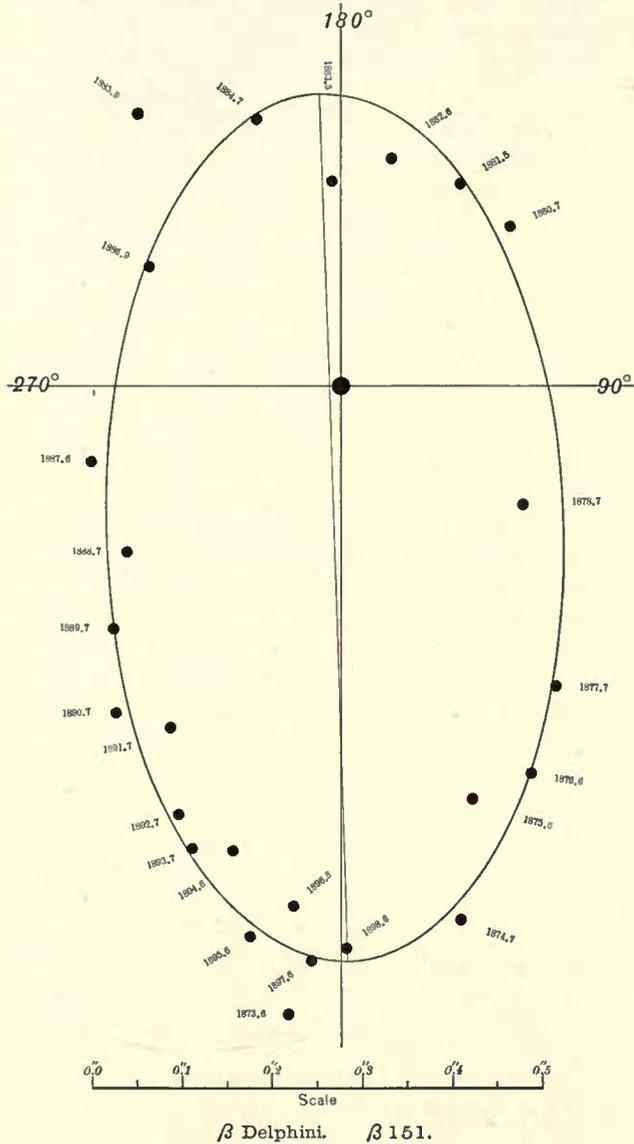
R.A. 20<sup>h</sup> 31<sup>m</sup> 55<sup>s</sup> }  
Decl. + 14° 11' }

A and B

|         |       |        |            |    |     |
|---------|-------|--------|------------|----|-----|
| 1873.60 | 355±  | 0.7±   | ...        |    | β   |
| 1874.66 | 15.5  | 0.65   | 4.1... 5.4 | 5n | Δ   |
| .70     | 13.6  | 0.49   | ...        | 3n | New |
| .73     | 8.0   | 0.69   | 3.5... 4.5 | 1n | OΣ  |
| 1875.61 | 14.7  | 0.42   | 4.0... 6.0 | 4n | Sp  |
| .65     | 20.1  | 0.54   | 4.3... 6.7 | 4n | Δ   |
| 1876.65 | 25.8  | 0.48   | 4.1... 6.3 | 4n | Δ   |
| .85     | 54.4  | obl.   | ...        | 1n | OΣ  |
| 1877.27 | 17.7  | 0.35   | ...        | 2n | Sp  |
| .71     | 29.7  | 0.51   | 4.6... 5.0 | 5n | Δ   |
| .79     | 40.8  | 0.32   | ...        | 2n | β   |
| 1878.65 | 53.7  | 0.24   | ...        | 4n | β   |
| .75     | 59.2  | ...    | ...        | 1n | Δ   |
| 1880.68 | 133.6 | 0.26   | ...        | 3n | β   |
| .75     | 214.5 | 0.2±   | ...        | 2n | H1  |
| 1881.54 | 149.2 | 0.26   | ...        | 5n | β   |
| .88     | 154.7 | ...    | ...        | 1n | Big |
| 1882.60 | 167.5 | 0.26   | ...        | 3n | β   |
| 1883.25 | 183.9 | 0.19   | ...        | 7n | En  |
| .55     | 182.5 | 0.23   | ...        | 3n | β   |
| 1884.69 | 195.9 | 0.32   | ...        | 3n | H1  |
| .71     | 197.7 | 0.32   | ...        | 4n | En  |
| .77     | 199.2 | 0.29   | ...        | 5n | β   |
| 1885.61 | 222.9 | 0.4±   | ...        | 1n | HΣ  |
| .75     |       | Single | ...        | 2n | H1  |
| .91     | 216.6 | 0.38   | ...        | 8n | En  |
| 1886.77 | 257.8 | ...    | ...        | 1n | HΣ  |
| .88     | 238.1 | 0.25±  | ...        | 7n | Sp  |

|         |       |       |            |                 |         |   |       |       |             |                |                |      |           |             |                                  |
|---------|-------|-------|------------|-----------------|---------|---|-------|-------|-------------|----------------|----------------|------|-----------|-------------|----------------------------------|
| 1886.91 | 219.5 | 0.39  | ...        | 4 <sup>n</sup>  | En      | 1897.61   | 357.3 | 0.71  | ...         | 4 <sup>n</sup> | Hu             |      |           |             |                                  |
| 1887.45 | 287.3 | 0.2±  | ...        | 9 <sup>n</sup>  | Sp      | .65   | 362.5 | 0.55  | ...         | 1 <sup>n</sup> | Maw            |      |           |             |                                  |
| .55     | 278.5 | 0.36  | ...        | 5 <sup>n</sup>  | T       | .66   | 356.1 | 0.79  | ...         | 3 <sup>n</sup> | D              |      |           |             |                                  |
| .66     | 272.0 | 0.41  | ...        | 5 <sup>n</sup>  | HΣ      | .69   | 357.7 | 0.62  | ...         | 4 <sup>n</sup> | Dob            |      |           |             |                                  |
| .75     | 308.1 | 0.3±  | ...        | 1 <sup>n</sup>  | Ho      | .76   | 354.0 | 0.65  | ...         | 1 <sup>n</sup> | See            |      |           |             |                                  |
| .85     | 287.8 | 0.2±  | ...        | 8 <sup>n</sup>  | Sp      | .86   | 356.9 | 0.62  | ...         | 4 <sup>n</sup> | Sp             |      |           |             |                                  |
| 1888.65 | 310.1 | 0.29  | ...        | 7 <sup>n</sup>  | β       | .90   | 359.5 | 0.63  | ...         | 1 <sup>n</sup> | Br             |      |           |             |                                  |
| .81     | 300.9 | 0.35  | ...        | 3 <sup>n</sup>  | HΣ      | 1898.50   | 361.0 | 0.64  | ...         | 3 <sup>n</sup> | A              |      |           |             |                                  |
| .83     | 311.5 | 0.25± | ...        | 17 <sup>n</sup> | Sp      | .58   | 359.0 | 0.67  | ...         | 4 <sup>n</sup> | β              |      |           |             |                                  |
| 1889.50 | 314.2 | 0.31  | ...        | 5 <sup>n</sup>  | β       | .61   | 360.3 | 0.62  | ...         | 7 <sup>n</sup> | Hu             |      |           |             |                                  |
| .78     | 318.5 | 0.43  | ...        | 6 <sup>n</sup>  | HΣ      | .70   | 359.5 | 0.79  | ...         | 4 <sup>n</sup> | D              |      |           |             |                                  |
| .86     | 319.2 | 0.37± | ...        | 11 <sup>n</sup> | Sp      | .72   | 363.0 | 0.55  | ...         | 2 <sup>n</sup> | Br             |      |           |             |                                  |
| 1890.49 | 324.2 | 0.45  | ...        | 4 <sup>n</sup>  | β       | .75   | 364.7 | 0.66  | ...         | 1 <sup>n</sup> | Lew            |      |           |             |                                  |
| .89     | 326.5 | 0.43  | ...        | 12 <sup>n</sup> | Sp      | .90   | 360.4 | 0.57  | ...         | 5 <sup>n</sup> | Sp             |      |           |             |                                  |
| 1891.45 | 331.6 | 0.38  | ...        | 4 <sup>n</sup>  | β       | AB and C (= Herschel)   |       |       |             |                |                |      |           |             |                                  |
| .52     | 338.4 | 0.79  | ...        | 1 <sup>n</sup>  | See     | 1828  | 107.7 | 18±   | ...14       | 1 <sup>n</sup> | H <sup>2</sup> |      |           |             |                                  |
| .64     | 330.1 | 0.39  | ...        | 3 <sup>n</sup>  | H1      | 1878.05   | 116.2 | 27.66 | ...         | 3 <sup>n</sup> | β              |      |           |             |                                  |
| .76     | 334.0 | 0.47  | ...        | 5 <sup>n</sup>  | HΣ      | 1881.19   | 115.6 | 27.57 | ...12.7     | 4 <sup>n</sup> | β              |      |           |             |                                  |
| .84     | 338.2 | ...   | ...        | 1 <sup>n</sup>  | Big     | 1883.54   | 116.2 | 27.43 | ...         | 1 <sup>n</sup> | β              |      |           |             |                                  |
| .88     | 333.5 | 0.46  | ...        | 9 <sup>n</sup>  | Sp      | 1888.82   | 115.7 | 26.77 | ...         | 2 <sup>n</sup> | β              |      |           |             |                                  |
| 1892.39 | 338.7 | 0.50  | ...        | 4 <sup>n</sup>  | β       | 1890.46   | 117.3 | 26.89 | ...         | 3 <sup>n</sup> | β              |      |           |             |                                  |
| .87     | 337.6 | 0.49  | ...        | 2 <sup>n</sup>  | Bar     | 1895.81   | 117.8 | 26.14 | ...         | 1 <sup>n</sup> | Lew            |      |           |             |                                  |
| .92     | 340.7 | 0.54  | ...        | 5 <sup>n</sup>  | Sp      | 1898.49   | 117.6 | 25.87 | ...         | 3 <sup>n</sup> | β              |      |           |             |                                  |
| 1893.52 | 339.2 | 0.58  | 4.0... 7.0 | 2 <sup>n</sup>  | Lv      | 1898.59   | 117.1 | 25.92 | ...         | 2 <sup>n</sup> | Bar            |      |           |             |                                  |
| .53     | 338.8 | 0.73  | 5.5... 8.0 | 2 <sup>n</sup>  | W       | AB and D (= H <sup>2</sup> IV. 35 = 2704)   |       |       |             |                |                |      |           |             |                                  |
| .63     | 335.3 | 0.57  | ...        | 3 <sup>n</sup>  | Ho      | 1829.40   | 343.8 | 32.48 | 3.0... 11.0 | 3 <sup>n</sup> | Σ              |      |           |             |                                  |
| .70     | 342.2 | 0.56  | ...        | 5 <sup>n</sup>  | Bar     | 1851.84   | 339.2 | 33.74 | ... 11.0    | 2 <sup>n</sup> | OΣ             |      |           |             |                                  |
| .79     | 346.8 | 0.51  | ...        | 3 <sup>n</sup>  | Com     | 1864.94   | 336.6 | 34.64 | ... 10.3    | 3 <sup>n</sup> | Δ              |      |           |             |                                  |
| .87     | 344.3 | 0.51  | ...        | 13 <sup>n</sup> | Sp      | 1888.82   | 333.2 | 36.35 | ...         | 2 <sup>n</sup> | β              |      |           |             |                                  |
| .95     | 345.8 | ...   | ...        | 1 <sup>n</sup>  | Big     | 1898.49   | 331.4 | 37.18 | ...         | 3 <sup>n</sup> | β              |      |           |             |                                  |
| 1894.51 | 346.3 | 0.56  | ...        | 8 <sup>n</sup>  | Bar     | 1898.71   | 332.3 | 36.98 | ...         | 1 <sup>n</sup> | Bar            |      |           |             |                                  |
| .72     | 345.9 | 0.6±  | ...        | 1 <sup>n</sup>  | HΣ      | <p>The close pair, AB, was discovered with the 6-inch in August 1873. It was evident at this time that it would prove to be a binary system, as otherwise it could not have escaped detection by prior observers. It has now (1899) completed substantially one revolution since it was discovered. The following orbits have been computed, the first column giving the date of the last measures used :</p> |       |       |             |                |                |      |           |             |                                  |
| .83     | 347.2 | 0.50  | ...        | 13 <sup>n</sup> | Sp      |   |       |       |             |                |                | 1883 | Doubiago  | 26.07 years | <i>A. N.</i> 2602                |
| 1895.31 | 351.8 | 0.49  | ...        | 1 <sup>n</sup>  | See     |   |       |       |             |                |                | 1884 | Gore      | 30.91       | <i>Proc. R. I. Ac.</i> IV, No. 5 |
| .48     | 349.7 | 0.68  | ...        | 6 <sup>n</sup>  | Bar     |   |       |       |             |                |                | 1887 | Celoria   | 16.95       | <i>A. N.</i> 2824                |
| .61     | 348.1 | 0.54  | ...        | 1 <sup>n</sup>  | Ho      |   |       |       |             |                |                | 1890 | Burnham   | 28.5        | <i>Sid. Mess.</i> X, 215         |
| .66     | 350.8 | 0.58  | ...        | 3 <sup>n</sup>  | Com     |   |       |       |             |                |                | 1892 | Glase nap | 22.97       | <i>A. N.</i> 3177                |
| .69     | 350.3 | 0.66  | 4.5... 6.0 | 2 <sup>n</sup>  | Dy      |   |       |       |             |                |                | 1895 | See       | 27.66       | <i>Evolution Binary Systems</i>  |
| .77     | 351.9 | 0.67  | ...        | 3 <sup>n</sup>  | Sp      |   |       |       |             |                |                | 1899 | Burnham   | 26.70       | (This volume)                    |
| .81     | 351.9 | 0.65  | ...        | 1 <sup>n</sup>  | Lew     |   |       |       |             |                |                |      |           |             |                                  |
| 1896.63 | 361.8 | 0.45  | ...        | 1 <sup>n</sup>  | Pt      |   |       |       |             |                |                |      |           |             |                                  |
| .66     | 354.0 | 0.59  | ...        | 3 <sup>n</sup>  | Com     |   |       |       |             |                |                |      |           |             |                                  |
| .69     | 356.6 | 0.51  | ...        | 3 <sup>n</sup>  | Morgan  |   |       |       |             |                |                |      |           |             |                                  |
| .76     | 357.0 | 0.67  | ...        | 3 <sup>n</sup>  | See     |   |       |       |             |                |                |      |           |             |                                  |
| .84     | 352.6 | 0.49  | ...        | 3 <sup>n</sup>  | A       |   |       |       |             |                |                |      |           |             |                                  |
| .86     | 355.1 | 0.60  | ...        | 3 <sup>n</sup>  | Hu      |   |       |       |             |                |                |      |           |             |                                  |
| .87     | 355.9 | 0.65  | ...        | 7 <sup>n</sup>  | Sp      |   |       |       |             |                |                |      |           |             |                                  |
| 1897.52 | 357.6 | 0.84  | ...        | 2 <sup>n</sup>  | Leh-man |   |       |       |             |                |                |      |           |             |                                  |
| .55     | 356.7 | 0.55  | ...        | 4 <sup>n</sup>  | Bar     |   |       |       |             |                |                |      |           |             |                                  |
| .55     | 356.3 | 0.68  | ...        | 3 <sup>n</sup>  | A       |   |       |       |             |                |                |      |           |             |                                  |

The principal positions down to 1899, and the last orbit given above, are shown on the accompanying diagram.



The elements of the several orbits are as follows :

|      |           | <i>P</i> | <i>T</i> | <i>e</i> | <i>a</i> | $\Omega$ | <i>i</i> | $\lambda$ |
|------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| 1883 | Doubiago  | 26.07    | 1882.2   | 0.36     | 0.55     | 163.6    | 54.9     | 354.6     |
| 1884 | Gore      | 30.91    | 1882.2   | 0.34     | 0.52     | 2.7      | 59.3     | 327.8     |
| 1887 | Celoria   | 16.95    | 1885.8   | 0.09     | 0.46     | 10.9     | 61.6     | 220.9     |
| 1892 | Glasenapp | 22.97    | 1882.4   | 0.26     | 0.50     | 174.2    | 64.1     | 343.9     |
| 1895 | See       | 27.66    | 1883.0   | 0.37     | 0.67     | 3.9      | 61.3     | 164.9     |
| 1899 | Burnham   | 26.70    | 1883.1   | 0.33     | 0.48     | 1.8      | 55.9     | 171.7     |

The next companion, C, was discovered by HERSCHEL, and is first mentioned in his *Fourth*

*Catalogue* (*Mem. R. A. S.* iv). This is much fainter than the more distant companion discovered by the first HERSCHEL, and observed by STRUVE as  $\Sigma$  2704, and does not appear to have been noticed by either of these observers. On account of its faintness it has been missed or neglected by all the early observers who measured D. My own measures are the first, and comprise substantially all the observations of this star.

There is no lack of positions of D, as this is readily seen with the smallest apertures. The change is due to the proper motion of the principal star. AUWERS gives this as  $0''.093$  in the direction of  $110^\circ.1$ . As this movement is nearly in the direction of C, it will finally become a difficult object, the minimum distance of  $3\frac{1}{4}''$  being reached in about 275 years.

In 1896 SEE measured a faint star from AB  $111^\circ.2 : 5''.66$  (1896.75)  $5n$ , with the 24-inch of the Lowell Observatory. As this star has not been seen elsewhere with much larger apertures, there is much doubt of its real existence.

[ $\beta$  (111)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^1$ ... $\beta^3$ ... $\beta$  (*Am. Jour. Sci.* Sept. 1873) (*Mon. Not.* xli, 305) (*Sid. Mess.* x, 215) ... $\beta$  (2875,2957,3048,3114,3142)... $\beta$  (*A. J.* 246)... $\Delta$  (11, 491)... $\Delta$  (1573,2086,2195)...Newcomb (*Wash. Obsns.* 1874)... $\Sigma$  (*Poukova Obsns.* ix, 222; x, 47,185)...Sp (11, 11 App. 111)...Sp (2133)...Hall (11) (*A. J.* 247)...Engelmann (2678,2742,2786)...Tarrant (2899)...Bigourdan (*Bul. Ast.* xviii) (*Paris Obsns.* 1883)...Barnard (*A. J.* 447)...Lv (*A. J.* 382)...Hough (2978,3234)...Wilson ( )...See (3314,3496)...Comstock (*Pub. Washburn Obsv.* x)...Lewis and Dyson (*Mon. Not.* lvi, 359; lxi, 400)...Pritchett (*A. J.* 397)...See (*A. J.* 349,357,378) (*Beob. Sternwarte*, Berlin, 1892, No. 6)...Morgan (*A. J.* 439)...Lehman (*Ast. Soc. Pac.* ix, 141)...Hussey (*A. J.* 397, 427)...Doberck (3466)...Doolittle (*A. J.* 416)...Aitken (3466,3585) (*A. J.* 429)...H $\Sigma$  ( )...Hough (3558)...Maw (*Mem. R. A. S.* liii)...Lewis ( ) Hussey ( )...Doolittle (*Pub. Flower Obsv.* 1)...Barnard ( ) ...Brown ( )...]

A few only of the measures of D are given. They will all be found in the references cited for AB, and in the following :

[Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* xi, xiii, xv) Lamont (*Annalen Konigsberg Stern.* xvii)...Wilson and Seabroke (*Mem. R. A. S.* xliii, xlvi)...Herschel (*Mem. R. A. S.* iv)...Gore (*Ast. Reg.* xix, 144)...Everett (*Mon. Not.* lvi, 464)...Flammarion (*Etoiles Doubles et Multiples*)...Greenwich *Obsns.* 1895...]

**$\beta$  672.** 71 *Aquilae*

R.A. 20<sup>h</sup> 32<sup>m</sup> 8<sup>s</sup> }  
Decl. — 1° 31' }

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1878.66 | 280.8 | 30.52 | 6.0...12.5 | 2n | $\beta$ |
| 1892.83 | 280.9 | 30.68 | 6.0...12.0 | 2n | Ho      |
| 1898.62 | 281.1 | 31.54 | 6...12.0   | 3n | Cg      |

Discovered with the 18½-inch. This star has no sensible proper motion.

[ $\beta$  (x)... $\beta^1$ ...Hough (3234)...Cogshall ( )...]

 **$\beta$  435** Lalande 39867

R.A. 20<sup>h</sup> 33<sup>m</sup> 14<sup>s</sup> }  
Decl. + 14° 35' }

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1876.68 | 113.5 | 2.86 | 8.1...10.9 | 4n | $\Delta$   |
| 1876.81 | 124.0 | 3.45 | 8.5...10.5 | 1n | O $\Sigma$ |
| 1892.67 | 116.8 | 3.08 | 8.0...10.8 | 2n | W          |
| 1898.55 | 113.3 | 3.32 | 8.2...9.4  | 3n | D          |

Discovered with the 6-inch. Near  $\beta$  *Delphini*.

[ $\beta$  (vii)... $\beta$  (2103)...O $\Sigma$  (*Poukowa Obsns.* x)... $\Delta$  (i)... Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  288.** *Delphini* 32

R.A. 20<sup>h</sup> 33<sup>m</sup> 31<sup>s</sup> }  
Decl. + 15° 25' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1878.54 | 167.8 | 7.87 | 7.0...13.5 | 1n | $\beta$ |
| 1891.51 | 162.0 | 7.71 | 6.2...13.2 | 3n | $\beta$ |
| 1899.42 | 161.3 | 7.24 | 6.2...13.2 | 2n | $\beta$ |

Discovered with the Washington 26-inch. This star (B.A.C. 7146) has a small proper motion, 0".030 in the direction of 289°1 (A.G.C.). Near  $\alpha$  *Delphini*.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* ii)...]

 **$\beta$  298.**  $\alpha$  *Delphini*

R.A. 20<sup>h</sup> 34<sup>m</sup> 4<sup>s</sup> }  
Decl. + 15° 29' }

A and B

|         |       |       |            |    |         |
|---------|-------|-------|------------|----|---------|
| 1891.70 | 223.8 | 28.90 | 4.0...13.5 | 2n | $\beta$ |
| 1898.55 | 223.8 | 29.51 | ...14.0    | 1n | $\beta$ |

A and C (= H 1554)

|         |       |                 |         |    |         |
|---------|-------|-----------------|---------|----|---------|
| 1828    | 278.0 | 35 <sup>±</sup> | ...13   | 1n | H       |
| 1878.62 | 279.8 | 42.29           | ...12.0 | 3n | $\beta$ |
| 1891.70 | 280.5 | 43.81           | ...11.1 | 2n | $\beta$ |
| 1898.55 | 278.9 | 43.50           | ...12.0 | 1n | $\beta$ |

A and D

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1877.82 | 150.2 | 47.96 | ...13.0 | 1n | $\beta$ |
| 1891.70 | 150.8 | 47.95 | ...11.5 | 2n | $\beta$ |
| 1898.55 | 150.8 | 47.62 | ...12.3 | 1n | $\beta$ |

A and E

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1891.70 | 308.9 | 51.65 | ...12.7 | 2n | $\beta$ |
| 1898.55 | 308.6 | 50.91 | ...13.0 | 1n | $\beta$ |

A and F

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1879.34 | 113.8 | 80.67 | ...10.8 | 2n | $\beta$ |
| 1891.70 | 114.6 | 79.79 | ...11.0 | 2n | $\beta$ |

The nearest star and some of the others noted with the Washington 26-inch. The 36-inch shows another and smaller star 14 m, about the same distance as B, in the direction of 335°.

AUWERS gives the proper motion of  $\alpha$  *Delphini* 0".046 in the direction of 90°. All the measures of the Herschel star are given above.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* ii)...]

 **$\beta$  1209.** S.D. (17°) 6055

R.A. 20<sup>h</sup> 34<sup>m</sup> 9<sup>s</sup> }  
Decl. — 17° 48' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1890.66 | 294.3 | 0.45 | 9.0...9.9  | 3n | $\beta$ |
| 1898.73 | 281.2 | 0.63 | 9.0...10.5 | 2n | Cg      |
| 1899.53 | 290.0 | 0.44 | 9.0...10   | 3n | A       |

Discovered with the 12-inch. It is 22".4  $p$  and 0".4  $s$  of the 7 m star, B.A.C. 7151.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* ii)...Cogshall ( )... Aitken ( )...]

 **$\beta$  267.** S.D. (4°) 5223

R.A. 20<sup>h</sup> 35<sup>m</sup> 22<sup>s</sup> }  
Decl. — 4° 49' }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1878.68 | 242.4 | 2.11 | 9.0...9.0   | 1n | $\beta$ |
| 1879.29 | 240.0 | 2.22 | 9.0...9.3   | 3n | Cin     |
| 1879.59 | 240.5 | 2.04 | 10.0...10.0 | 1n | Cin     |
| 1885.70 | 62.2  | ...  | 9.5...10.0  | 1n | W       |
| 1892.69 | 241.6 | 2.04 | 9.8...10.0  | 2n | T       |
| 1898.66 | 239.9 | 2.03 | 9.0...9.5   | 3n | Bd      |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The angle in the measure in  $\beta^1$  is erroneously printed  $151^\circ.9$ , the correction for parallel not having been applied. It should be as given above. There is no change in the components. This pair and H 921, which is  $5' s$ , form a wide quadruple.

[ $\beta$  (v11)... $\beta$  (2103)... $\beta^1$ ...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)... Tarrant (3186)...Boothroyd ( )...]

$\beta$  673. D.M. (20°) 4680

R.A. 20<sup>h</sup> 36<sup>m</sup> 29<sup>s</sup> }  
Decl. + 20° 17' }

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1878.78 | 298.1 | 4.10 | 7.3...11.8 | 2n | $\beta$    |
| 1884.62 | 294.3 | 4.00 | ...        | 2n | H $\Sigma$ |
| 1893.66 | 298.3 | 3.71 | 7.2...11.5 | 3n | W          |
| 1898.67 | 295.6 | 3.89 | 7.5...11.1 | 3n | D          |

Discovered with the 18½-inch. The  $n$  star of a wide pair, the other being D.M. (20°) 4682,  $1^s.9 f$  and  $1'.7 s$ .

[ $\beta$  (x)... $\beta^1$ ...Wilson ( )...Doolittle (*Pub. Flower. Obsy.* 1) ...H $\Sigma$  ( )...]

$\beta$  674. Yarnall 9020

R.A. 20<sup>h</sup> 37<sup>m</sup> 53<sup>s</sup> }  
Decl. - 21° 19' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1877.51 | 120±  | 1.3± | 8.0...10.5 | 1n | $\beta$ |
| 1879.78 | 103.4 | 1.35 | 8.0...10.8 | 1n | Cin     |
| 1892.79 | 99.9  | 1.19 | 8.0...11.0 | 1n | Ho      |
| 1897.80 | 103.1 | 1.69 | 7 ... 9.8  | 1n | See     |
| 1898.67 | 100.9 | 1.46 | 7.9... 9.5 | 4n | D       |
| 1898.67 | 102.8 | 1.59 | 7.2... 9.7 | 3n | Cg      |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^1$ ...Cin<sup>6</sup>...Hough (3234)...See (3496)...Doolittle (*Pub. Flower Obsy.* 1)...Cogshall ( )...]

$\beta$  675. 51 Cygni

R.A. 20<sup>h</sup> 38<sup>m</sup> 31<sup>s</sup> }  
Decl. + 49° 54' }

A and B

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1878.24 | 101.5 | 2.78 | 6.0...13.0 | 3n | $\beta$    |
| 1885.54 | 103.4 | 3.25 | ...        | 2n | H $\Sigma$ |
| 1889.45 | 101.5 | 2.99 | 5.0...13.2 | 3n | $\beta$    |
| 1898.63 | 102.3 | 3.16 | 6.0...13.2 | 3n | A          |

A and C

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1878.39 | 182.4 | 25.39 | ...12.0 | 1n | $\beta$ |
| 1898.60 | 182.5 | 25.94 | ...12.5 | 3n | A       |

A and D

|         |       |       |         |    |         |
|---------|-------|-------|---------|----|---------|
| 1878.39 | 328.4 | 32.85 | ...12.0 | 1n | $\beta$ |
| 1898.60 | 328.9 | 33.43 | ...12.0 | 3n | A       |

Discovered with the 18½-inch. The large star has a proper motion of  $0''.031$  in the direction of  $93^\circ.7$  (AUWERS). As this is nearly in the direction of B, its distance, if fixed, should decrease annually by that amount. This movement of A during the time covered by the measures would be  $0''.6$ . The observations tend to show an increasing distance, and it is probable that the two stars form a physical system.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O. II*)...H $\Sigma$  ( )... Aitken (3585)...]

$\beta$  64. W<sup>r</sup> XX. 977

R.A. 20<sup>h</sup> 39<sup>m</sup> 18<sup>s</sup> }  
Decl. + 12° 17' }

A and B

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1876.20 | 172.4 | 0.63 | 8.7... 9.0 | 6n | $\Delta$ |
| 1882.68 | 193.0 | 0.50 | ...        | 1n | Perry    |
| 1891.84 | 180.3 | 0.65 | 8.3... 8.4 | 4n | $\beta$  |
| 1894.16 | 187.9 | 0.50 | ...        | 3n | Sp       |
| 1897.57 | 183.8 | 0.57 | ...        | 1n | Bow      |
| 1897.82 | 186.3 | 0.49 | ...        | 1n | Dy       |
| 1897.83 | 186.9 | 0.55 | ...        | 1n | Br       |
| 1898.71 | 184.0 | 0.61 | 7.5... 7.5 | 3n | A        |
| 1898.75 | 188.6 | 0.55 | ...        | 1n | Lew      |

AB and C (= O $\Sigma$  (App.) 209)

|         |       |       |            |    |          |
|---------|-------|-------|------------|----|----------|
| 1874.67 | 158.6 | 96.46 | 7.1... 7.3 | 3n | $\Delta$ |
| 1891.84 | 158.1 | 96.45 | ... 8.2    | 3n | $\beta$  |
| 1898.68 | 157.8 | 96.60 | 7.2... 7.5 | 2n | A        |

The close pair was discovered with the 9.4-inch of the Dartmouth College Observatory. There appears to be slow direct motion in angle. The measures show no change in the distant star C. All the observations of this are given. There is a small star nearer AB, which has been measured from the close pair as follows:

|         |       |       |         |    |          |
|---------|-------|-------|---------|----|----------|
| 1874.25 | 119.3 | ...   | ...10.7 | 1n | $\Delta$ |
| 1891.84 | 118.9 | 62.22 | ...10.5 | 2n | $\beta$  |

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (2086)...Sp (III)... $\Delta$  (I)...Perry (*Eng. Mech.* xxxvi, 65)...Lewis, Bowyer and Dyson (*Mon. Not.* LIX, 400)...Aitken (3585)...Brown ( )...]

 **$\beta$  152. Cephei 55**

R.A. 20<sup>h</sup> 39<sup>m</sup> 18<sup>s</sup> }  
Decl. + 56° 57' }

|         | $\circ$ | "    |            |    |            |  |
|---------|---------|------|------------|----|------------|--|
| 1876.01 | 111.0   | 0.45 | 7.2... 8.0 | 5n | $\Delta$   |  |
| 1878.53 | 112.3   | 0.55 | 7.0... 9.0 | 1n | $\beta$    |  |
| 1885.57 | 110.1   | 0.56 | ...        | 2n | H $\Sigma$ |  |
| 1889.40 | 107.5   | 0.60 | ...        | 6n | Sp         |  |
| 1897.90 | 106.8   | 0.50 | ...        | 1n | Br         |  |
| 1898.68 | 103.6   | 0.67 | 7.5... 9.0 | 3n | A          |  |

Discovered with the 6-inch. There may be some change in the angle. This is Radcliffe 4932.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^1$ ... $\Delta$  (I)... $\Delta$  (2086)...Sp (III)...Aitken (3585)...H $\Sigma$  ( )...Brown ( )...]

 **$\beta$  834. D.M. (6°) 4638**

R.A. 20<sup>h</sup> 39<sup>m</sup> 48<sup>s</sup> }  
Decl. + 6° 43' }

|         | $\circ$ | "    |             |    |         |
|---------|---------|------|-------------|----|---------|
| 1881.58 | 134.0   | 2.44 | 8.5... 11.0 | 6n | $\beta$ |
| 1886.86 | 131.7   | 1.97 | ...         | 4n | UL      |
| 1887.81 | 133.3   | 2.14 | 8.3... 11.0 | 3n | Com     |
| 1898.68 | 130.9   | 2.41 | 8.9... 10.5 | 4n | D       |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^4$ ...Updegraff and Lamb (*Pub. Washburn Obsy.* v)...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* I)...]

 **$\beta$  153. B.A.C. 7187**

R.A. 20<sup>h</sup> 40<sup>m</sup> 10<sup>s</sup> }  
Decl. — 26° 51' }

|         | $\circ$ | "    |             |    |     |
|---------|---------|------|-------------|----|-----|
| 1876.78 | 282.2   | 1.61 | 7.5... 9.0  | 1n | Cin |
| 1877.70 | 282.7   | 1.34 | 7.0... 9.5  | 1n | Cin |
| 1882.62 | 286.0   | 1.65 | 7.7... 9.0  | 2n | W   |
| 1892.61 | 285.5   | 1.39 | 7.0... 10.0 | 1n | W   |
| 1894.73 | 280.0   | 0.89 | 7... 10     | 1n | Sel |
| 1896.83 | 280.0   | 1.49 | 6.5... 11.0 | 2n | See |
| 1897.68 | 273.0   | 1.55 | 7½... 10    | 2n | Sc  |
| 1897.74 | 274.3   | 1.66 | ...         | 1n | See |
| 1898.71 | 274.1   | 1.38 | 7.1... 9.8  | 4n | D   |

Discovered with the 6-inch.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)...Cin<sup>3</sup>...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...Sellors (3303)...See (3496)...See ( )...Doolittle (*Pub. Flower Obsy.* I)...Scott (*Mon. Not.* LIX, 427)...]

 **$\beta$  471. D.M. (61°) 2046**

R.A. 20<sup>h</sup> 41<sup>m</sup> 1<sup>s</sup> }  
Decl. + 62° 0' }

|         | $\circ$ | "    |              |    |          |
|---------|---------|------|--------------|----|----------|
| 1876.72 | 305.9   | 1.46 | 10.0... 10.0 | 1n | $\Delta$ |
| 1893.79 | 308.0   | 1.97 | 10.0... 10.3 | 3n | W        |
| 1898.45 | 307.0   | 1.78 | 10.3... 10.9 | 3n | D        |

Discovered with the 6-inch.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (I)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* I)...]

 **$\beta$  676.  $\epsilon$  Cygni**

R.A. 20<sup>h</sup> 41<sup>m</sup> 21<sup>s</sup> }  
Decl. + 33° 31' }

|         | $\circ$ | "     |           |    |            |
|---------|---------|-------|-----------|----|------------|
| 1852.63 | 338.8   | 40.69 | 2... 12   | 1n | O $\Sigma$ |
| 1861.63 | 332.6   | 39.64 | 2... 12.5 | 1n | O $\Sigma$ |
| 1878.08 | 320.9   | 37.72 | 3... 12   | 2n | $\beta$    |
| 1883.60 | 316.5   | 38.66 | ...       | 2n | H $\Sigma$ |
| 1891.52 | 310.3   | 38.68 | ... 13    | 3n | $\beta$    |
| 1898.31 | 305.3   | 39.22 | ... 12.5  | 2n | $\beta$    |
| 1898.59 | 305.2   | 39.14 | ... 12.0  | 3n | A          |
| 1898.67 | 304.3   | 39.64 | ... 12.0  | 3n | D          |

Discovered with the 18½-inch. The large star has a considerable proper motion, 0".481 in the direction of 46°5 (AUWERS). This corresponds with substantial exactness to the displacement of the companion shown by the measures. The small star had been seen by O $\Sigma$  as appears by his observations published long after my *Tenth Catalogue*.

[ $\beta$  (X)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...O $\Sigma$  (*Poukrowa Obsns.* x)...Aitken (3585)...Doolittle (*Pub. Flower Obsy.* I)...]

 **$\beta$  364. Lalande 40166**

R.A. 20<sup>h</sup> 41<sup>m</sup> 52<sup>s</sup> }  
Decl. + 24° 58' }

|         | $\circ$ | "    |            |    |          |
|---------|---------|------|------------|----|----------|
| 1876.17 | 219.3   | 1.06 | 8.7... 8.9 | 4n | $\Delta$ |
| 1892.75 | 220.5   | 1.25 | 8.7... 8.7 | 2n | Ho       |
| 1898.64 | 223.3   | 1.31 | 8.5... 8.7 | 3n | D        |

Discovered with the 6-inch. In a low-power field with 30 *Vulpeculae*.

[ $\beta$  (VI)... $\beta$  (2062)... $\Delta$  (I)...Hough (3234)...Doolittle (*Pub. Flower Obsy.* I)...]

**β 65.** 13 *Delphini*

R.A. 20<sup>h</sup> 41<sup>m</sup> 52<sup>s</sup> }  
Decl. + 5° 34' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1875.44 | 186.4 | 1.61 | 5.2... 8.8  | 4 <sup>n</sup> | Δ   |
| 1876.85 | 178.6 | 1.42 | 6.0... 10.0 | 1 <sup>n</sup> | OΣ  |
| 1878.47 | 186.3 | 1.72 | 5.2... 9.0  | 3 <sup>n</sup> | Sp  |
| 1884.62 | 187.3 | 1.76 | ...         | 2 <sup>n</sup> | HΣ  |
| 1887.40 | 188.8 | 1.59 | 5.2... 9.0  | 4 <sup>n</sup> | T   |
| 1888.65 | 186.8 | 1.49 | 5.0... 9.2  | 1 <sup>n</sup> | Lv  |
| 1888.70 | 187.1 | 1.54 | ...         | 2 <sup>n</sup> | T   |
| 1895.62 | 189.7 | 1.41 | ...         | 3 <sup>n</sup> | Col |
| 1897.84 | 188.4 | 1.48 | ...         | 2 <sup>n</sup> | Br  |
| 1898.62 | 189.1 | 1.42 | 6.4... 7.7  | 3 <sup>n</sup> | D   |

Discovered with the 6-inch. The measures do not show any material relative change. The proper motion of this star is very small, 0".010 in the direction of 264°.5 (AUWERS).

[β (1)...β (*Mon. Not.* xxxiii, 351)...Δ (1)...Δ (2081)...HΣ ( )...OΣ (*Poulkova Obsns.* x)...Sp (ii)...Tarrant (2866)...Lv<sup>t</sup>...Doolittle (*Pub. Flower Obsy.* 1)...Brown ( )...Coleman (*Mem. R. A. S.* LIII)...]

**β 677.** T *Cygni*

R.A. 20<sup>h</sup> 42<sup>m</sup> 23<sup>s</sup> }  
Decl. + 33° 56' }

A and B

|         |       |       |             |                |    |
|---------|-------|-------|-------------|----------------|----|
| 1878.41 | 121.3 | 9.66  | 7.0... 12.0 | 1 <sup>n</sup> | β  |
| 1881.71 | 119.8 | 9.65  | 6.0... 11.7 | 3 <sup>n</sup> | Ho |
| 1885.55 | 117.7 | 10.15 | ...         | 1 <sup>n</sup> | HΣ |
| 1890.52 | 120.9 | 9.91  | 5.6... 12.2 | 3 <sup>n</sup> | β  |
| 1898.31 | 120.7 | 9.88  | 6.0... 12.0 | 2 <sup>n</sup> | β  |

A and C

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1890.52 | 194.4 | 12.35 | ... 13.3 | 3 <sup>n</sup> | β |
| 1898.31 | 195.9 | 12.46 | ... 13.5 | 2 <sup>n</sup> | β |

The nearest companion was detected with the 18½-inch; the other with the 36-inch. The variability of this star was discovered by SCHMIDT; period supposed to be about one year, 5½ to 6 m. The Harvard photometric magnitude is 5.2. BALL measured a distant star in his examination for parallax (*Dunsink Obsns.* III).

[β (x)...β<sup>r</sup>...β (3048)...β (*Pub. L. O.* II)...Hough (2978) ...HΣ ( )...]

**β 66.** D.M. (66°) 3995

R.A. 20<sup>h</sup> 42<sup>m</sup> 59<sup>s</sup> }  
Decl. + 27° 1' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.00 | 158.9 | 1.23 | 8.6... 9.1 | 5 <sup>n</sup> | Δ   |
| 1883.16 | 159.5 | 1.57 | 8.2... 8.5 | 5 <sup>n</sup> | En  |
| 1890.84 | 161.7 | 1.57 | ...        | 2 <sup>n</sup> | Maw |
| 1898.70 | 159.5 | 1.16 | 8.4... 8.9 | 4 <sup>n</sup> | D   |

Discovered with the 6-inch.

[β (1)...β (*Mon. Not.* xxxiii, 351)...Δ (1)...Engelmann (2678)...Maw (*Mem. R. A. S.* L)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 268.** Radcliffe 4958

R.A. 20<sup>h</sup> 43<sup>m</sup> 11<sup>s</sup> }  
Decl. + 41° 38' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.88 | 221.4 | 0.42 | 7.4... 8.3 | 2 <sup>n</sup> | Δ  |
| 1884.31 | 216.2 | 0.53 | ...        | 3 <sup>n</sup> | HΣ |
| 1888.64 | 216.4 | 0.5± | ...        | 7 <sup>n</sup> | Sp |
| 1893.62 | 218.4 | 0.52 | 7.8... 8.8 | 3 <sup>n</sup> | W  |

Discovered with the 9.4-inch at the Dartmouth College Observatory. About 21' n is OΣ 414.

[β (v)...β (*Mon. Not.* xxxv, 31)...Δ (1)...Δ (2086)...HΣ ( )...Sp (III)...Wilson ( )...]

**β 365.** O. Arg. N. 21118

R.A. 20<sup>h</sup> 43<sup>m</sup> 36<sup>s</sup> }  
Decl. + 51° 21' }

|         |       |       |             |                |   |
|---------|-------|-------|-------------|----------------|---|
| 1892.77 | 285.2 | 14.80 | 8.5... 11.8 | 2 <sup>n</sup> | W |
| 1898.69 | 286.1 | 14.53 | 8.5... 10.8 | 1 <sup>n</sup> | β |

Discovered with 6-inch. Σ 2732 is 1<sup>m</sup> 29<sup>s</sup> p and 6.7 s.

[β (vi)...β (2062)...Wilson ( )...]

**β 366.** O. Arg. N. 21157

R.A. 20<sup>h</sup> 44<sup>m</sup> 49<sup>s</sup> }  
Decl. + 50° 3' }

A and B

|         |         |      |            |                |        |
|---------|---------|------|------------|----------------|--------|
| 1876.44 | 128.5   | 1.40 | 8.2... 8.5 | 5 <sup>n</sup> | Δ      |
| 1893.55 | 127.5   | 1.24 | 8.2... 8.5 | 2 <sup>n</sup> | Lv     |
| 1893.72 | 129.0   | 1.47 | 8.0... 8.5 | 2 <sup>n</sup> | W      |
| 1896.88 | (152.3) | 1.86 | ...        | 1 <sup>n</sup> | Morgan |
| 1898.48 | 128.6   | 1.42 | 8.3... 8.4 | 3 <sup>n</sup> | D      |
| 1898.69 | 130.5   | 1.21 | 8.5... 8.7 | 1 <sup>n</sup> | β      |

## C and D (= Δ)

|         |     |      |             |                |    |
|---------|-----|------|-------------|----------------|----|
| 1876.44 | 3.3 | 1.07 | 10.7...11.2 | 5 <sup>n</sup> | Δ  |
| 1893.55 | 1.2 | 1.35 | 10.0...11.0 | 1 <sup>n</sup> | Lv |
| 1898.48 | 6.9 | 1.72 | 9.4... 9.8  | 3 <sup>n</sup> | D  |
| 1898.69 | 5.0 | 1.41 | 10.3...10.5 | 1 <sup>n</sup> | β  |

## AB and CD

|         |       |       |     |                |   |
|---------|-------|-------|-----|----------------|---|
| 1876.30 | 106.3 | 50.78 | ... | 3 <sup>n</sup> | Δ |
| 1893.72 | 106.1 | 50.71 | ... | 1 <sup>n</sup> | W |

## A and C

|         |       |       |     |                |   |
|---------|-------|-------|-----|----------------|---|
| 1898.48 | 105.1 | 50.64 | ... | 3 <sup>n</sup> | D |
| 1898.69 | 107.2 | 51.54 | ... | 1 <sup>n</sup> | β |

The pair AB and the distant companion C were discovered with the 6-inch. The latter was found to be double by J while measuring AB. Both pairs are without change. OΣ 412 is 2<sup>m</sup> 48<sup>s</sup> p and 11' n.

[β (VI)...β (2062)...Δ (I)...Lv (A. J. 382)...Wilson ( )  
...Morgan (A. J. 439)...]

## β 67. Lalande 40318

R.A. 20<sup>h</sup> 45<sup>m</sup> 37<sup>s</sup> }  
Decl. + 30° 28' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.45 | 287.1 | 1.51 | 6.9...10.2 | 4 <sup>n</sup> | J  |
| 1876.70 | 289.4 | 1.84 | 7.0...10.0 | 1 <sup>n</sup> | OΣ |
| 1885.38 | 283.6 | 1.73 | ...        | 4 <sup>n</sup> | HΣ |
| 1892.67 | 291.2 | 1.68 | 7.0...     | 1 <sup>n</sup> | W  |
| 1897.79 | 288.1 | 1.62 | ...        | 1 <sup>n</sup> | Br |
| 1898.58 | 286.9 | 1.36 | 7.0... 9.3 | 3 <sup>n</sup> | D  |

Discovered with the 6-inch. OΣ 415 is 30' s.

[β (I)...β (Mon. Not. xxxiii, 351)...Δ (I)...OΣ (Poulkowa Obsns. x)...Wilson ( )...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...Brown ( )...]

## β 250. Lalande 40340

R.A. 20<sup>h</sup> 45<sup>m</sup> 51<sup>s</sup> }  
Decl. + 46° 13' }

|         |     |       |            |                |    |
|---------|-----|-------|------------|----------------|----|
| 1875.60 | 7.6 | 20.30 | 7.0...12.0 | 1 <sup>n</sup> | J  |
| 1876.70 | 5.2 | 20.04 | 6.5...11.5 | 1 <sup>n</sup> | OΣ |
| 1885.55 | 6.9 | 19.92 | ...        | 1 <sup>n</sup> | HΣ |
| 1892.86 | 7.4 | 19.43 | 7.2...12.0 | 2 <sup>n</sup> | W  |
| 1898.46 | 6.6 | 19.58 | 7.2...10.0 | 3 <sup>n</sup> | D  |

Discovered with the 6-inch.

[β (V)...β (Mon. Not. xxxv, 31)...Δ (I)...OΣ (Poulkowa Obsns. x)...Wilson ( )...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...]

## β 154. Lalande 40292

R.A. 20<sup>h</sup> 46<sup>m</sup> 6<sup>s</sup> }  
Decl. — 16° 37' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1875.73 | 63.0 | 2.74 | 8.7...10.0 | 4 <sup>n</sup> | J   |
| 1877.60 | 61.1 | 3.03 | 8.0...10.0 | 1 <sup>n</sup> | Cin |
| 1879.66 | 60.1 | 2.91 | 8.5... 9.5 | 1 <sup>n</sup> | Cin |
| 1879.69 | 59.8 | 2.88 | 8.0... 9.2 | 2 <sup>n</sup> | Cin |
| 1886.77 | 60.9 | 2.87 | 7.9... 8.6 | 3 <sup>n</sup> | LM  |
| 1888.57 | 64.9 | 2.73 | 8.5... 9.5 | 1 <sup>n</sup> | Lv  |
| 1890.51 | 66.3 | 2.66 | 8.0... 9.4 | 1 <sup>n</sup> | Gl  |
| 1898.62 | 59.6 | 2.88 | 8.3... 9.4 | 3 <sup>n</sup> | D   |

Discovered with the 6-inch. Evidently fixed.

[β (III)...β (Mon. Not. xxxiv, 59)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...  
LM...Lv<sup>1</sup>...Glasenapp (I)...Doolittle (Pub. Flower Obsy. 1)...]

## β 155. O. Arg. N. 21217

R.A. 20<sup>h</sup> 47<sup>m</sup> 24<sup>s</sup> }  
Decl. + 50° 58' }

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1876.49 | 25.2 | 0.55 | 6.5... 7.4 | 6 <sup>n</sup> | Δ  |
| 1884.60 | 23.5 | 0.70 | ...        | 2 <sup>n</sup> | HΣ |
| 1884.90 | 24.2 | 0.39 | 7.3... 7.7 | 5 <sup>n</sup> | En |
| 1888.93 | 26.6 | 0.58 | ...        | 2 <sup>n</sup> | Sp |
| 1897.90 | 28.3 | 0.75 | ...        | 1 <sup>n</sup> | Br |
| 1898.46 | 27.3 | 0.76 | 7.3... 7.9 | 3 <sup>n</sup> | D  |

Discovered with the 6-inch. A fine pair, but no material change. HΣ measures a third star, 25° 5' : 17".74 (1885.53) 1<sup>n</sup>. This star was observed by BALL for parallax. The comparison star is 198<sup>n</sup> distant in the direction of 48°.4 (Dunsink Obsns. v). Σ 2732 is 2<sup>m</sup> 18<sup>s</sup> p and 30' n.

[β (III)...β (Mon. Not. xxxiv, 59)...Δ (I)...Δ (2086)...  
Engelmann (2786)...Sp (III)...Doolittle (Pub. Flower Obsy. 1)...HΣ ( )...Brown ( )...]

## β 367. Lalande 40478

R.A. 20<sup>h</sup> 49<sup>m</sup> 54<sup>s</sup> }  
Decl. + 27° 38' }

## A and B

|         |       |      |            |                |       |
|---------|-------|------|------------|----------------|-------|
| 1876.37 | 115.7 | 0.55 | 7.5... 7.9 | 4 <sup>n</sup> | Δ     |
| 1882.68 | 105.0 | 0.45 | ...        | 1 <sup>n</sup> | Perry |
| 1883.66 | 139.7 | 0.35 | 7.8... 8.2 | 6 <sup>n</sup> | En    |
| 1891.68 | 129.8 | 0.44 | 8.0... 8.6 | 3 <sup>n</sup> | β     |
| 1897.74 | 135.6 | 0.55 | ...        | 3 <sup>n</sup> | Dob   |
| 1897.83 | 137.1 | 0.42 | ...        | 1 <sup>n</sup> | Br    |
| 1899.51 | 136.1 | 0.42 | 8.0... 8.1 | 3 <sup>n</sup> | A     |

AB and C

|         |      |       |          |    |          |
|---------|------|-------|----------|----|----------|
| 1875.60 | 28.2 | 30.88 | ... 12.0 | 1n | $\Delta$ |
| 1891.68 | 24.0 | 31.50 | ... 12.0 | 3n | $\beta$  |
| 1899.50 | 22.8 | 31.82 | ... 12.2 | 2n | A        |

AB and D

|         |      |       |          |    |   |
|---------|------|-------|----------|----|---|
| 1899.50 | 92.6 | 30.94 | ... 14.0 | 2n | A |
|---------|------|-------|----------|----|---|

Discovered with the 6-inch. There seems to be some angular motion in the close pair. In the field with 32 *Vulpeculae*. The proper motion of this star from BOSSERT is 0".160 in the direction of 138°.5. The two measures of C give 0".147 in 131°.3. This star is fixed in space with reference to the binary AB.

[ $\beta$  (VI)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (I)...Perry (*Eng. Mech.* XXXVI, 65)...Engelmann (2742)...Doberck (3466)...Brown ( )...Aitken ( )...]

$\beta$  1034. 7 *Aquarii*

R.A. 20<sup>h</sup> 50<sup>m</sup> 25<sup>s</sup> }  
Decl. — 10° 9' }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1888.68 | 165.0 | 2.09 | 6.0... 11.7 | 5n | $\beta$ |
| 1897.72 | 163.7 | 2.05 | ...         | 3n | A       |

Discovered with the 36-inch. It is not a difficult pair. The measures of 1888 were made with the 12-inch. The principal star has a proper motion of 0".033 in the direction of 257°.8 (AUWERS). It is very probable that this is a physical system.

[ $\beta$  (XIV)... $\beta$  (2875)... $\beta$  (*Pub. L. O.* II)...Aitken (*A. J.* 429)...]

$\beta$  764. S.D. (9°) 5631

R.A. 20<sup>h</sup> 52<sup>m</sup> 22<sup>s</sup> }  
Decl. — 9° 50' }

A and B

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1880.55 | 354.4 | 0.90 | 9.0... 9.2 | 1n | $\beta$ |
| 1886.79 | 173.2 | 0.64 | 9.2... 9.3 | 2n | LM      |
| 1893.75 | 353.8 | 0.79 | 9.0... 9.3 | 3n | W       |
| 1898.75 | 359.0 | 0.86 | 8.7... 8.7 | 3n | Bd      |

AB and C

|         |       |        |         |    |         |
|---------|-------|--------|---------|----|---------|
| 1880.55 | 112.9 | 99.62  | ... 9.0 | 1n | $\beta$ |
| 1893.71 | 112.3 | 99.64  | ... 9.1 | 3n | W       |
| 1898.75 | 112.0 | 100.34 | ... 8.4 | 3n | Bd      |

AB and D

|         |      |        |         |    |         |
|---------|------|--------|---------|----|---------|
| 1880.55 | 21.6 | 137.45 | ... 9.0 | 1n | $\beta$ |
| 1893.71 | 21.5 | 137.17 | ... 9.1 | 3n | W       |
| 1898.75 | 21.6 | 137.80 | ... 8.2 | 3n | Bd      |

Discovered with the 6-inch. The close pair is the  $\rho$  star of a small triangle. The other stars of the triangle, C and D, are S.D. (9°) 5632 and 5635. WILSON measures 11.5 m star from AB, 90°.5 : 58".20 (1893.71) 3n; BOOTHROYD, 89°.7 : 59".08 (1898.75) 3n.

[ $\beta$  (XI)... $\beta^2$ ... $\beta^3$ ...LM...Wilson ( )...Boothroyd ( )...]

$\beta$  1137. B.A.C. 7278

R.A. 20<sup>h</sup> 52<sup>m</sup> 37<sup>s</sup> }  
Decl. + 50° 16' }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1889.44 | 344.3 | 6.88 | 6.0... 13.7 | 3n | $\beta$ |
| 1898.31 | 346.1 | 6.94 | 7.0... 13.2 | 2n | $\beta$ |
| 1898.72 | 343.9 | 7.20 | 6.0... 14.3 | 3n | A       |

Discovered with the 36-inch. This is a naked-eye star in *Cygnus*; Harvard photometric magnitude 5.9.

[ $\beta$  (XVI)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...Aitken (3585)...]

$\beta$  765. Lacaille 8632

R.A. 20<sup>h</sup> 53<sup>m</sup> 9<sup>s</sup> }  
Decl. — 35° 45' }

|         |         |      |              |    |         |
|---------|---------|------|--------------|----|---------|
| 1879.74 | 140.0 ± | 2 ±  | 7.0... 11.0  | 1n | $\beta$ |
| 1891.85 | 139.1   | 2.06 | 6.9... 12.3  | 3n | $\beta$ |
| 1891.76 | 126.4   | 2 ±  | 7 ... 12 1/2 | 1n | Sel     |
| 1898.68 | 130.3   | 1.86 | 7.0... 10.8  | 3n | A       |
| 1898.73 | 140.7   | 2.32 | 7 ... 12.5   | 1n | Bd      |

Discovered with the 6-inch at Mt. Hamilton in 1879. In *Cord. G.C.* 7.1 m.

[ $\beta$  (XI)... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* I, II)...Sellors (3154)...Aitken (3585)...Boothroyd ( )...]

$\beta$  678. Lalande 40636

R.A. 20<sup>h</sup> 54<sup>m</sup> 20<sup>s</sup> }  
Decl. — 8° 49' }

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1878.78 | 185.9 | 2.45 | 8.0... 11.5 | 1n | $\beta$ |
| 1879.64 | 189.7 | 2.37 | 8.0... 11.0 | 2n | Cin     |
| 1886.80 | 192.6 | ...  | 8.3... 12.5 | 1n | LM      |

|         |       |      |            |       |    |
|---------|-------|------|------------|-------|----|
| 1893.77 | 202.5 | 2.43 | 8.0...11.7 | 3 $n$ | W  |
| 1897.84 | 201.4 | 2.49 | ...        | 1 $n$ | Br |
| 1898.68 | 197.8 | 2.37 | 8.4...11.4 | 4 $n$ | D  |
| 1898.82 | 200.0 | 2.55 | 8.0...11.0 | 2 $n$ | A  |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^t$ ...Cin<sup>s</sup>...LM...Wilson ( )...Brown ( )...  
Aitken (3585)...Doolittle (*Pub. Flower Obsy.* 1)...]

**$\beta$  68.** O. Arg. N. 21466

R.A. 20<sup>h</sup> 55<sup>m</sup> 36<sup>s</sup> }  
Decl. + 49° 45' }

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1875.21 | 153.1 | 1.79 | 8.5... 9.2 | 4 $n$ | $\Delta$ |
| 1882.68 | 151.0 | 1.82 | 8.5... 9.0 | 1 $n$ | Perry    |
| 1892.67 | 151.6 | 1.97 | 8.3... 8.9 | 3 $n$ | W        |

Discovered with the 6-inch. Unchanged.  $\Sigma$  2741  
is 56<sup>s</sup>  $p$  and 15.4  $n$ .

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\Delta$  (1)...Perry (*Eng.*  
*Mech.* xxxvi, 65)...Wilson ( )...]

**$\beta$  1210.** Piazzì XX. 440

R.A. 20<sup>h</sup> 56<sup>m</sup> 6<sup>s</sup> }  
Decl. + 48° 13' }

A and B

|         |       |      |            |       |         |
|---------|-------|------|------------|-------|---------|
| 1890.63 | 119.9 | 2.30 | 7.6...12.3 | 3 $n$ | $\beta$ |
| 1898.42 | 117.2 | 2.35 | ...12.2    | 3 $n$ | $\beta$ |
| 1898.60 | 120.2 | 2.54 | 7.0...12.2 | 2 $n$ | A       |

C and D (= O $\Sigma$  425)

|         |       |      |             |       |            |
|---------|-------|------|-------------|-------|------------|
| 1851.70 | 135.0 | "    | 10.5...11.0 | 1 $n$ | O $\Sigma$ |
| 1890.63 | 134.2 | 4.28 | 10.8...11.2 | 3 $n$ | $\beta$    |
| 1898.46 | 133.0 | 4.31 | ...         | 2 $n$ | $\beta$    |
| 1898.60 | 133.4 | 4.32 | ...11.5     | 2 $n$ | A          |

A and C (= O $\Sigma$  425)

|         |      |       |            |       |            |
|---------|------|-------|------------|-------|------------|
| 1847.49 | 27.6 | 12.33 | 7.0...     | 3 $n$ | O $\Sigma$ |
| 1868.43 | 29.7 | 12.81 | 7.2...11.0 | 4 $n$ | $\Delta$   |
| 1890.63 | 28.6 | 13.80 | ...        | 3 $n$ | $\beta$    |
| 1898.45 | 28.0 | 13.80 | ...        | 2 $n$ | $\beta$    |
| 1898.60 | 28.0 | 13.98 | ...11.0    | 2 $n$ | A          |

A and E

|         |      |       |     |       |         |
|---------|------|-------|-----|-------|---------|
| 1898.46 | 18.0 | 45.17 | ... | 2 $n$ | $\beta$ |
|---------|------|-------|-----|-------|---------|

The close companion to the principal star of the triple, O $\Sigma$  425, was discovered with the 36-inch. All the measures of the other stars are given above,

except a measure of the angle of AD on one night, 46°0 (1851.70); and from this and the angle of CD he gives 4".11 for the distance of CD.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* ii)...O $\Sigma$  (*Poulkova Obsns.* ix)... $\Delta$  (1)...Aitken (3585)...]

**$\beta$  1290.** D.M. (46°) 3142

R.A. 20<sup>h</sup> 56<sup>m</sup> 50<sup>s</sup> }  
Decl. + 47° 1' }

A and B

|         |      |      |            |       |         |
|---------|------|------|------------|-------|---------|
| 1898.44 | 16.3 | 3.90 | 9.2... 9.4 | 3 $n$ | $\beta$ |
|---------|------|------|------------|-------|---------|

A and  $a$

|         |       |      |         |       |         |
|---------|-------|------|---------|-------|---------|
| 1898.44 | 271.3 | 3.05 | ...13.1 | 3 $n$ | $\beta$ |
|---------|-------|------|---------|-------|---------|

B and  $b$

|         |      |      |         |       |         |
|---------|------|------|---------|-------|---------|
| 1898.44 | 25.4 | 2.42 | ...13.8 | 3 $n$ | $\beta$ |
|---------|------|------|---------|-------|---------|

Discovered with the 40-inch. A pair of small stars, each with a faint companion. It is 64<sup>s</sup>  $f$  and 2'  $s$  of 59 *Cygni* ( $\Sigma$  2743).

**$\beta$  472.** D.M.<sup>o</sup> (61°) 2078

R.A. 20<sup>h</sup> 57<sup>m</sup> 9<sup>s</sup> }  
Decl. + 61° 24' }

|         |     |      |            |       |          |
|---------|-----|------|------------|-------|----------|
| 1877.69 | 5.8 | 0.66 | 8.2... 8.5 | 3 $n$ | $\Delta$ |
| 1893.67 | 6.0 | 0.77 | 8.3... 8.7 | 3 $n$ | W        |
| 1898.97 | 4.4 | 0.87 | 8.3... 8.7 | 3 $n$ | D        |

Discovered with the 6-inch.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (1)...Wilson ( )  
...Doolittle (*Pub. Flower Obsy.* 1)...]

**$\beta$  69.** W<sup>2</sup> XX. 1743

R.A. 20<sup>h</sup> 57<sup>m</sup> 11<sup>s</sup> }  
Decl. + 21° 13' }

A and B

|         |       |      |            |       |          |
|---------|-------|------|------------|-------|----------|
| 1875.42 | 314.6 | 0.97 | 8.2... 9.0 | 3 $n$ | $\Delta$ |
| 1881.62 | 313.9 | 0.88 | 8.0... 8.5 | 2 $n$ | Ho       |
| 1882.68 | 313.5 | 1.22 | 8 ... 9    | 1 $n$ | Perry    |
| 1884.22 | 313.7 | 1.41 | 8.0... 9.0 | 6 $n$ | En       |
| 1891.84 | 316.5 | 0.95 | 8.3... 9.1 | 3 $n$ | $\beta$  |
| 1896.72 | 311.7 | 0.72 | ...        | 1 $n$ | Lew      |
| 1897.62 | 315.2 | 1.02 | ...        | 2 $n$ | Bow      |
| 1898.72 | 311.1 | 0.97 | ...        | 1 $n$ | Bow      |
| 1898.73 | 313.9 | 0.85 | ...        | 1 $n$ | Lew      |

AB and C

|         |       |       |         |    |          |
|---------|-------|-------|---------|----|----------|
| 1875.81 | 238.4 | 78.44 | ... 7.0 | 1n | $\Delta$ |
| 1884.78 | 238.9 | 78.47 | ... 8.1 | 3n | En       |
| 1891.34 | 239.0 | 77.88 | ... 8.1 | 3n | $\beta$  |
| 1899.42 | 239.5 | 77.86 | ...     | 1n | $\beta$  |

C and D (= Ho 599)

|         |       |       |        |    |         |
|---------|-------|-------|--------|----|---------|
| 1891.84 | 154.6 | 19.47 | ... 13 | 1n | $\beta$ |
| 1895.65 | 155.0 | 18.40 | ... 12 | 2n | Ho      |
| 1899.42 | 153.0 | 18.91 | ...    | 2n | $\beta$ |

Discovered with the 6-inch. The measures show no change in the close pair. C and D make Ho 599.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Perry (*Eng. Mech.* xxxvi, 65)...Engelmann (2678)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Hough (3558)...]

$\beta$  1211. Lalande 40744

R.A. 20<sup>h</sup> 57<sup>m</sup> 15<sup>s</sup> }  
Decl. — 18° 35' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1890.65 | 344.7 | 0.58 | 7.5... 8.1 | 3n | $\beta$ |
| 1897.72 | 347.6 | 0.67 | ...        | 3n | A       |
| 1897.75 | 349.0 | 0.52 | 7.8... 9.0 | 1n | See     |

Discovered with the 12-inch; the *f* star of a small triangle.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* 11)...Aitken (*A. J.* 429)...See (3496)...]

$\beta$  156. Groombridge 3369

R.A. 20<sup>h</sup> 57<sup>m</sup> 39<sup>s</sup> }  
Decl. + 46° 6' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1875.41 | 241.6 | 1.05 | 7.1... 9.4 | 4n | $\Delta$ |
| 1891.62 | 245.9 | 0.99 | 7.5... 9.9 | 3n | $\beta$  |
| 1896.64 | 247.6 | 1.11 | ...        | 2n | Lew      |
| 1898.57 | 242.1 | 1.14 | 7.8... 9.5 | 4n | D        |

Discovered with the 6-inch. It is 29' *n* of 60 *Cygni* (O $\Sigma$  426).

[ $\beta$  (11)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Lewis (*Mon. Not.* LIX, 400)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  445. *Cygni* 287

R.A. 20<sup>h</sup> 58<sup>m</sup> 23<sup>s</sup> }  
Decl. + 28° 37' }

|         |       |      |             |    |            |
|---------|-------|------|-------------|----|------------|
| 1877.58 | 106.6 | 4.60 | 7.5... 12.0 | 1n | $\Delta$   |
| 1878.58 | 114.4 | 4.96 | 7.0... 10.5 | 1n | O $\Sigma$ |
| 1881.89 | 108.9 | 4.73 | 7.0... 11.4 | 3n | Ho         |
| 1884.66 | 111.1 | 4.99 | ...         | 2n | H $\Sigma$ |
| 1892.68 | 110.5 | 4.77 | 7.5... 11.8 | 2n | W          |

Discovered with the 18½-inch. Lalande 40821.

[ $\beta$  (viii)... $\beta$  (*Am. Jour. Sci.* July 1877)... $\Delta$  (1)...H $\Sigma$  ( ) ...O $\Sigma$  (*Poulkowa Obsns.* x)...Hough (2978)...Wilson ( )...]

$\beta$  1138. Lalande 40856

R.A. 20<sup>h</sup> 58<sup>m</sup> 34<sup>s</sup> }  
Decl. + 45° 22' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1888.82 | 185.8 | 0.3± | 7 ... 7    | 2n | Ho      |
| 1889.44 | 188.7 | 0.29 | 7.2... 8.5 | 3n | $\beta$ |
| 1894.75 | 187.4 | 0.25 | 7 ... 7    | 1n | Ho      |
| 1897.92 | 189.2 | 0.36 | ...        | 1n | Lew     |
| 1898.72 | 185.7 | 0.32 | 7.1... 8.0 | 2n | A       |

Discovered with the 36-inch, but it is given in a list of new pairs subsequently published by HOUGH, by whom it was observed in 1888 (= Ho 282). In D.M. 6.7 m; *A. G. C.* 7.2 m.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Hough (2977,3558)...Lewis (*Mon. Not.* LIX, 400)...Aitken (3585)...]

$\beta$  269 =  $\beta$  835. Lalande 40815

R.A. 20<sup>h</sup> 58<sup>m</sup> 39<sup>s</sup> }  
Decl. + 7° 17' }

|         |       |      |             |    |            |
|---------|-------|------|-------------|----|------------|
| 1876.18 | 252.6 | 1.08 | 8.1... 10.1 | 5n | $\Delta$   |
| 1879.64 | 247.3 | ...  | 8.5... 11.0 | 1n | Cin        |
| 1881.66 | 255.7 | 0.84 | 8.0... 11.0 | 3n | $\beta$    |
| 1885.58 | 251.4 | 1.15 | ...         | 3n | H $\Sigma$ |
| 1887.74 | 253.2 | 1.02 | 8.2... 10.2 | 3n | Com        |
| 1890.38 | 253.3 | 1.00 | ...         | 5n | Sp         |
| 1898.48 | 249.9 | 1.11 | 9.1... 9.9  | 4n | D          |

Discovered with the 9.4-inch at the Dartmouth College Observatory. It was again found with the 15½-inch of the Washburn Observatory, and inadvertently included as new in  $\beta$  (xii). It is possible

that H<sup>1</sup> I. 62 is identical with this pair, assuming an error of 1° in HERSCHEL'S declination of his pair. His place is in the same R.A., but 1° south. There is no pair of his Class I in or near that place. HERSCHEL measured the position-angle twice, 234°.8 (1783.40) and 237°.1 (1802.80). If direct motion should be shown by later measures of  $\beta$  269, there would be but little doubt as to the identity of the two pairs. The measures in Cin<sup>5</sup> of  $\beta$  269 and  $\beta$  70 are transposed.

[ $\beta$  (v, XII)... $\beta$  (*Mon. Not.* xxxv, 31; xxxvii, 280)... $\beta^4$ ... $\Delta$   
(1)...Cin<sup>5</sup>...Comstock (*Pub. Washburn Obsy.* vi)...Sp  
(iii)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  1139. Groombridge 3375

R.A. 20<sup>h</sup> 58<sup>m</sup> 39<sup>s</sup> }  
Decl. + 56° 36' }

1889.37 138.6    1.86    6.0...12.5    3n     $\beta$   
1898.79 140.8    2.05    6.0...13.2    3n    A

Discovered with the 36-inch.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...Aitken (3585)...]

$\beta$  70. Lalande 40824

R.A. 20<sup>h</sup> 58<sup>m</sup> 52<sup>s</sup> }  
Decl. + 11° 33' }

B and C

1879.64 95.0    3.59    10.0...11.0    1n    Cin  
1891.63 96.7    5.16    10.2...10.4    2n     $\beta$   
1898.69 96.3    5.38    11.0...11.0    2n    D  
1899.50 96.2    5.33    11.0...11.0    2n     $\beta$

A and B

1891.64 238.8    78.63    8.0...    2n     $\beta$   
1899.50 239.1    79.06    ...    2n     $\beta$

A and C

1898.69 237.4    75.09    ...    2n    D  
1899.50 236.4    74.80    8.0...    2n     $\beta$

Discovered with the 6-inch. The measures in Cin<sup>5</sup> of  $\beta$  269 and  $\beta$  70 are transposed.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Cin<sup>5</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  157. *Aquarii* 43

R.A. 21<sup>h</sup> 0<sup>m</sup> 31<sup>s</sup> }  
Decl. - 14° 24' }

A and C

1876.54 81.9    21.36    ...12.0    1n     $\Delta$   
1878.59 83.7    20.99    ...12.0    1n     $\beta$   
1879.64 80.7    20.10    ...12.0    1n    Cin  
1898.52 74.7    13.90    ...    2n     $\beta$

A and B (=  $\Sigma$  2752)

1827.62 145.2    5.17    6.7...10.7    3n     $\Sigma$   
1848.67 145.3    5.61    ...    1n    Mh  
1866.68 149.4    5.55    7.0...10.5    3n     $\Delta$   
1878.59 151.9    5.60    ...    1n     $\beta$   
1879.64 151.4    5.35    8.0...10.5    1n    Cin  
1898.52 155.0    5.51    ...    2n     $\beta$

The faint star, C, was noted with the 6-inch. The principal star has a proper motion of 0".339 in the direction of 90°0 (PORTER), and evidently the  $\Sigma$  companion, B, is moving with it. The change in C corresponds to this movement, and therefore that star does not belong to the system. It will finally be nearer to A than B now is, the minimum distance of 3" being reached about 1939. All the measures of AB are given above. MADLER (*Dorpat Obsns.* xi) has an angle, 26°.5, which must belong to some other pair.

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^4$ ...Cin<sup>5</sup>...Mitchell (Cin<sup>2</sup>)... $\Delta$  (ii)...]

$\beta$  368. *Aquarii* 45

R.A. 21<sup>h</sup> 1<sup>m</sup> 1<sup>s</sup> }  
Decl. - 8° 43' }

A and B

1876.10 99.3    0.49    7.4... 7.7    3n     $\Delta$   
1877.76 91.0    ...    7.5... 9.0    1n    Cin  
1878.11 89.9    0.69    7.2... 7.5    3n     $\Delta$   
1879.24 89.6    0.67    7.5... 8.6    4n    Cin  
1880.73 91.3    0.87    ...    1n    Pt  
1881.63 90.4    0.63    6.9... 7.7    3n     $\beta$   
1882.67 89.4    0.5    7.0... 7.5    1n    W  
1886.69 90.1    0.70    8.1... 8.6    2n    LM  
1886.60 93.3    0.66    7.1... 8.0    2n    Lv  
1890.64 88.7    0.58    6.9... 7.8    3n     $\beta$   
1892.10 90.2    0.58    ...    4n    Sp  
1892.68 92.1    0.60    7.5... 7.5    3n    T  
1898.58 89.0    0.61    7.2... 8.0    1n    A

C and D

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1890.65 | 317.9 | 6.15 | 14.0...14.7 | 2n | β |
| 1898.58 | 316.1 | 5.14 | 14.0...14.5 | 1n | A |

AB and C

|         |      |       |     |    |   |
|---------|------|-------|-----|----|---|
| 1890.65 | 27.2 | 12.02 | ... | 2n | β |
| 1898.58 | 30.9 | 12.20 | ... | 1n | A |

The bright star was suspected to be a close pair with the 6-inch in 1873, and verified with the same instrument in 1875. In measuring this with the 36-inch, the double companion, CD, was detected. These are very faint stars, and require a large aperture. There seems to be no sensible change thus far in the close pair. Lalande 40892.

[β (VI)...β (2062,3048)...β<sup>4</sup>...β (Pub. L. O. II)...Δ (I)...Cin<sup>4</sup>...Cin<sup>5</sup>...Pritchett (Pub. Morrison Obsy. I)...Wilson (Cin<sup>10</sup>)...LM...Lv<sup>1</sup>...Sp (III)...Tarrant (3186)...Aitken (3585)...]

β 679.

|   |      |      |           |    |   |
|---|------|------|-----------|----|---|
| R.A. 21 <sup>h</sup> 1 <sup>m</sup> 24 <sup>s</sup> } |      |      |           |    |   |
| Decl. + 43° 12' }                                     |      |      |           |    |   |
| 1878.10   | 68.1 | 0.38 | 10 ... 10 | 2n | β |
| 1889.45   | 65.6 | 0.52 | 10 ... 10 | 3n | β |
| 1896.56   | 54.0 | 0.42 | ...       | 1n | L |

This close and exceedingly minute pair was discovered with the 18½-inch. It is too faint for the D.M. It is in a low-power field *sp* D.M. (43°) 3802, 8.8 m.

[β (X)...β<sup>1</sup>...β (2957)...β (Pub. L. O. II)...Lewis (Mon. LIX, 400)...]

β 473. S.D. (10°) 5606

|   |       |      |            |    |    |
|---|-------|------|------------|----|----|
| R.A. 21 <sup>h</sup> 1 <sup>m</sup> 24 <sup>s</sup> } |       |      |            |    |    |
| Decl. — 10° 41' }                                     |       |      |            |    |    |
| 1877.08   | 115.5 | 1.74 | 9.0...10.2 | 3n | Δ  |
| 1893.53   | 114.9 | 1.88 | 8.5...10.0 | 2n | Lv |
| 1893.81   | 118.5 | 1.79 | 8.5... 9.5 | 1n | W  |
| 1898.65   | 118.0 | 1.82 | 8.2... 9.7 | 3n | Cg |

Discovered with the 6-inch In S.D. 8.0 m. A 12.7 m star, COGSHALL 357° 2 : 25' 37 (1898.67) 2n.

[β (IX)...β (Mon. Not. XXXVIII, 78)...Δ (I)...Lv (A. J. 382)...Wilson ( )...Cogshall ( )...]

β 158. Lalande 40984

|   |       |       |            |    |   |
|---|-------|-------|------------|----|---|
| R.A. 21 <sup>h</sup> 1 <sup>m</sup> 37 <sup>s</sup> } |       |       |            |    |   |
| Decl. + 47° 19' }                                     |       |       |            |    |   |
| 1875.72   | 314.9 | 10.44 | 7.3...11.8 | 3n | Δ |
| 1879.57   | 314.6 | 10.72 | 8.5...12.5 | 1n | β |
| 1891.57   | 314.1 | 10.84 | 8.0...11.2 | 2n | β |
| 1898.86   | 313.9 | 10.89 | 7.9...11.1 | 4n | D |

Discovered with the 6-inch. In the field *f* a new double nebula was found at the same time (DREYER 7026).

[β (III)...β (Mon. Not. XXXIV, 59)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Δ (I)...Doolittle (Pub. Flower Obsy. I)...]

β 680. D.M. (53°) 2546

|   |       |      |            |    |    |
|---|-------|------|------------|----|----|
| R.A. 21 <sup>h</sup> 1 <sup>m</sup> 52 <sup>s</sup> } |       |      |            |    |    |
| Decl. + 53° 11' }                                     |       |      |            |    |    |
| A and B   |       |      |            |    |    |
| 1877.57   | 131.4 | 0.5± | 8 ... 8+   | 1n | β  |
| 1877.70   | 128.3 | 0.63 | 8.1... 8.6 | 2n | Δ  |
| 1885.53   | 309.0 | 0.70 | ...        | 2n | HΣ |
| 1890.74   | 306.7 | 0.58 | ...        | 6n | Sp |
| 1891.65   | 310.1 | 0.64 | 8.4... 9.2 | 3n | β  |

AB and C

|         |      |       |         |    |    |
|---------|------|-------|---------|----|----|
| 1890.58 | 34.2 | 23.95 | ...     | 1n | Sp |
| 1885.52 | 33.6 | 23.41 | ...     | 1n | HΣ |
| 1891.66 | 32.8 | 23.31 | ...10.7 | 2n | β  |

Discovered with the 18½-inch. Further measures of the close pair are needed.

[β (X)...β<sup>1</sup>...β (3114)...β (Pub. L. O. II)...Δ (I)...Sp (III)...HΣ ( )...]

β 836. W<sup>2</sup> XX. 1880

|   |       |      |            |    |     |
|---|-------|------|------------|----|-----|
| R.A. 21 <sup>h</sup> 2 <sup>m</sup> 27 <sup>s</sup> } |       |      |            |    |     |
| Decl. + 47° 54' }                                     |       |      |            |    |     |
| A and B   |       |      |            |    |     |
| 1881.63   | 191.4 | 0.62 | 9.0... 9.1 | 3n | β   |
| 1888.08   | 189.6 | 0.65 | 9.2... 9.1 | 3n | Com |
| 1889.29   | 191.4 | 0.63 | 9.1... 9.1 | 4n | β   |
| 1898.69   | 183.4 | 0.78 | 8.5... 8.6 | 4n | A   |

| C and D   |       |       |             |                |     |
|-----------|-------|-------|-------------|----------------|-----|
| 1889.29   | 65.0  | 1.27  | 10.2...11.2 | 3 <sup>n</sup> | β   |
| 1898.69   | 67.0  | 1.32  | 10.8...11.5 | 2 <sup>n</sup> | A   |
| AB and CD |       |       |             |                |     |
| 1881.63   | 219.1 | 27.38 | ...10.2     | 3 <sup>n</sup> | β   |
| 1888.15   | 218.9 | 27.46 | 8.3...9.5   | 3 <sup>n</sup> | Com |
| 1889.29   | 219.4 | 27.45 | ...         | 4 <sup>n</sup> | β   |
| 1898.63   | 219.1 | 27.49 | ...         | 3 <sup>n</sup> | A   |

The principal pair was discovered with the 15½-inch of the Washburn Observatory, and it was then stated that C might also be double. This was verified with the 36-inch in 1888, thus making a pretty but difficult quadruple group.

[β (xii)...β<sup>4</sup>...β (2957)...β (*Pub. L. O.* 11)...Comstock (*Pub. Washburn Obsy.* vi)...Aitken (3585)...]

**β 988.** D.M. (40°) 4413

R.A. 21<sup>h</sup> 2<sup>m</sup> 28<sup>s</sup> }  
Decl. + 40° 56' }

| A and B |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.63 | 238.1 | 1.20 | 8.9...11.7 | 3 <sup>n</sup> | β |
| 1893.81 | 226.2 | 1.28 | 9.0...12.0 | 2 <sup>n</sup> | W |
| 1898.48 | 223.9 | 1.46 | 9...9      | 1 <sup>n</sup> | D |

| A and C |      |       |        |                |   |
|---------|------|-------|--------|----------------|---|
| 1880.58 | 55.4 | 16.07 | ...8.9 | 3 <sup>n</sup> | β |
| 1893.81 | 53.3 | 15.08 | ...9.2 | 2 <sup>n</sup> | W |
| 1898.45 | 51.2 | 15.16 | ...9.8 | 1 <sup>n</sup> | D |

Discovered with the 18½-inch. Change in AB is probable.

[β (xiii)...β<sup>3</sup>...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 837.** D.M. (—0°) 4170

R.A. 21<sup>h</sup> 2<sup>m</sup> 43<sup>s</sup> }  
Decl. — 0° 16' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.73 | 189.7 | 3.70 | 8.4...10.1 | 3 <sup>n</sup> | β   |
| 1886.84 | 186.1 | 3.33 | ...        | 4 <sup>n</sup> | UL  |
| 1887.77 | 189.3 | 3.53 | 8.0...10.0 | 3 <sup>n</sup> | Com |
| 1898.54 | 187.1 | 3.44 | 8.5...10.1 | 5 <sup>n</sup> | D   |
| 1898.84 | 187.0 | 3.47 | 8.3...9.5  | 1 <sup>n</sup> | β   |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (xii)...β<sup>4</sup>...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 71. γ Equulei**

R.A. 21<sup>h</sup> 4<sup>m</sup> 30<sup>s</sup> }  
Decl. + 9° 39' }

| A and C |      |       |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1877.73 | 10.0 | 41.34 | 4.8...12 | 1 <sup>n</sup> | β |
| 1888.82 | 9.2  | 43.33 | ...      | 3 <sup>n</sup> | β |
| 1898.57 | 7.9  | 44.30 | ...10.5  | 3 <sup>n</sup> | β |

A and B (= Knott)

|         |       |      |         |                |    |
|---------|-------|------|---------|----------------|----|
| 1867.50 | 276.8 | 2.13 | ...11.0 | 2 <sup>n</sup> | Kn |
| 1877.73 | 274.5 | 2.16 | ...     | 1 <sup>n</sup> | β  |
| 1883.77 | 274.6 | 2.17 | ...     | 3 <sup>n</sup> | Hl |
| 1888.82 | 275.4 | 2.14 | ...     | 3 <sup>n</sup> | β  |
| 1897.82 | 273.2 | 2.40 | ...     | 4 <sup>n</sup> | A  |
| 1898.55 | 275.0 | 2.30 | ...     | 1 <sup>n</sup> | β  |

The distant star was noted with the 6-inch. The bright star has a proper motion of 0.165 in the direction of 165°.5. This corresponds to the change in C shown by the measures. KNOTT's companion has the same proper motion as the principal star, and hence this is probably a physical pair. The measures show no relative motion.

γ Equulei and 6 Equulei, about 5' distant, make Σ 54, App. I.

[β (i)...β (*Mon. Not.* xxxiii, 351)...β<sup>1</sup>...β (2875)...β (*Pub. L. O.* 11)...]

The following relate principally to B and D:

[Knott (*Mem. R. A. S.* xliii) (*Mon. Not.* xxviii, 47; XLVII, 11)...A (ii)...A (1574)...Engelmann (*Mess. Neunzig Doppelsterne*, 1865)...*Radcliffe Obsns.* xxv...Hall (ii)...Pritchett (*Pub. Morrison Obsy.* 1)...Tarrant (2899)...Jedrzejewicz (2343)...Maiebeckato (*Obsns.* 1892)...Aitken (*A. J.* 429)...]

**β 251.** O. Arg. S. 21193

R.A. 21<sup>h</sup> 4<sup>m</sup> 53<sup>s</sup> }  
Decl. — 31° 5' }

|         |       |      |           |                |     |
|---------|-------|------|-----------|----------------|-----|
| 1877.70 | 233.6 | 2.71 | 7.0...9.5 | 1 <sup>n</sup> | Cin |
| 1879.69 | 234.4 | ...  | 8.0...9.5 | 1 <sup>n</sup> | β   |
| 1896.74 | 231.3 | 3.08 | 7.8...9.6 | 3 <sup>n</sup> | See |

Discovered with the 6-inch.

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>2</sup>...Cin<sup>4</sup>...See (3496)...]

**β 159.** Lalande 41178

R.A. 21<sup>h</sup> 6<sup>m</sup> 21<sup>s</sup> }  
Decl. + 47° 12' }

A and B

|         |       |      |            |                |       |
|---------|-------|------|------------|----------------|-------|
| 1876.69 | 318.4 | 1.33 | 6.1... 9.2 | 6 <sup>n</sup> | Δ     |
| 1882.68 | 300.0 | 1.34 | ...        | 1 <sup>n</sup> | Perry |
| 1889.53 | 316.7 | 1.28 | 7.1... 9.7 | 3 <sup>n</sup> | β     |
| 1898.56 | 316.6 | 1.22 | 6.7... 9.8 | 4 <sup>n</sup> | D     |

A and C (= OΣ (App.) 215)

|         |       |        |         |                |    |
|---------|-------|--------|---------|----------------|----|
| 1875.72 | 189.6 | 134.14 | ... 6.9 | 4 <sup>n</sup> | Δ  |
| 1886.48 | 189.5 | 134.21 | ... 7.4 | 4 <sup>n</sup> | Fr |
| 1889.53 | 189.4 | 134.16 | ... 7.3 | 2 <sup>n</sup> | β  |
| 1898.56 | 189.5 | 133.64 | ... 7.0 | 4 <sup>n</sup> | D  |

The close pair was discovered with the 6-inch. There is a faint star about 14" from AB in the direction of 147°. All the measures of OΣ (App.) 215 are given above. If there is any proper motion, it is evidently common to all the components.

β (iv)...β (Mon. Not. xxxiv, 382)...β (2957)...β (Pub. L. O. II)...Δ (1)...Perry (Eng. Mech. xxxvi, 65)...Franz (3080)...Doolittle (Pub. Flower Obsy. I)...

**β 270.** Equulei 19

R.A. 21<sup>h</sup> 7<sup>m</sup> 31<sup>s</sup> }  
Decl. + 6° 43' }

A and B

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1875.82 | 354.6 | 0.62 | 7.4... 9.7 | 2 <sup>n</sup> | Δ  |
| 1877.72 | 347.4 | 1.26 | 7.0... 9.0 | 1 <sup>n</sup> | β  |
| 1885.61 | 353.2 | 0.67 | ...        | 2 <sup>n</sup> | HΣ |
| 1889.44 | 350.0 | 0.5± | ...        | 7 <sup>n</sup> | Sp |
| 1891.60 | 347.5 | 0.70 | 7.0... 8.5 | 2 <sup>n</sup> | β  |
| 1898.71 | 344.9 | 0.61 | 7.2... 8.5 | 3 <sup>n</sup> | A  |
| 1898.73 | 347.7 | 0.56 | 7.0... 8.5 | 1 <sup>n</sup> | β  |

A and C

|         |      |       |          |                |   |
|---------|------|-------|----------|----------------|---|
| 1877.72 | 32.4 | 20±   | ... 13   | 1 <sup>n</sup> | β |
| 1898.70 | 32.7 | 32.55 | ... 12.7 | 2 <sup>n</sup> | β |
| 1898.71 | 32.1 | 32.80 | ... 12.8 | 2 <sup>n</sup> | A |

A and D (= S 781)

|         |       |        |            |                |   |
|---------|-------|--------|------------|----------------|---|
| 1824.99 | 173.0 | 183.24 | 6½... 7    | 2 <sup>n</sup> | S |
| 1877.72 | 172.6 | 183.40 | 7.0... 7.0 | 1 <sup>n</sup> | β |
| 1891.60 | 172.6 | 184.52 | ... 7.0    | 2 <sup>n</sup> | β |
| 1898.66 | 172.8 | 184.44 | ...        | 3 <sup>n</sup> | β |
| 1898.66 | 172.3 | 184.40 | ... 7.0    | 1 <sup>n</sup> | A |

The close pair was discovered with the 9.4-inch of the Dartmouth College Observatory. So far there is no material change. All the measures of SOUTH'S pair are given. A and D are respectively Lalande 41173 and 41179. Each star was observed twice by LALANDE. The mean differences of R.A. and Decl. give for the position-angle and distance at that time 172°9 : 184".86.

[β (v)...β (Mon. Not. xxxv, 31)...β<sup>r</sup>...β (3114)...β (Pub. L. O. II)...Sp (III)...HΣ ( )...Aitken (3585)...]

**β 681.** Rümker 9004

R.A. 21<sup>h</sup> 7<sup>m</sup> 40<sup>s</sup> }  
Decl. + 16° 26' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.64 | 239.7 | 2.51 | 7.0... 11.3 | 3 <sup>n</sup> | β  |
| 1884.61 | 232.9 | 2.86 | ...         | 2 <sup>n</sup> | HΣ |
| 1892.79 | 234.3 | 2.33 | 7.0... 11.0 | 1 <sup>n</sup> | Ho |
| 1897.84 | 240.6 | 3.10 | ...         | 1 <sup>n</sup> | Br |
| 1898.57 | 235.9 | 2.89 | 7.2... 11.2 | 4 <sup>n</sup> | D  |
| 1899.50 | 238.2 | 2.94 | 7.1... 11.0 | 2 <sup>n</sup> | β  |

Discovered with the 18½-inch. Without change.

[β (x)...β<sup>r</sup>...Hough (3134)...HΣ ( )...Brown ( )...Doolittle (Pub. Flower Obsy. I)...]

**β 160.** Lalande 41242

R.A. 21<sup>h</sup> 7<sup>m</sup> 48<sup>s</sup> }  
Decl. + 45° 13' }

B and C

|         |       |      |              |                |   |
|---------|-------|------|--------------|----------------|---|
| 1892.67 | 116.7 | 6.11 | 11.0... 11.2 | 1 <sup>n</sup> | W |
| 1898.86 | 115.2 | 6.41 | 10.2... 10.7 | 4 <sup>n</sup> | D |

A and B

|         |       |       |        |                |   |
|---------|-------|-------|--------|----------------|---|
| 1892.67 | 154.3 | 56.96 | 7.5... | 1 <sup>n</sup> | W |
| 1898.86 | 154.2 | 57.47 | 7.3... | 4 <sup>n</sup> | D |

Distant double companion noted with the 6-inch. Not likely to be of any special interest.

[β (III)...β (Mon. Not. xxxiv, 59)...Wilson ( )...Doolittle (Pub. Flower Obsy. I)...]

**β 682.** Lalande 41222

R.A. 21<sup>h</sup> 8<sup>m</sup> 30<sup>s</sup> }  
Decl. + 4° 12' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1877.77 | 105.6 | 5.64 | 7.5... 12.0 | 1 <sup>n</sup> | β  |
| 1885.66 | 103.5 | 5.74 | ...         | 2 <sup>n</sup> | HΣ |

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1891.63 | 103.3 | 5.63 | 7.7...12.2 | 2n | $\beta$ |
| 1898.53 | 100.7 | 5.67 | 7.4...11.5 | 6n | D       |
| 1899.44 | 102.2 | 5.28 | 7.0...13.0 | 1n | $\beta$ |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...H $\Sigma$  ( )...  
Doolittle (*Pub. Flower Obsy. I*)...]

**$\beta$  1261.** D.M. (15°) 4384

R.A. 21<sup>h</sup> 10<sup>m</sup> 29<sup>s</sup> }  
Decl. + 15° 36' }

|         |       |      |            |    |         |
|---------|-------|------|------------|----|---------|
| 1886.76 | 151.5 | 1.39 | 8.5...11.0 | 2n | Ho      |
| 1891.85 | 148.9 | 1.72 | 8.5... 9.7 | 3n | $\beta$ |
| 1895.88 | 150.6 | ...  | ...        | 1n | Sp      |
| 1897.84 | 148.2 | 1.57 | ...        | 3n | A       |

This pair was discovered with the 18½-inch in September 1884, but was not included in the lists of new pairs of that time.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O. II*)...Hough (2978)  
...Sp (iii)...Aitken (*A. J.* 429)...]

**$\beta$  161.** W<sup>r</sup> XX1. 197

R.A. 21<sup>h</sup> 10<sup>m</sup> 53<sup>s</sup> }  
Decl. — 4° 45' }

B and C

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1891.64 | 316.8 | 7.10 | 10.2...11.5 | 2n | $\beta$ |
| 1898.71 | 318.5 | 7.40 | ...11.0     | 1n | $\beta$ |

A and B

|         |       |        |            |    |         |
|---------|-------|--------|------------|----|---------|
| 1891.62 | 350.2 | 101.01 | 8.1...10.0 | 2n | $\beta$ |
| 1898.71 | 349.9 | 100.94 | 8.2... 9.0 | 1n | $\beta$ |

A and a

|         |       |       |     |    |         |
|---------|-------|-------|-----|----|---------|
| 1891.65 | 315.3 | 34.10 | ... | 1n | $\beta$ |
| 1898.71 | 318.0 | 33.90 | ... | 1n | $\beta$ |

a and b

|         |      |       |             |    |         |
|---------|------|-------|-------------|----|---------|
| 1891.65 | 15.8 | 11.66 | 13.5...13.5 | 1n | $\beta$ |
| 1898.71 | 19.2 | 10.86 | 13.5...12.0 | 1n | $\beta$ |

The distant double companion was found with the 6-inch. The declination was erroneously given — 5° 45' in  $\beta$  (iii). A and B are respectively S.D. (4°) 5404 and 5403, 8.3 and 9.3 m.

[ $\beta$  (iii)... $\beta$  (*Mon. Not. xxxiv, 59*)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

**$\beta$  162.** D.M. (35°) 4461

R.A. 21<sup>h</sup> 12<sup>m</sup> 14<sup>s</sup> }  
Decl. + 35° 16' }

|         |       |      |            |    |          |
|---------|-------|------|------------|----|----------|
| 1875.11 | 240.5 | 1.05 | 8.0... 8.5 | 4n | $\Delta$ |
| 1880.77 | 241.5 | 0.98 | 8.0... 8.0 | 1n | $\beta$  |
| 1883.91 | 67.0  | 1.28 | 8.1... 8.3 | 5n | En       |
| 1891.63 | 243.5 | 1.09 | 8.5... 8.6 | 3n | $\beta$  |

Discovered with the 6-inch. Probably fixed. A 13 m star in the direction of 138°5.

[ $\beta$  (iii)... $\beta$  (*Mon. Not. xxxiv, 59*)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)... $\Delta$  (2086)...Engelmann (2678)...]

**$\beta$  163.** Lalande 41386

R.A. 21<sup>h</sup> 12<sup>m</sup> 47<sup>s</sup> }  
Decl. + 11° 4' }

|         |       |      |            |    |            |
|---------|-------|------|------------|----|------------|
| 1876.09 | 252.3 | 1.15 | 7.1... 9.0 | 4n | $\Delta$   |
| 1878.60 | 256.9 | 0.87 | 7.0... 9.0 | 1n | O $\Sigma$ |
| 1884.31 | 254.3 | 1.19 | ...        | 3n | H $\Sigma$ |
| 1887.79 | 251.3 | 0.68 | 7 ... 10   | 3n | H1         |
| 1891.52 | 254.6 | 0.75 | 7.2... 9.8 | 3n | $\beta$    |
| 1892.91 | 248.1 | 0.57 | ...        | 2n | Sp         |
| 1895.46 | 251.9 | 0.56 | ...        | 5n | Sp         |
| 1895.69 | 246.9 | 0.63 | 7.2... 9.8 | 2n | Lew        |
| 1898.76 | 253.2 | 0.63 | 7.0... 9.6 | 3n | A          |

Discovered with the 6-inch. This star has a proper motion of 0.081 in the direction of 180° (KUSTNER). There is no relative change, but the components have the same proper motion.

[ $\beta$  (iii)... $\beta$  (*Mon. Not. xxxiv, 59*)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...O $\Sigma$  (*Poulkowa Obsns. x*)...Hall (ii)...Sp (iii)...Lewis (*Mon. Not. lvi, 359*) (*Greenwich Obsns. 1895*)...Aitken (3585)...H $\Sigma$  ( )...]

**$\beta$  271.** Lalande 41363

R.A. 21<sup>h</sup> 12<sup>m</sup> 49<sup>s</sup> }  
Decl. — 26° 51' }

A and B

|         |       |      |             |    |         |
|---------|-------|------|-------------|----|---------|
| 1876.68 | 226.6 | 2.21 | 7.2... 9.7  | 1n | Cin     |
| 1877.66 | 233.3 | 2.14 | 7.5... 10.0 | 1n | Cin     |
| 1879.68 | 225.3 | ...  | 6.0... 10.0 | 1n | Cin     |
| 1879.69 | 231.8 | 2.30 | 6.5... 9.5  | 1n | Cin     |
| 1886.78 | 237.5 | 2.77 | 6.0... 9.0  | 1n | LM      |
| 1891.54 | 237.2 | 2.70 | 7.0... 10.4 | 2n | $\beta$ |
| 1897.24 | 241.4 | 3.19 | 7.7... 10.7 | 5n | See     |
| 1898.74 | 239.5 | 2.90 | 6.8... 9.1  | 4n | D       |
| 1898.84 | 236.3 | 3.37 | ...         | 1n | $\beta$ |

A and C

1898.84 74.2 74.57 ... 12.0 1n β

Discovered with the 9.4-inch at the Dartmouth College Observatory. It is a most interesting binary from the large common proper motion of the components. The annual movement is 0.693 in the direction of 245.3 (PORTER). The relative motion is slow, so that the period must be a long one. The magnitude in GOULD is 6.7.

[β (v)...β (Mon. Not. xxxv, 31)...β (3114)...β (Pub. L. O. 11) ...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...LM...See (3496)... Doolittle (Pub. Flower Obsy. 1)...]

β 252. Lalande 41364

R.A. 21<sup>h</sup> 12<sup>m</sup> 58<sup>s</sup> }  
Decl. - 27° 49' }

1877.54 278.4 2.53 8.2... 8.3 5n Cin  
1885.67 96.3 2.44 8.0... 8.1 2n W  
1888.65 277.7 2.65 8.2... 8.2 1n Lv  
1891.73 279.2 2.67 ... 1n Col  
1896.89 276.9 2.59 8.5... 8.5 2n See  
1897.74 276.8 2.55 8¼... 8½ 2n Sc

Discovered with the 6-inch. Unchanged. The measures in Cin<sup>5</sup> and Lv<sup>2</sup> of this pair are erroneously credited to another double in the vicinity, 2<sup>m</sup> 16<sup>s</sup> ρ and 4' 47" n.

[β (v)...β (Mon. Not. xxxv, 31)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>... Wilson (Cin<sup>10</sup>)...Lv<sup>2</sup>...Collins (Proc. Haverford Coll. Obsy. 1892)...See (3496)...Scott (Mon. Not. LIX, 427)...]

β 289. W<sup>2</sup> XXI. 289

R.A. 21<sup>h</sup> 13<sup>m</sup> 22<sup>s</sup> }  
Decl. + 34° 25' }

A and B

1878.53 137.8 0.90 8.2... 10.0 1n β  
1881.64 130.4 0.67 9 ... 11 1n Ho  
1898.76 140.5 0.89 8.3... 9.0 1n β  
1898.82 139.2 1.00 8.0... 10.2 3n A

A and C

1878.53 262.1 5.39 ... 13 1n β  
1898.75 261.5 6.28 ... 12 1n β  
1898.82 258.4 6.55 ... 13.0 2n A

Discovered with the 26-inch at the Naval Observatory. In the field with v Cygni (OΣ 433), 24<sup>s</sup> f and 1'7 n.

[β (v)...β (Mon. Not. xxxv, 31)...β<sup>1</sup>...Hough (2978)... Aitken (3585)...]

β 1140. O. Arg. N. 22012

R.A. 21<sup>h</sup> 14<sup>m</sup> 1<sup>s</sup> }  
Decl. + 58° 6' }

1889.58 276.5 3.89 6.7... 12.3 3n β  
1893.80 274.1 4.40 ... 13.0 2n Bar  
1898.31 276.6 3.86 7.0... 12.0 2n β

Discovered with the 36-inch. This star is surrounded by a faint nebula, about 12' in diameter, discovered by BARNARD by means of photography (Mon. Not. LIX, 369).

[β (xvi)...β (2956)...β (Pub. L. O. 11)...Barnard (A. J. 447)...]

β 838. Lalande 41462

R.A. 21<sup>h</sup> 14<sup>m</sup> 51<sup>s</sup> }  
Decl. + 2° 37' }

1881.66 90.3 1.29 7.6... 9.5 3n β  
1884.65 93.8 1.84 ... 2n HΣ  
1886.84 93.9 1.69 ... 3n UL  
1887.77 95.8 1.71 8.2... 9.8 3n Com  
1891.85 96.7 1.34 8.3... 9.2 3n β  
1893.59 97.1 1.48 7.8... 10.2 3n W  
1894.57 101.1 1.82 ... 1n Bar  
1894.87 98.1 1.22 ... 3n Sp  
1895.74 101.3 1.36 ... 1n Lew  
1896.66 98.7 1.66 8.0... 9.9 3n Lv  
1897.74 93.8 1.39 ... 3n A  
1897.85 100.9 1.65 8 ... 11 1n Br

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...β (3114)...β (Pub. L. O. 11)...Updegraff and Lamb (Pub. Washburn Obsy. v)...Comstock (Sid. Mess. IX, 78) (Pub. Washburn Obsy. vi)...Wilson ( )...Barnard (A. J. 447)...Sp (iii)...Lewis (Mon. Not. LVI, 359) (Greenwich Obsns. 1895)...Lv (A. J. 407)...Aitken (A. J. 429)...HΣ ( )...Brown ( )...]

**β 1262.** Lalande 41483

R.A. 21<sup>h</sup> 15<sup>m</sup> 40<sup>s</sup> }  
Decl. — 15° 26' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1878.02 | 113.8 | 2.07 | 8.0... | 9.1 | 3 <sup>n</sup> | Cin |
| 1886.72 | 116.0 | 2.08 | 8.0... | 9.2 | 2 <sup>n</sup> | LM  |
| 1891.85 | 113.3 | 1.79 | 8.3... | 9.0 | 3 <sup>n</sup> | β   |
| 1897.72 | 112.3 | 1.98 | ...    |     | 3 <sup>n</sup> | A   |

Discovered with the 6-inch in 1873. The double, H<sup>1</sup> N. 139, is undoubtedly identical with this pair. H<sup>1</sup> has no measures or description beyond giving it as Class I, and his place is some distance *sp*, but there is no double star there, and he probably saw the pair given above. There seems to be no relative motion.

[β (xviii)...β (3113)...β (*Pub. L. O. II*)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...LM...Aitken (*A. J. 429*)...]

**β 446.** W<sup>2</sup> XXI. 344

R.A. 21<sup>h</sup> 15<sup>m</sup> 44<sup>s</sup> }  
Decl. + 32° 56' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1876.80 | 261.7 | 2.30 | 9.0... |      | 1 <sup>n</sup> | β |
| 1893.65 | 265.4 | 2.96 | 8.5... | 12.5 | 3 <sup>n</sup> | W |
| 1898.22 | 255.1 | 2.88 | 8.4... | 13+  | 1 <sup>n</sup> | D |

Discovered with the 18½-inch. In the field with a 7 in star.

[β (viii)...β (*Am. Jour. Sci.* July 1877)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 839.** D.M. (48°) 3348

R.A. 21<sup>h</sup> 16<sup>m</sup> 10<sup>s</sup> }  
Decl. + 48° 50' }

A and B

|         |       |       |        |       |                |    |
|---------|-------|-------|--------|-------|----------------|----|
| 1881.47 | 201.7 | 15.18 | 8.5... | 12.0  | 3 <sup>n</sup> | β  |
| 1892.86 | 200.8 | 14.45 | 8      | ...12 | 1 <sup>n</sup> | Ho |
| 1898.69 | 201.7 | 15.03 | 8.2... | 11.5  | 1 <sup>n</sup> | β  |

A and C

|         |       |       |        |      |                |     |
|---------|-------|-------|--------|------|----------------|-----|
| 1881.47 | 197.0 | 21.46 | ...    | 9.4  | 3 <sup>n</sup> | β   |
| 1887.85 | 197.8 | 21.43 | 8.0... | 9.8  | 3 <sup>n</sup> | Com |
| 1892.86 | 195.4 | 21.20 | ...    | 9    | 1 <sup>n</sup> | Ho  |
| 1898.69 | 197.1 | 21.67 | ...    | 10.5 | 1 <sup>n</sup> | β   |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (xii)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy.* vi)...Hough (3234)...]

**β 766.** θ<sup>2</sup> *Microscopii*

R.A. 21<sup>h</sup> 16<sup>m</sup> 45<sup>s</sup> }  
Decl. — 41° 31' }

|         |       |      |     |       |                |     |
|---------|-------|------|-----|-------|----------------|-----|
| 1879.73 | 314.1 | 0.83 | 5   | ... 6 | 2 <sup>n</sup> | β   |
| 1886.71 | 302.0 | ...  | 6   | ... 7 | 1 <sup>n</sup> | Pol |
| 1889.43 | 307.1 | 1.06 | 5   | ... 7 | 1 <sup>n</sup> | β   |
| 1894.76 | 292.3 | 0.63 | 6   | ... 7 | 2 <sup>n</sup> | Sel |
| 1896.81 | 281.7 | 0.94 | 7   | ... 8 | 3 <sup>n</sup> | See |
| 1896.81 | 286.1 | 0.86 | ... |       | 1 <sup>n</sup> | Cg  |
| 1897.79 | 272.7 | 0.98 | ... |       | 1 <sup>n</sup> | See |
| 1898.71 | 293.4 | 1.08 | 5   | ... 7 | 2 <sup>n</sup> | A   |

Discovered with the 6-inch at Mt. Hamilton in 1879. Some change in the angle is very probable.

[β (xi)...β<sup>2</sup>...β (2957)...β (*Pub. L. O. I, II*)...Pollock (*Pub. Sydney Obsy.* 1891)(*Mon. Not. XLVII*, 473)...Sellors (3303)...See (3496)...Aitken (3585)...]

**β 1035.** B.A.C. 7422

R.A. 21<sup>h</sup> 17<sup>m</sup> 16<sup>s</sup> }  
Decl. — 26° 4' }

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1888.74 | 198.7 | 1.05 | 8.0... | 10.7 | 3 <sup>n</sup> | β  |
| 1898.72 | 205.6 | 1.21 | 8.5... | 11.0 | 1 <sup>n</sup> | Cg |
| 1898.74 | 207.0 | 1.09 | 8.0... | 10.3 | 3 <sup>n</sup> | A  |

Discovered with the 12-inch. Apparently angular motion.

[β (xiv)...β (2875)...β (*Pub. L. O. II*)...Aitken (3585)...Cogshall ( )...]

**β 272.** Lalande 41564

R.A. 21<sup>h</sup> 17<sup>m</sup> 50<sup>s</sup> }  
Decl. — 13° 19' }

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1876.16 | 253.8 | 4.52 | 9.3... | 11.3 | 3 <sup>n</sup> | A   |
| 1878.71 | 256.0 | 4.57 | 8.2... | 12.0 | 2 <sup>n</sup> | Cin |
| 1879.79 | 255.7 | 4.31 | 8.0... | 12.0 | 1 <sup>n</sup> | Cin |
| 1892.69 | 258.5 | 4.97 | 8.5... | 11.7 | 3 <sup>n</sup> | W   |
| 1898.61 | 256.8 | 4.81 | 8.9... | 9.8  | 4 <sup>n</sup> | D   |

Discovered with the 6-inch. In the field with 18 *Aquarii*.

[β (v)...β (*Mon. Not.* xxxv, 31)...A (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 447. Vulpeculae 129**

R.A. 21<sup>h</sup> 18<sup>m</sup> 46<sup>s</sup> }  
Decl. + 24° 48' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.21 | 330.4 | 8.54 | 6.5...12.5 | 2 <sup>n</sup> | β  |
| 1881.67 | 331.1 | 9.14 | 6.0...12.5 | 1 <sup>n</sup> | Ho |
| 1885.66 | 329.9 | 8.62 | ...        | 2 <sup>n</sup> | HΣ |
| 1892.80 | 330.7 | 9.41 | 6.0...12.0 | 1 <sup>n</sup> | Ho |
| 1898.63 | 330.2 | 8.74 | 6.3...13.0 | 3 <sup>n</sup> | Bd |
| 1898.73 | 328.3 | 8.91 | 6.2...12.3 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. Fixed. Lalande 41637.

[β (1x)...β (Mon. Not. xxxviii, 78)...β<sup>a</sup>...Hough (2978, 3234)...Boothroyd ( )...Aitken (3585)...HΣ( )...]

**β 164. Lalande 41645**

R.A. 21<sup>h</sup> 19<sup>m</sup> 13<sup>s</sup> }  
Decl. + 8° 52' }

A and B

|         |       |      |            |                |      |
|---------|-------|------|------------|----------------|------|
| 1874.40 | 244.8 | 0.64 | ...        | 1 <sup>n</sup> | New  |
| 1875.48 | 241.6 | 0.57 | 8.0... 8.5 | 3 <sup>n</sup> | Δ    |
| 1877.72 | 237.3 | 0.82 | 8.0... 8.5 | 1 <sup>n</sup> | β    |
| 1878.60 | 62.6  | 0.59 | 7.5... 8.0 | 1 <sup>n</sup> | OΣ   |
| 1886.69 | 63.0  | 0.78 | ...        | 6 <sup>n</sup> | HΣ   |
| 1886.78 | 237.6 | 0.68 | 8.0... 8.1 | 2 <sup>n</sup> | LM   |
| 1890.69 | 240.2 | 0.50 | 7.6... 7.8 | 3 <sup>n</sup> | β    |
| 1891.79 | 240.0 | 0.57 | 8.0... 8.5 | 4 <sup>n</sup> | T    |
| 1895.70 | 244.4 | 0.53 | 7.6... 7.6 | 3 <sup>n</sup> | Cole |
| 1896.73 | 246.0 | .... | ...        | 1 <sup>n</sup> | Cole |
| 1898.68 | 238.0 | 0.70 | 7.5... 7.5 | 3 <sup>n</sup> | A    |

AB and C (= Σ 2793)

|         |       |       |            |                |      |
|---------|-------|-------|------------|----------------|------|
| 1828.80 | 242.2 | 26.51 | 7.0... 8.7 | 3 <sup>n</sup> | Σ    |
| 1842.89 | 241.5 | ....  | ...        | 1 <sup>n</sup> | Ma   |
| 1865.14 | 241.2 | 26.62 | 6.8... 9.0 | 3 <sup>n</sup> | Δ    |
| 1878.60 | 242.5 | 26.40 | ... 8.7    | 1 <sup>n</sup> | OΣ   |
| 1890.69 | 241.5 | 26.99 | ... 8.7    | 3 <sup>n</sup> | β    |
| 1892.81 | 243.0 | 26.66 | 6.5... 8.2 | 2 <sup>n</sup> | Gl   |
| 1895.70 | 240.8 | 26.86 | ...        | 5 <sup>n</sup> | Cole |
| 1898.68 | 241.8 | 26.69 | ... 8.5    | 3 <sup>n</sup> | A    |

The principal star of the wide pair, Σ 2793, was found to be a close pair with the 6-inch. The change, if any, is very slow. The distant star is fixed. All the measures of C are given.

[β (III)...β (Mon. Not. xxxiv, 59)...β<sup>a</sup>...β (3048)...β (Pub. L. O. II)...Newcomb (Wash. Obsns. 1874)...Δ (II, p.

511)...Δ (2086)...LM...OΣ (Poulkowa Obsns. x)...Tarrant (3186)...HΣ ( )...Aitken (3585)...Glase-napp (II)...Madler (Fixstern-Systeme 1)...Coleman (Mem. R. A. S. LIII)...]

**β 767. Lacaille 8809**

R.A. 21<sup>h</sup> 19<sup>m</sup> 19<sup>s</sup> }  
Decl. - 43° 4' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.70 | 146.1 | 3.40 | 6.0... 9.0 | 2 <sup>n</sup> | β   |
| 1887.43 | 143.9 | 3.22 | 6 ... 8    | 4 <sup>n</sup> | Pol |
| 1890.94 | 142.6 | 2.73 | 6 ... 8    | 5 <sup>n</sup> | Sel |
| 1898.66 | 144.1 | 3.18 | 6.0...10.0 | 3 <sup>n</sup> | A   |
| 1898.72 | 145.6 | 3.07 | 6.5...11.5 | 2 <sup>n</sup> | Cg  |

Discovered with the 6-inch at Mt. Hamilton in 1879. In Cord. G. C. 6 m (Microscopium).

[β (xi)...β<sup>a</sup>...Pollock (Pub. Sydney Obsy. 1891) (Mon. Not. XLVII, 473) (Mem. R. A. S. L)...Sellors (3154)...Aitken (3585)...Cogshall ( )...]

**β 683. Lalande 41683**

R.A. 21<sup>h</sup> 20<sup>m</sup> 43<sup>s</sup> }  
Decl. - 20° 44' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1877.53 | 198.4 | 2.04 | 8.5...11.0 | 1 <sup>n</sup> | β   |
| 1879.79 | 197.3 | 2.5± | 8.5...12.0 | 1 <sup>n</sup> | Cin |
| 1882.71 | 193.1 | 1±   | 7.0...10.0 | 1 <sup>n</sup> | W   |
| 1892.79 | 193.2 | 2.89 | 8.0...11.0 | 1 <sup>n</sup> | Ho  |
| 1898.69 | 194.6 | 2.67 | 8.2...12.0 | 2 <sup>n</sup> | Bd  |
| 1898.71 | 195.1 | 3.01 | 8.0...10.8 | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. While the relative change is small, the components have a common proper motion of 0.125 in the direction of 154.7° (PORTER), and therefore form a physical system.

[β (x)...β<sup>a</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...Hough (3234)...Boothroyd ( )...Aitken (3585)...]

**β 1141. O. Arg. N. 22270**

R.A. 21<sup>h</sup> 22<sup>m</sup> 6<sup>s</sup> }  
Decl. + 57° 43' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1889.58 | 165.9 | 2.72 | 7.7...13.2 | 3 <sup>n</sup> | β |
| 1898.68 | 171.9 | 3.13 | 7.5...13.8 | 3 <sup>n</sup> | A |

Discovered with the 36-inch.

[β (xvi)...β (2956)...β (Pub. L. O. II)...Aitken (3585)...]

**β 369.** Radcliffe 5237

R.A. 21<sup>h</sup> 22<sup>m</sup> 31<sup>s</sup> }  
Decl. + 52° 14' }

|         |      |       |            |                |    |
|---------|------|-------|------------|----------------|----|
| 1885.55 | 33.4 | 16.03 | ...        | 1 <sup>n</sup> | HΣ |
| 1891.50 | 31.9 | 16.26 | 7.3...11.3 | 3 <sup>n</sup> | β  |

Discovered with the 6-inch. The 36-inch shows a third star 14 m, a little farther from A than this, in the direction of 330°.

[β (VI)...β (2062,3114)...β (Pub. L. O. II)...HΣ ( )...]

**β 72.** W<sup>2</sup> XXI. 511

R.A. 21<sup>h</sup> 23<sup>m</sup> 43<sup>s</sup> }  
Decl. — 5° 55' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1877.06 | 45.2 | 1.82 | 9.0...11.2 | 3 <sup>n</sup> | Δ   |
| 1878.17 | 43.1 | 1.90 | ...        | 2 <sup>n</sup> | β   |
| 1878.75 | 37.0 | 1.74 | 8.0...11.0 | 2 <sup>n</sup> | Cin |
| 1886.68 | 38.0 | 2.00 | 8.4...11.1 | 4 <sup>n</sup> | LM  |
| 1890.68 | 42.2 | 1.84 | 8.3... 8.9 | 3 <sup>n</sup> | β   |
| 1890.77 | 44.1 | 1.94 | 9.0...11.5 | 2 <sup>n</sup> | T   |
| 1897.74 | 37.6 | 1.89 | ...        | 3 <sup>n</sup> | A   |

Discovered with the 6-inch. β Aquarii is 11' n, and β 684 in the field.

[β (I)...β (Mon. Not. xxxiii, 351)...β<sup>1</sup>...β (3048)...β (Pub. L. O. II)...Δ (I)...Cin<sup>5</sup>...LM...Tarrant (3186)...Aitken (A. J. 429)...]

**β 684.** W<sup>1</sup> XXI. 517

R.A. 21<sup>h</sup> 23<sup>m</sup> 53<sup>s</sup> }  
Decl. — 5° 57' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1878.62 | 133.9 | 1.11 | 9.0... 9.2 | 1 <sup>n</sup> | β  |
| 1886.78 | 126.1 | 1.16 | 9.4... 9.8 | 2 <sup>n</sup> | LM |
| 1890.68 | 126.7 | 1.12 | 8.7... 8.9 | 3 <sup>n</sup> | β  |
| 1897.75 | 124.8 | 1.16 | ...        | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. In the field with β 72. Angular motion is probable.

[β (x)...β<sup>1</sup>...β (3048)...β (Pub. L. O. II)...Aitken (A. J. 429)...]

**β 685.** 2 Pegasi

R.A. 21<sup>h</sup> 24<sup>m</sup> 31<sup>s</sup> }  
Decl. + 23° 7' }

|         |       |       |            |                |   |
|---------|-------|-------|------------|----------------|---|
| 1878.05 | 334.1 | 29.82 | 5.5...12.5 | 2 <sup>n</sup> | β |
| 1893.68 | 332.4 | 29.58 | 5.0...12.8 | 1 <sup>n</sup> | W |
| 1899.72 | 332.3 | 30.28 | ...13.0    | 3 <sup>n</sup> | D |

Discovered with the 18½-inch. The principal star has a proper motion of 0.015 in the direction of 82.5 (AUWERS).

[β (x)...β<sup>1</sup>...Wilson ( )...Doolittle (Pub. Flower Obsy. I)...]

**β 448.** D.M. (44°) 3832

R.A. 21<sup>h</sup> 24<sup>m</sup> 36<sup>s</sup> }  
Decl. + 44° 24' }

A double star, supposed to be in this place, was found with the 18½-inch October 1876, and the distance estimated 2", and the magnitudes 7 and 11. I could not see this star double with the 18½-inch in 1879, nor with the 36-inch in 1891. HΣ found it single in 1885. There is no obvious error in the original entry, nor any doubt noted as to the existence of the companion. The magnitude of this star is 6.4 in A.G.C.

[β (IX)...β (Mon. Not. xxxviii, 78)...β<sup>3</sup>...HΣ ( )...]

**β 1142.** D.M. (56°) 2579

R.A. 21<sup>h</sup> 25<sup>m</sup> 7<sup>s</sup> }  
Decl. + 56° 39' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1889.59 | 353.9 | 0.41 | 8.7... 8.7 | 3 <sup>n</sup> | β |
| 1898.80 | 356.6 | 0.44 | 9.3... 9.3 | 3 <sup>n</sup> | A |

Discovered with the 36-inch.

[β (xvi)...β (2956)...β (Pub. L. O. II)...Aitken (3585)...]

**β 73.** β Aquarii

R.A. 21<sup>h</sup> 25<sup>m</sup> 14<sup>s</sup> }  
Decl. — 6° 6' }

A and C

|         |       |       |         |                |    |
|---------|-------|-------|---------|----------------|----|
| 1879.57 | 184.9 | 54.51 | ...11.5 | 3 <sup>n</sup> | β  |
| 1893.82 | 185.0 | 54.95 | ...11.5 | 3 <sup>n</sup> | W  |
| 1898.63 | 184.6 | 55.97 | ...11.2 | 3 <sup>n</sup> | Cg |
| 1898.90 | 185.4 | 55.73 | ...12.0 | 1 <sup>n</sup> | β  |

A and B (= H 936)

|         |       |       |         |                |    |
|---------|-------|-------|---------|----------------|----|
| 1828    | 322.8 | 20±   | 3 ...15 | 1 <sup>n</sup> | H  |
| 1879.34 | 318.9 | 34.26 | ...10.9 | 2 <sup>n</sup> | β  |
| 1893.82 | 318.5 | 34.92 | ...11.0 | 3 <sup>n</sup> | W  |
| 1898.63 | 318.4 | 34.96 | ...10.5 | 3 <sup>n</sup> | Cg |
| 1898.90 | 319.1 | 34.72 | ...11.0 | 1 <sup>n</sup> | β  |

The faint companion was noted with the 6-inch. All the measures of the HERSCHEL star are given. These stars are not likely to have any connection with the large star. The proper motion is very small, 0".009 in the direction of 263°.6.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta^2$ ... $\beta^3$ ...Wilson ( ) ...Cogshall ( )...]

$\beta$  165. Lalande 41954

R.A. 21<sup>h</sup> 27<sup>m</sup> 55<sup>s</sup> }  
Decl. - 3° 59' }

|         |       |      |            |                |          |
|---------|-------|------|------------|----------------|----------|
| 1876.10 | 176.6 | 4.77 | 8.7...10.8 | 3 <sup>n</sup> | $\Delta$ |
| 1879.29 | 176.7 | 4.82 | 8.0...10.5 | 2 <sup>n</sup> | Cin      |
| 1888.82 | 176.5 | 5.04 | 8.3...10.8 | 1 <sup>n</sup> | Lv       |
| 1890.77 | 179.3 | 4.96 | ...        | 1 <sup>n</sup> | Byers    |
| 1890.77 | 174.3 | 4.42 | 8.7...11.0 | 2 <sup>n</sup> | T        |
| 1898.51 | 176.5 | 5.08 | 8.6...9.8  | 4 <sup>n</sup> | D        |

Discovered with the 6-inch. Probably fixed.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Cin<sup>5</sup>...Cin<sup>6</sup>...Lv<sup>1</sup>...Byers (*Proc. Haverford Coll. Obsy.* 1891)...Tarrant (3186)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  370. O. Arg. N. 22429

R.A. 21<sup>h</sup> 28<sup>m</sup> 15<sup>s</sup> }  
Decl. + 52° 13' }

|         |       |      |           |                |          |
|---------|-------|------|-----------|----------------|----------|
| 1876.77 | 326.5 | 3.46 | 8.5...9.0 | 4 <sup>n</sup> | $\Delta$ |
| 1880.82 | 325.5 | 3.59 | ...       | 1 <sup>n</sup> | Pt       |
| 1892.77 | 328.0 | 3.69 | 8.5...9.4 | 4 <sup>n</sup> | W        |
| 1898.60 | 326.7 | 3.68 | 8.7...9.0 | 4 <sup>n</sup> | D        |

Discovered with the 6-inch. ROGERS gives the proper motion, 0".045 in 90°.

[ $\beta$  (VI)... $\beta$  (2062)... $\Delta$  (1)...Pritchett (*Pub. Morrison Obsy.* 1)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  273. W<sup>2</sup> XXI. 646

R.A. 21<sup>h</sup> 28<sup>m</sup> 33<sup>s</sup> }  
Decl. + 10° 55' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.84 | 93.1 | 5.77 | 8.1...12.0 | 4 <sup>n</sup> | $\Delta$ |
| 1879.97 | 92.4 | 5.54 | 8.0...11.5 | 3 <sup>n</sup> | $\beta$  |
| 1898.50 | 90.9 | 6.13 | 8.7...10.5 | 3 <sup>n</sup> | D        |
| 1898.84 | 92.9 | 5.73 | 8.0...10.5 | 1 <sup>n</sup> | $\beta$  |

Discovered with the 9.4-inch at the Dartmouth College Observatory. Unchanged.

[ $\beta$  (V)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^2$ ... $\beta^3$ ... $\Delta$  (1)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  74. Lalande 42052

R.A. 21<sup>h</sup> 29<sup>m</sup> 40<sup>s</sup> }  
Decl. + 20° 52' }

|         |       |      |           |                |            |
|---------|-------|------|-----------|----------------|------------|
| 1874.67 | 321.4 | 1.54 | 7.0...9.0 | 1 <sup>n</sup> | O $\Sigma$ |
| 1876.09 | 319.5 | 1.43 | 7.1...9.0 | 5 <sup>n</sup> | $\Delta$   |
| 1882.68 | 325.0 | 1.6  | 6.5...10  | 1 <sup>n</sup> | Perry      |
| 1884.38 | 321.7 | 1.62 | ...       | 3 <sup>n</sup> | H $\Sigma$ |
| 1893.53 | 319.9 | 1.32 | 7.3...8.9 | 3 <sup>n</sup> | Lv         |

Discovered with the 6-inch. No relative motion.

[ $\beta$  (I)... $\beta$  (*Mon. Not.* xxxiii, 351)...O $\Sigma$  (*Poulkowa Obsns.* x)... $\Delta$  (1)...Perry (*Eng. Mech.* xxxvi, 65)...Lv (*A. J.* 382)...H $\Sigma$  ( )...]

$\beta$  166. O. Arg. N. 22487

R.A. 21<sup>h</sup> 30<sup>m</sup> 17<sup>s</sup> }  
Decl. + 59° 48' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1875.54 | 259.3 | 1.16 | 7.4...10.2 | 4 <sup>n</sup> | $\Delta$   |
| 1885.52 | 254.1 | 1.31 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1893.77 | 256.6 | 1.44 | 7.8...11.0 | 2 <sup>n</sup> | W          |
| 1898.57 | 256.9 | 1.46 | 8.7...10.5 | 3 <sup>n</sup> | D          |

Discovered with the 6-inch.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Wilson ( )...H $\Sigma$  ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  167. Cygni 363

R.A. 21<sup>h</sup> 31<sup>m</sup> 0<sup>s</sup> }  
Decl. + 29° 31' }

|         |      |      |            |                |            |
|---------|------|------|------------|----------------|------------|
| 1876.48 | 89.2 | 2.08 | 7.0...11.4 | 4 <sup>n</sup> | $\Delta$   |
| 1881.73 | 88.0 | 1.97 | 7.0...11.0 | 3 <sup>n</sup> | Ho         |
| 1882.68 | 91.0 | 2.17 | ...        | 1 <sup>n</sup> | Perry      |
| 1885.66 | 92.2 | 2.33 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1893.66 | 88.9 | 2.19 | 6.5...10.8 | 2 <sup>n</sup> | W          |

Discovered with the 6-inch. Without change.

*Piazzi* XXI. 215.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Perry (*Eng. Mech.* xxxvi, 65)...Hough (2978)...Wilson ( )...H $\Sigma$  ( )...]

**$\beta$  371.** O. Arg. N. 22566

R.A.  $21^{\text{h}} 32^{\text{m}} 58^{\text{s}}$  }  
Decl.  $+ 58^{\circ} 10'$  }

|         |       |        |                  |      |          |
|---------|-------|--------|------------------|------|----------|
| 1876.58 | $4.0$ | $8.39$ | $8.2 \dots 10.7$ | $3n$ | $\Delta$ |
| 1892.82 | $4.3$ | $8.33$ | $8.5 \dots 11.2$ | $3n$ | $W$      |
| 1898.19 | $3.2$ | $8.78$ | $8.2 \dots 10.1$ | $4n$ | $D$      |

Discovered with the 6-inch.

[ $\beta$  (v1) ...  $\beta$  (2062) ...  $\Delta$  (1) ... Wilson ( ) ... Doolittle  
(*Pub. Flower Obsy.* 1) ...]

 **$\beta$  1212.** 24 *Aquarii*

R.A.  $21^{\text{h}} 33^{\text{m}} 20^{\text{s}}$  }  
Decl.  $- 0^{\circ} 36'$  }

A and B

|         |         |        |                 |      |         |
|---------|---------|--------|-----------------|------|---------|
| 1890.75 | $254.5$ | $0.45$ | $6.5 \dots 6.9$ | $3n$ | $\beta$ |
| 1891.75 | $261.0$ | $0.55$ | $6.3 \dots 7.1$ | $4n$ | $\beta$ |
| 1892.40 | $256.2$ | $0.38$ | ...             | $2n$ | $Sp$    |
| 1893.68 | $260.5$ | $0.55$ | $7.1 \dots 7.5$ | $3n$ | $W$     |
| 1893.88 | $262.8$ | $0.59$ | ...             | $1n$ | $Bar$   |
| 1894.82 | $264.7$ | $0.52$ | ...             | $7n$ | $Bar$   |
| 1894.86 | $261.5$ | $0.45$ | ...             | $3n$ | $Sp$    |
| 1897.81 | $263.5$ | $0.65$ | ...             | $3n$ | $A$     |
| 1897.89 | $267.4$ | $0.73$ | ...             | $1n$ | $Br$    |
| 1898.78 | $269.0$ | $0.49$ | $6.5 \dots 6.6$ | $3n$ | $A$     |
| 1898.84 | $269.0$ | $0.54$ | ...             | $1n$ | $\beta$ |

AB and C

|         |         |         |            |      |         |
|---------|---------|---------|------------|------|---------|
| 1891.76 | $141.0$ | $44.46$ | ... $10.9$ | $2n$ | $\beta$ |
| 1893.83 | $141.2$ | $43.92$ | ... $11.5$ | $2n$ | $W$     |
| 1897.89 | $143.4$ | $43.13$ | ...        | $1n$ | $Br$    |
| 1898.84 | $142.7$ | $43.33$ | ... $9.9$  | $2n$ | $\beta$ |

Discovered with the 36-inch. It was evident at the time of discovery that the close pair was a binary from the common proper motion of the components, as otherwise the duplicity would have been seen long ago. This proper motion is given by AUWERS as  $0''.215$  in the direction of  $82^{\circ} 5'$ . This corresponds, as might be expected, to the change in the distant star C. The motion of AB is slow so far, but it is probable that the components have about the maximum separation at this time, and that hereafter the angular motion will be more rapid.

[ $\beta$  (xvii) ...  $\beta$  (3047,3114) ...  $\beta$  (*Pub. L. O.* 11) ... Wilson ( )  
...  $Sp$  (III) ... Barnard (*A. J.* 447) ... Aitken (*A. J.* 429)  
... Aitken (3585) ... Brown ( ) ...]

 **$\beta$  686.** Radcliffe 5329

R.A.  $21^{\text{h}} 33^{\text{m}} 43^{\text{s}}$  }  
Decl.  $+ 55^{\circ} 13'$  }

A and B

|         |         |        |                  |      |           |
|---------|---------|--------|------------------|------|-----------|
| 1877.58 | $117.5$ | $0.4$  | ...              | $1n$ | $\beta$   |
| 1877.70 | $127.9$ | $0.48$ | $7.7 \dots 8.0$  | $1n$ | $\Delta$  |
| 1885.52 | $296.5$ | $0.80$ | ...              | $1n$ | $H\Sigma$ |
| 1893.57 | $303.7$ | $0.87$ | $8.5 \dots 11.0$ | $1n$ | $W$       |
| 1898.70 | $289.9$ | $0.87$ | $8.0 \dots 13.0$ | $1n$ | $A$       |

AB and C (= O $\Sigma$  App. 220)

|         |        |         |                 |      |          |
|---------|--------|---------|-----------------|------|----------|
| 1875.96 | $11.0$ | $41.22$ | $8.3 \dots 8.3$ | $3n$ | $\Delta$ |
| 1878.65 | $11.0$ | $41.67$ | ...             | $1n$ | $\beta$  |
| 1883.23 | $10.9$ | $41.53$ | $8.1 \dots 8.0$ | $4n$ | $Fr$     |
| 1893.57 | $10.9$ | $41.05$ | ... $9.5$       | $1n$ | $W$      |

The duplicity of the principal star of this wide pair was discovered with the  $18\frac{1}{2}$ -inch. It is a difficult pair, and likely to prove an interesting one. The estimated magnitudes of B are very discordant. The foregoing are all the measures of C. This star is Radcliffe 5330.

[ $\beta$  (x) ...  $\beta$  ...  $\Delta$  (1) ... Wilson ( ) ... Franz (2649) ... Aitken  
( ) ...  $H\Sigma$  ( ) ...]

 **$\beta$  449.** Radcliffe 5335

R.A.  $21^{\text{h}} 34^{\text{m}} 42^{\text{s}}$  }  
Decl.  $+ 41^{\circ} 11'$  }

A and B

|         |        |        |                  |      |         |
|---------|--------|--------|------------------|------|---------|
| 1876.80 | $19.1$ | $6.78$ | ...              | $1n$ | $\beta$ |
| 1891.51 | $15.6$ | $6.09$ | $7.1 \dots 12.7$ | $3n$ | $\beta$ |
| 1898.69 | $14.5$ | $6.13$ | ...              | $2n$ | $Hu$    |

A and D

|         |         |         |            |      |         |
|---------|---------|---------|------------|------|---------|
| 1876.80 | $248.2$ | $17.94$ | ...        | $1n$ | $\beta$ |
| 1889.94 | $239.6$ | $15.70$ | ... $13$   | $1n$ | $Ho$    |
| 1891.51 | $247.2$ | $17.45$ | ... $12.1$ | $2n$ | $\beta$ |

A and C (= H $^{\text{I}}$  III. 110 = O $\Sigma$  447)

|         |         |         |                  |      |                |
|---------|---------|---------|------------------|------|----------------|
| 1783.81 | $157.6$ | $13.90$ | ...              | $1n$ | $H^{\text{I}}$ |
| 1848.30 | $169.4$ | $13.96$ | $7.0 \dots 11.1$ | $4n$ | $O\Sigma$      |
| 1866.58 | $170.5$ | $13.69$ | $7.0 \dots 10.8$ | $3n$ | $\Delta$       |
| 1889.94 | $170.5$ | $13.81$ | ... $11.0$       | $1n$ | $Ho$           |
| 1891.51 | $172.2$ | $13.61$ | ... $11.0$       | $2n$ | $\beta$        |
| 1894.66 | $171.2$ | $13.68$ | $7.1 \dots 10.8$ | $2n$ | $Gl$           |

A and E

|         |      |       |     |                |                   |
|---------|------|-------|-----|----------------|-------------------|
| 1783.81 | 49.4 | 25.97 | ... | 1 <sup>n</sup> | H <sup>1</sup>    |
| 1848.30 | 45.3 | 29.00 | ... | 7.9            | 4 <sup>n</sup> OΣ |
| 1866.58 | 45.7 | 29.12 | ... | 7.7            | 3 <sup>n</sup> Δ  |
| 1889.94 | 45.1 | 28.85 | ... | 8.0            | 1 <sup>n</sup> Ho |
| 1891.51 | 44.6 | 28.95 | ... | 7.2            | 3 <sup>n</sup> β  |
| 1894.66 | 44.9 | 28.92 | ... | 7.9            | 2 <sup>n</sup> Gl |

The two small stars, B and D, were noted with the 18½-inch. The brighter stars, ACE, make H<sup>1</sup> III. 110 = OΣ 447. They are relatively fixed. All the measures are given.

[β (VIII)...β (*Am. Jour. Sci.* July 1877)...β (3114)...β (*Pub. L. O. II*)...Hough (2978)...Hussey ( )...OΣ (*Poulkova Obsns.* IX)...Δ (I)...Glaserapp (III)...]

β 687. Radcliffe 5340

R.A. 21<sup>h</sup> 34<sup>m</sup> 53<sup>s</sup> }  
Decl. + 55° 15' }

|         |     |      |        |     |                   |
|---------|-----|------|--------|-----|-------------------|
| 1878.65 | 8.4 | 0.89 | 8.0... | 9.0 | 1 <sup>n</sup> β  |
| 1885.55 | 4.4 | 0.66 | ...    | ... | 3 <sup>n</sup> HΣ |
| 1890.74 | 4.9 | 0.64 | ...    | ... | 6 <sup>n</sup> Sp |
| 1893.70 | 1.8 | 0.76 | 7.2... | 9.0 | 2 <sup>n</sup> W  |
| 1898.65 | 2.5 | 0.83 | 7.7... | 9.3 | 4 <sup>n</sup> A  |

Discovered with the 18½-inch. My first angle was printed 188°.4. An examination of the original record shows that it should have been as given here.

[β (x)...β<sup>1</sup>...Sp (III)...Wilson ( )...Aitken (3585)...IIΣ ( )...]

β 1143. Piazzì XXI. 248

R.A. 21<sup>h</sup> 35<sup>m</sup> 14<sup>s</sup> }  
Decl. + 56° 57' }

A and B

|         |       |      |        |      |                  |
|---------|-------|------|--------|------|------------------|
| 1889.62 | 323.5 | 1.55 | 6.0... | 13.7 | 3 <sup>n</sup> β |
| 1898.75 | 325.0 | 1.73 | 6.3... | 14.0 | 2 <sup>n</sup> A |

A and C (= Σ 2816)

|         |       |       |        |     |                  |
|---------|-------|-------|--------|-----|------------------|
| 1832.94 | 120.1 | 11.66 | 6.3... | 7.9 | 5 <sup>n</sup> Σ |
| 1866.65 | 121.2 | 11.77 | 5.8... | 7.5 | 3 <sup>n</sup> Δ |
| 1889.61 | 120.4 | 11.86 | ...    | 7.3 | 3 <sup>n</sup> β |
| 1898.87 | 120.7 | 11.60 | ...    | ... | 1 <sup>n</sup> A |

A and D (= Σ 2816)

|         |       |       |     |     |                  |
|---------|-------|-------|-----|-----|------------------|
| 1832.94 | 339.7 | 19.96 | ... | 8.0 | 5 <sup>n</sup> Σ |
| 1866.65 | 339.8 | 19.81 | ... | 7.5 | 3 <sup>n</sup> Δ |
| 1889.61 | 339.5 | 19.94 | ... | 7.3 | 3 <sup>n</sup> β |
| 1898.87 | 339.4 | 20.15 | ... | ... | 1 <sup>n</sup> A |

The close companion to the principal star of the wide triple Σ 2816 (= H<sup>1</sup> III. 71 = S 795) was discovered with the 36-inch. It is probably too difficult for any of the instruments with which the other stars have been observed. The old components appear to be relatively fixed. AUWERS gives the proper motion of the principal star 0".0167 in the direction of 153°.9. This should increase the distance of D about 1" in the interval covered by the measures. The measures indicate a common movement in space. This is a naked-eye star in *Cepheus* (= B.A.C. 7545). The Harvard photometric magnitude is 5.5.

[β (xvi)...β (2936)...β (*Pub. L. O. II*)...Aitken (3585)...]

There are other measures of the bright stars :

[Madler (*Fixstern-Systeme I*) (*Dorpat Obsns.* IX, XI, XIII)...Wrottesley (*Phil. Trans.* 1851)...Radcliffe *Obsns.* xxii...Δ (1125)...Δ (I, p. 118, II)...Herschel (*Mem. R. A. S.* IV)...Nobile (*Rend. Accad. Sci. Napoli*, Jan. 1875)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII)...Glaserapp (III)...]

β 372. D.M. (50°) 3403

R.A. 21<sup>h</sup> 35<sup>m</sup> 48<sup>s</sup> }  
Decl. + 51° 1' }

|         |       |      |        |      |                  |
|---------|-------|------|--------|------|------------------|
| 1876.93 | 352.7 | 1.89 | 8.5... | 10.6 | 4 <sup>n</sup> Δ |
| 1892.69 | 357.2 | 1.83 | 8.5... | 11.0 | 2 <sup>n</sup> W |

Discovered with the 6-inch. Near π *Cygni*, 2<sup>m</sup> ρ and 22' n.

[β (vi)...β (2062)...Δ (I)...Wilson ( )...]

β 274. W<sup>2</sup> XXI. 881

R.A. 21<sup>h</sup> 36<sup>m</sup> 26<sup>s</sup> }  
Decl. + 38° 56' }

|         |       |      |        |      |                   |
|---------|-------|------|--------|------|-------------------|
| 1875.93 | 180.7 | 3.45 | 7.8... | 10.9 | 7 <sup>n</sup> Δ  |
| 1880.83 | 182.4 | 3.54 | ...    | ...  | 1 <sup>n</sup> Pt |
| 1892.95 | 181.7 | 3.99 | 8.0... | 10.5 | 1 <sup>n</sup> W  |
| 1898.52 | 177.4 | 3.59 | 7.8... | 9.0  | 2 <sup>n</sup> D  |

Discovered with the 9.4-inch at the Dartmouth College Observatory.

[β (v)...β (*Mon. Not.* xxxv, 31)...Δ (I)...Pritchett (*Pub. Morrison Obsy.* I)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* I)...]

**$\beta$  373.**

R.A.  $21^{\text{h}} 37^{\text{m}} 1^{\text{s}}$  }  
Decl.  $+ 48^{\circ} 47'$  }

|         |       |      |             |                |   |
|---------|-------|------|-------------|----------------|---|
| 1876.58 | 171.0 | 4.12 | 10.1...12.0 | 3 <sup>n</sup> | J |
| 1893.76 | 171.3 | 4.68 | 10.0...11.8 | 3 <sup>n</sup> | W |
| 1898.54 | 170.6 | 4.42 | 9.8...11.8  | 2 <sup>n</sup> | D |

Discovered with the 6-inch. The south star of a wide pair.

[ $\beta$  (v1)... $\beta$  (2062)... $\Delta$  (1)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  688.** Radcliffe 5364

R.A.  $21^{\text{h}} 37^{\text{m}} 43^{\text{s}}$  }  
Decl.  $+ 40^{\circ} 30'$  }

|         |       |           |           |                |            |
|---------|-------|-----------|-----------|----------------|------------|
| 1878.36 | 208.7 | 0.35      | 7.6...7.6 | 5 <sup>n</sup> | $\beta$    |
| 1884.95 | 201.4 | 0.38      | ...       | 3 <sup>n</sup> | H $\Sigma$ |
| 1887.70 | 207.1 | 0.3 $\pm$ | 8.0...8.0 | 1 <sup>n</sup> | Ho         |
| 1890.13 | 202.6 | 0.4 $\pm$ | ...       | 4 <sup>n</sup> | Sp         |
| 1891.94 | 204.5 | 0.4 $\pm$ | ...       | 3 <sup>n</sup> | Sp         |
| 1898.74 | 200.8 | 0.52      | 7.7...7.7 | 3 <sup>n</sup> | A          |

Discovered with the  $18\frac{1}{2}$ -inch. There may be slow motion in angle. This star is a short distance *sf* 77 *Cygni*.

[ $\beta$  (x)... $\beta^s$ ...Hough (2978)...Sp (III)...Aitken (3585)...H $\Sigma$  ( )...]

 **$\beta$  1263.** Lalande 42381

R.A.  $21^{\text{h}} 38^{\text{m}} 40^{\text{s}}$  }  
Decl.  $+ 2^{\circ} 17'$  }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1891.60 | 212.6 | 0.48 | 8.5...10.2 | 3 <sup>n</sup> | $\beta$ |
| 1898.68 | 220.3 | 0.45 | 8.0...10.0 | 1 <sup>n</sup> | $\beta$ |

Discovered with the 36-inch.  $\beta$  689 is 3<sup>s</sup> *f* and 9<sup>s</sup> 6 *n*.

[ $\beta$  (xviii)... $\beta$  (3113)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

 **$\beta$  689.** *Aquarii* 88

R.A.  $21^{\text{h}} 38^{\text{m}} 43^{\text{s}}$  }  
Decl.  $+ 2^{\circ} 26'$  }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1878.37 | 240.5 | 1.80 | 7.5...10.7 | 3 <sup>n</sup> | $\beta$    |
| 1885.69 | 237.2 | 1.68 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1891.60 | 241.6 | 1.71 | 7.3...11.4 | 5 <sup>n</sup> | $\beta$    |
| 1898.68 | 240.8 | 2.56 | 7.0...10.0 | 1 <sup>n</sup> | A          |

Discovered with the  $18\frac{1}{2}$ -inch. Lalande 42384.

[ $\beta$  (x)... $\beta^s$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...H $\Sigma$  ( )...]

 **$\beta$  374.** O. Arg. N. 22750

R.A.  $21^{\text{h}} 38^{\text{m}} 59^{\text{s}}$  }  
Decl.  $+ 50^{\circ} 27'$  }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1877.03 | 143.3 | 1.86 | 8.4...10.3 | 5 <sup>n</sup> | J  |
| 1893.54 | 141.3 | 1.86 | 8.3...10.5 | 3 <sup>n</sup> | Lv |

Discovered with the 6 inch. It is 70<sup>s</sup> *f*  $\pi^x$  *Cygni*, and 11<sup>s</sup> *n*.

[ $\beta$  (v1)... $\beta$  (2062)... $\Delta$  (1)...Lv (*A. J.* 382)...]

 **$\beta$  989.**  $\kappa$  *Pegasi*

R.A.  $21^{\text{h}} 39^{\text{m}} 13^{\text{s}}$  }  
Decl.  $+ 25^{\circ} 6'$  }

A and B

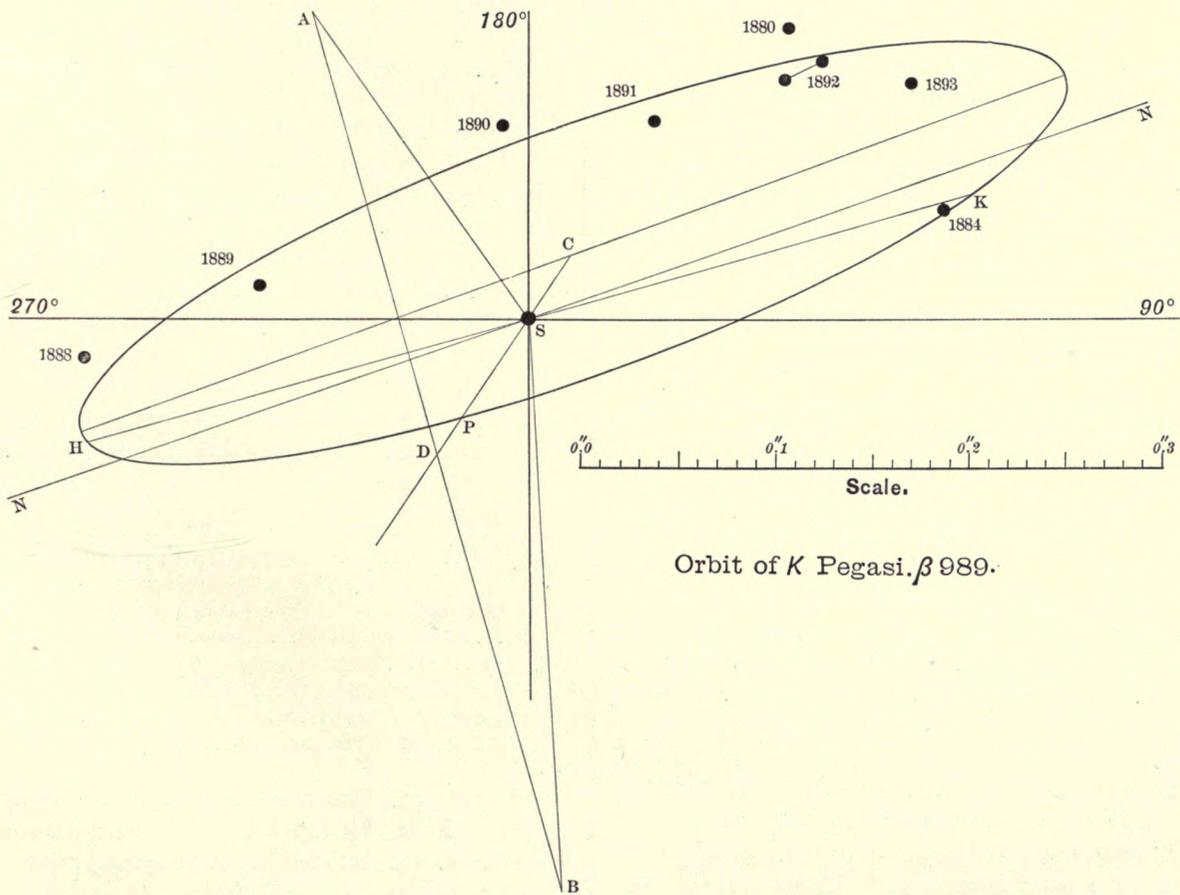
|         |       |            |           |                |          |
|---------|-------|------------|-----------|----------------|----------|
| 1880.68 | 137.9 | 0.2 $\pm$  | 4.8...5.3 | 4 <sup>n</sup> | $\beta$  |
| 1883.02 | 116.0 | 0.16       | ...       | 1 <sup>n</sup> | En       |
| 1884.01 | 140.0 | 0.25       | ...       | 1 <sup>n</sup> | En       |
| 1884.87 | 104.7 | 0.22       | ...       | 1 <sup>n</sup> | $\beta$  |
| 1887.82 | 286.8 | 0.25 $\pm$ | ...       | 1 <sup>n</sup> | Sp       |
| 1888.78 | 274.7 | 0.23       | ...       | 3 <sup>n</sup> | $\beta$  |
| 1888.89 | 298.9 | 0.25 $\pm$ | ...       | 3 <sup>n</sup> | Sp       |
| 1889.51 | 262.3 | 0.14       | 4.3...5.0 | 4 <sup>n</sup> | $\beta$  |
| 1890.57 | 187.1 | 0.10       | ...       | 4 <sup>n</sup> | $\beta$  |
| 1890.93 | 136.4 | ...        | ...       | 1 <sup>n</sup> | Sp       |
| 1891.61 | 150.0 | 0.10       | ...       | 3 <sup>n</sup> | $\beta$  |
| 1891.81 | 144.6 | 0.13       | ...       | 4 <sup>n</sup> | $\beta$  |
| 1891.93 | 159.0 | 0.20 $\pm$ | ...       | 3 <sup>n</sup> | Sp       |
| 1892.39 | 132.8 | 0.18       | ...       | 4 <sup>n</sup> | $\beta$  |
| 1892.88 | 131.0 | 0.20       | ...       | 1 <sup>n</sup> | Bar      |
| 1892.97 | 135.1 | 0.20 $\pm$ | ...       | 4 <sup>n</sup> | Sp       |
| 1893.51 | 121.0 | 0.29       | 4.0...4.1 | 3 <sup>n</sup> | Lv       |
| 1893.76 | 127.5 | 0.20       | ...       | 2 <sup>n</sup> | Bar      |
| 1893.82 | 130.5 | 0.25 $\pm$ | ...       | 1 <sup>n</sup> | Com      |
| 1893.93 | 123.6 | 0.27 $\pm$ | ...       | 8 <sup>n</sup> | Sp       |
| 1894.50 | 117.6 | 0.19       | ...       | 5 <sup>n</sup> | Bar      |
| 1894.84 | 114.8 | 0.14       | ...       | 4 <sup>n</sup> | Lew      |
| 1894.88 | 114.7 | 0.25 $\pm$ | ...       | 6 <sup>n</sup> | Sp       |
| 1895.60 | 107.8 | 0.18       | ...       | 6 <sup>n</sup> | Bar      |
| 1895.72 | 104.3 | 0.10       | ...       | 2 <sup>n</sup> | Dyson    |
| 1895.74 | 104.6 | 0.12       | 3.5...9.0 | 7 <sup>n</sup> | Lew      |
| 1895.73 | 103.0 | ...        | ...       | 1 <sup>n</sup> | Christie |
| 1895.79 | 112.7 | 0.15 $\pm$ | ...       | 4 <sup>n</sup> | Com      |
| 1895.91 | 108.1 | 0.20 $\pm$ | ...       | 4 <sup>n</sup> | Sp       |
| 1896.64 | 80.9  | 0.09       | ...       | 6 <sup>n</sup> | Lew      |
| 1896.68 | 93.7  | 0.09       | ...       | 3 <sup>n</sup> | A        |
| 1897.57 | 27.0  | 0.09       | ...       | 4 <sup>n</sup> | Lew      |
| 1897.76 | 16.6  | ...        | ...       | 1 <sup>n</sup> | Lew      |
| 1897.80 | 4.8   | ...        | ...       | 1 <sup>n</sup> | Dyson    |

|         |       |      |     |     |                |     |
|---------|-------|------|-----|-----|----------------|-----|
| 1897.90 | 342.0 | "    | ... | ... | 1 <sup>n</sup> | Lew |
| 1898.50 | 294.5 | 0.16 | 5.7 | ... | 5 <sup>n</sup> | A   |
| 1898.66 | 304.6 | 0.10 | ... | ... | 2 <sup>n</sup> | Bar |
| 1898.68 | 300.0 | 0.28 | ... | ... | 5 <sup>n</sup> | Lew |
| 1898.88 | 289.7 | 0.35 | ... | ... | 2 <sup>n</sup> | Bow |
| 1898.86 | 288.9 | 0.27 | ... | ... | 4 <sup>n</sup> | Lew |
| 1899.47 | 284.0 | 0.19 | ... | ... | 4 <sup>n</sup> | A   |

|         |       |       |     |     |                |      |
|---------|-------|-------|-----|-----|----------------|------|
| 1862.77 | 309.2 | 12.12 | ... | ... | 1 <sup>n</sup> | Ma   |
| 1864.87 | 303.9 | 11.56 | 4.3 | ... | 6 <sup>n</sup> | Δ    |
| 1866.61 | 301.3 | 12.03 | ... | ... | 1 <sup>n</sup> | Hd   |
| 1872.62 | 301.7 | 11.7  | 4   | ... | 1 <sup>n</sup> | WS   |
| 1874.80 | 302.5 | 12.1  | 4   | ... | 1 <sup>n</sup> | Gled |
| 1875.89 | 303.3 | ...   | ... | ... | 1 <sup>n</sup> | WS   |
| 1880.60 | 303.1 | 11.76 | ... | 9.1 | 4 <sup>n</sup> | β    |
| 1881.37 | 302.3 | 12.47 | ... | ... | 2 <sup>n</sup> | Sk   |
| 1888.81 | 300.0 | 12.13 | 4   | ... | 3 <sup>n</sup> | Hl   |
| 1888.82 | 300.7 | 12.22 | ... | ... | 2 <sup>n</sup> | β    |
| 1888.92 | 300.8 | 11.95 | ... | ... | 2 <sup>n</sup> | Sp   |
| 1891.96 | 298.9 | 12.10 | ... | ... | 1 <sup>n</sup> | Big  |
| 1892.81 | 297.7 | 12.09 | ... | ... | 2 <sup>n</sup> | Maw  |
| 1893.66 | 297.5 | 11.86 | 3.9 | ... | 2 <sup>n</sup> | Gl   |
| 1895.25 | 298.8 | 12.21 | ... | ... | 4 <sup>n</sup> | Lew  |
| 1895.60 | 301.1 | 12.28 | ... | ... | 8 <sup>n</sup> | Bar  |
| 1898.43 | 299.6 | 12.43 | ... | ... | 1 <sup>n</sup> | A    |
| 1898.71 | 298.8 | 12.45 | ... | ... | 3 <sup>n</sup> | Lew  |

AB and C (= Σ 2824)

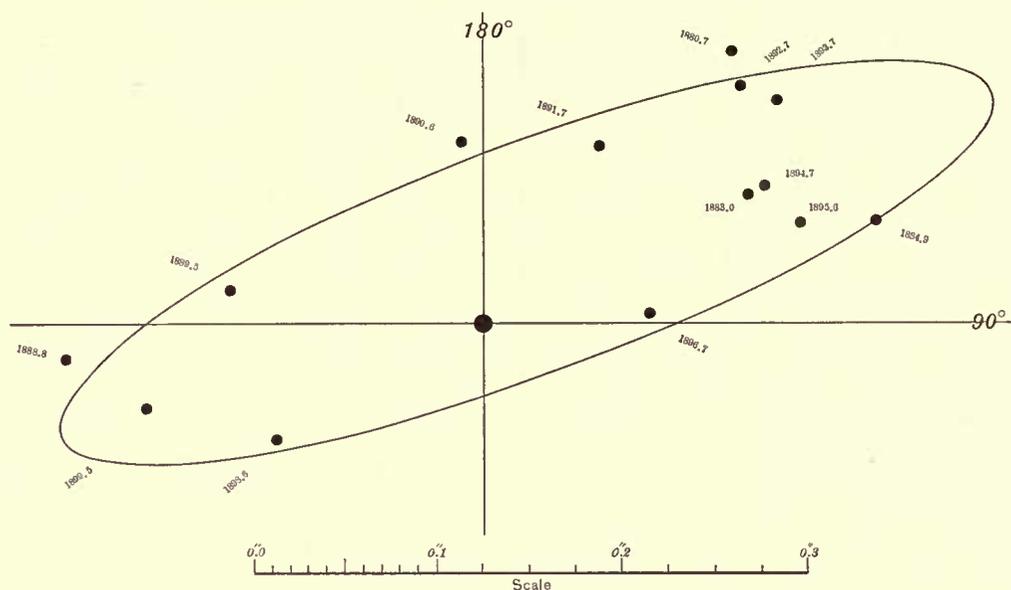
|         |       |       |     |     |                |                |
|---------|-------|-------|-----|-----|----------------|----------------|
| 1828    | 306.4 | "     | 4.2 | ... | 2 <sup>n</sup> | H <sup>2</sup> |
| 1831.56 | 308.5 | 11.01 | 3.9 | ... | 5 <sup>n</sup> | Σ              |
| 1844.89 | 307.3 | 11.48 | ... | ... | 1 <sup>n</sup> | Ma             |
| 1848.00 | 306.5 | 11.20 | ... | ... | 2 <sup>n</sup> | Ma             |
| 1850.99 | 306.1 | 11.60 | ... | ... | 3 <sup>n</sup> | Ma             |
| 1857.45 | 305.9 | 11.86 | ... | ... | 4 <sup>n</sup> | Ma             |
| 1860.82 | 302.8 | 9.82  | ... | ... | 1 <sup>n</sup> | Ma             |
| 1862.45 | 304.8 | 11.93 | ... | ... | 1 <sup>n</sup> | Kn             |



Orbit of K Pegasi.β 989.

The close pair was discovered with the 18½-inch. It is not only a most important physical system, but has a period shorter than any other known

binary in the heavens. It has been followed with the micrometer through more than one and a half revolutions. It is at all times a close pair, the



$\kappa$  Pegasi.  $\beta$  989. (Fig. 2.)

maximum distance being but little more than  $0''.2$ ; but as the components are of nearly the same magnitude, the elongation can be seen with a moderate aperture. Several orbits have been found which differ but little so far as the period is concerned. The several results, with the respective dates of the last measures used, are as follows:

|      |           |             |                                       |
|------|-----------|-------------|---------------------------------------|
| 1890 | Burnham   | 11.13 years | <i>Pub. L. O.</i> II. 128             |
| 1892 | Glasepapp | 11.54 "     | <i>Mon. Not.</i> LII. 548             |
| 1893 | Burnham   | 11.37 "     | <i>Pub. L. O.</i> II. 252             |
| 1895 | See       | 11.42 "     | <i>Evolution of Binary System</i> , I |

My orbit of 1893 is shown in the accompanying diagram, reproduced from *Popular Astronomy* for April 1894.

Future investigations probably will not materially change the period, but may improve some of the other elements of the orbit. The principal positions to 1899.5 are shown in Fig. 2 with the same ellipse given in the other diagram. This apparent orbit appears so far to satisfy the recent measures.

As a wide pair this was discovered by HERSCHEL I. in 1786. He made no measures, but described it as "extremely unequal, the small star almost north, but a little preceding." It was not measured until 1831, when STRUVE observed it, and incorporated it in his great catalogue as  $\Sigma$  2824. AUWERS gives the proper motion of  $\kappa$  Pegasi  $0''.021$  in the direction of  $60^\circ.2$ . The change in the distant

star is apparently due to rectilinear motion, but it does not correspond very closely to the proper motion referred to. A comparison of STRUVE'S position with a mean of the three sets of measures in 1888, gives for the annual movement of the large star  $0''.034$  in the direction of  $68^\circ$ . The discrepancy may be accounted for in three ways: the small star may be physically connected with the other, and the change due to orbital motion; or the small star may have some proper motion of its own; or the value of the proper motion of the principal star as found from meridian observations may have a small error. It is perhaps impossible at this time to say which of the explanations is the most probable.

[ $\beta$  (XIII)... $\beta^3$ ... $\beta$  (2875,2957,3048,3114,3142)... $\beta$  (*Pub. L. O.* II, pp. 128,252)... $\beta$  (*Mon. Not.* XLI, 33; LI, 313)... $\beta$  (*Pop. Asty.* I, 352)...Engelmann (2678,2742)...Sp (III)...Barnard (*A. J.* 447)...Comstock (*Pub. Washburn Obsy.* X)...LM...Lewis (*Greenwich Obsns.* 1894, 1895) (*Mon. Not.* LV, 17; LVI, 359)...Lv (*A. J.* 382)...See (3285, 3314) (*A. J.* 378)...Aitken (3396,3585)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...Aitken ( )...]

I have given above a complete list of the measures of  $\Sigma$  2824 (= H<sup>1</sup> N. 43). These observations, which are not included in the foregoing references to AB, will be found as follows:

[Madler (*Fixstern-Systeme* I) (*Dorpat Obsns.* XI, XII, XIII, XV)...Herschel (*Mem. R. A. S.* IV)...Knott, Wilson, Seabroke and Gledhill (*Mem. R. A. S.* XLII, XLIII, XLVI)... $\Delta$  (II)... $\Delta$  (1573)...*Annals Harvard Obsy.* XIII...Flammarion

(*Etoiles Doubles et Multiples*)...Maw (*Mem. R. A. S.* LI)...  
Hall (II)...Everett (*Mon. Not.* LVI, 464)...Bigourdan (*Bul.*  
*Ast.* XVIII)...Glazenapp (III)...Coleman (*Mem. R. A. S.*  
LIII)...]

**β 690.** *μ Cephei*

R.A. 21<sup>h</sup> 39<sup>m</sup> 50<sup>s</sup> }  
Decl. + 58° 14' }

A and B

|         |       |       |            |                |   |
|---------|-------|-------|------------|----------------|---|
| 1878.87 | 259.4 | 19.16 | 5.0...12.3 | 3 <sup>n</sup> | β |
| 1889.52 | 259.6 | 19.58 | 6...13.2   | 3 <sup>n</sup> | β |
| 1898.58 | 260.0 | 19.36 | ...12.6    | 2 <sup>n</sup> | β |

A and C

|         |       |       |         |                |   |
|---------|-------|-------|---------|----------------|---|
| 1878.42 | 299.4 | 41.19 | ...     | 1 <sup>n</sup> | β |
| 1898.58 | 298.7 | 41.14 | ...12.7 | 2 <sup>n</sup> | β |

This is HERSCHEL'S "Garnet star," variable 4 to 6 m in five or six years; and is No. 253 of SCHJELLERUP'S *Catalogue of Red Stars*. The companions were detected with the 18½-inch.

[β (x)...β<sup>r</sup>...β<sup>s</sup>...β (2957)...β (*Pub. L. O.* II)...]

**β 691.** D.M. (17°) 4529

R.A. 21<sup>h</sup> 40<sup>m</sup> 4<sup>s</sup> }  
Decl. + 17° 12' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1877.76 | 328.3 | 1.16 | 9.0...11.5 | 1 <sup>n</sup> | β |
|---------|-------|------|------------|----------------|---|

Discovered with the 18½-inch. It should be re-measured.

[β (x)...β<sup>r</sup>...]

**β 1036.** Yarnall 9529

R.A. 21<sup>h</sup> 40<sup>m</sup> 59<sup>s</sup> }  
Decl. — 17° 51' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1888.74 | 205.0 | 4.53 | 8.0...11.0 | 3 <sup>n</sup> | β |
| 1895.79 | 209.2 | 4.70 | 8.0...11.7 | 3 <sup>n</sup> | A |
| 1897.72 | 205.1 | 4.76 | ...        | 3 <sup>n</sup> | A |

Discovered with the 12-inch.

[β (XIV)...β (2875)...β (*Pub. L. O.* II)...Aitken (*A. J.* 429)  
(*Ast. Soc. Pac.* VII, 305)...]

**β 692.** Lalande 42601

R.A. 21<sup>h</sup> 44<sup>m</sup> 49<sup>s</sup> }  
Decl. + 31° 17' }

A and B

|         |      |      |            |                |    |
|---------|------|------|------------|----------------|----|
| 1878.24 | 10.8 | 2.48 | 7.5...11.0 | 2 <sup>n</sup> | β  |
| 1881.72 | 12.7 | 2.79 | 8.0...11.0 | 1 <sup>n</sup> | Ho |
| 1885.66 | 11.0 | 2.76 | ...        | 2 <sup>n</sup> | HΣ |
| 1892.79 | 8.8  | 2.97 | 7.0...11.0 | 1 <sup>n</sup> | Ho |

A and C

|         |       |       |         |                |    |
|---------|-------|-------|---------|----------------|----|
| 1878.78 | 119.4 | 36.89 | ...11.0 | 1 <sup>n</sup> | β  |
| 1892.79 | 298.9 | 37.13 | ...11.0 | 1 <sup>n</sup> | Ho |

Discovered with the 18½-inch. My record shows that C is on the *f* side.

[β (x)...β<sup>r</sup>...Hough (2978,3234)...HΣ ( )...]

**β 840.** S.D. (2°) 5650

R.A. 21<sup>h</sup> 46<sup>m</sup> 43<sup>s</sup> }  
Decl. — 2° 9' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1881.83 | 39.4 | 2.57 | 8.7...10.0 | 3 <sup>n</sup> | β   |
| 1886.84 | 39.1 | 2.92 | ...        | 3 <sup>n</sup> | UL  |
| 1887.84 | 36.9 | 2.94 | 8.8... 9.8 | 3 <sup>n</sup> | Com |
| 1899.15 | 36.3 | 2.71 | 9.0...10.0 | 4 <sup>n</sup> | D   |

Discovered with the 15½-inch at the Washburn Observatory. The magnitude in S.D. is 9.2.

[β (XII)...β<sup>r</sup>...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 168.** Lalande 42642

R.A. 21<sup>h</sup> 47<sup>m</sup> 7<sup>s</sup> }  
Decl. — 20° 35' }

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1868.84 | 73.6 | 6.10 | 7.5... 8.5 | 1 <sup>n</sup> | Hd  |
| 1876.74 | 75.5 | 5.50 | 8.2... 9.5 | 2 <sup>n</sup> | Cin |
| 1877.69 | 73.7 | 5.50 | 8.1... 9.7 | 2 <sup>n</sup> | Cin |
| 1882.48 | 73.7 | 5.93 | 8.0... 9.5 | 1 <sup>n</sup> | W   |
| 1893.80 | 70.2 | 4.78 | 8... 9     | 2 <sup>n</sup> | Sel |
| 1896.56 | 74.0 | 5.59 | ...        | 5 <sup>n</sup> | Hu  |

Discovered with the 6-inch. Fixed. A distant companion *f*. This pair is also found in the subsequently published Harvard observations.

[β (III)...β (*Mon. Not.* XXXIV, 59)...*Annals Harvard Obsy.* XIII...Cin<sup>3</sup>...Cin<sup>4</sup>...Wilson (Cin<sup>10</sup>)...Sellors (3240)...  
Hussey (*A. J.* 397)...]

**β 1213.** D.M. (12°) 4710

R.A. 21<sup>h</sup> 48<sup>m</sup> 26<sup>s</sup> }  
Decl. + 13° 0' }

B and C

1890.69 311.9 0.81 9.1... 9.5 3<sup>n</sup> β

A and B

1890.69 258.8 62.29 8.0... 3<sup>n</sup> β  
1898.69 258.9 63.45 8.0... 1<sup>n</sup> A

Discovered with the 18½-inch at Chicago, but not included in the catalogues of new pairs of that time.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Aitken ( )...]

**β 768.** Lacaille 8964

R.A. 21<sup>h</sup> 49<sup>m</sup> 9<sup>s</sup> }  
Decl. - 37° 49' }

This is a bright star (GOULD 5.8 m) closely following γ *Gruis*. It was suspected to be a close pair with the 6-inch at Mt. Hamilton in 1879. At the Sydney Observatory it was thought to be elongated in 90° in 1886. An examination with the 12-inch at the Lick Observatory in 1891, under favorable conditions, left the matter still in doubt, as no certain elongation could be seen. At all times the star was of course near the horizon, and it may not be double, but should be watched hereafter at favorable points of observation.

[β (xi)...β²...β (3114)...β (Pub. L. O. II)...Russell (*Mon. Not.* XLVII, 473)...]

**β 841.** D.M. (53°) 2628

R.A. 21<sup>h</sup> 49<sup>m</sup> 21<sup>s</sup> }  
Decl. + 53° 43' }

1881.56 194.4 2.03 8.5... 11.5 3<sup>n</sup> β  
1888.19 193.6 2.06 8.5... 11.8 2<sup>n</sup> Com

Discovered with the 15½-inch at the Washburn Observatory. COMSTOCK measures another (place not given) "near β 841," 172° 7' : 2" 23' : 9... 10.5 (1887.88). The place of H 3066 is given by H, 21<sup>h</sup> 48<sup>m</sup> 17<sup>s</sup>; + 53° 25', which is described as "quadruple," and the angle of AB given 199°. I

could not find this in 1873 in the assigned place. There is little doubt of its identity with β 841.

[β (xii)...β⁴...Comstock (*Pub. Washburn Obsy.* vi)...]

**β 75.** Lalande 42736

R.A. 21<sup>h</sup> 49<sup>m</sup> 40<sup>s</sup> }  
Decl. + 10° 19' }

1875.45 34.3 1.20 8.0... 8.5 4<sup>n</sup> Δ  
1882.68 34.0 1.23 8... 9 1<sup>n</sup> Perry  
1888.68 37.8 1.29 8.1... 8.5 2<sup>n</sup> Lv  
1891.73 39.1 1.15 8.1... 8.3 3<sup>n</sup> β  
1891.78 40.5 1.34 ... 3<sup>n</sup> Maw  
1894.69 40.2 1.12 ... 5<sup>n</sup> Sp  
1895.75 37.0 1.14 8.1... 8.3 3<sup>n</sup> Lew  
1896.69 37.8 1.17 8.0... 8.2 3<sup>n</sup> Lv  
1896.83 37.6 1.01 ... 1<sup>n</sup> Bow  
1896.83 40.0 1.05 ... 2<sup>n</sup> Lew  
1897.79 39.3 1.27 ... 1<sup>n</sup> Morgan  
1897.82 39.5 1.09 ... 3<sup>n</sup> A  
1898.73 40.4 1.07 ... 2<sup>n</sup> Bow

Discovered with the 6-inch. Some change is probable. This system has a common proper motion of 0".164 in the direction of 232°.4 (PORTER).

[β (i)...β (*Mon. Not.* XXXIII, 351)...β (3114)...β (*Pub. L. O.* □ II)...Δ (i)...Perry (*Eng. Mech.* XXXVI, 65)...Lv (*A. J.* 407)...Lv¹...Sp (III)...Maw (*Mem. R. A. S. L.*, 75)...Lewis (*Mon. Not.* LVI, 359)...Morgan (*A. J.* 439)...Aitken (*A. J.* 429)...Lewis and Bowyer (*Mon. Not.* LIX, 400)...]

**β 693.** Lalande 42730

R.A. 21<sup>h</sup> 49<sup>m</sup> 54<sup>s</sup> }  
Decl. - 7° 33' }

1878.37 54.1 0.93 7.8... 10.3 3<sup>n</sup> β  
1879.16 54.4 1.03 7.0... 10.3 2<sup>n</sup> Cin  
1886.78 48.7 1.15 7.0... 9.8 1<sup>n</sup> LM  
1893.82 57.9 1.43 7.0... 10.5 1<sup>n</sup> W  
1893.82 47.2 1.14 ... 3<sup>n</sup> Com  
1894.74 55.5 0.89 ... 1<sup>n</sup> Com  
1895.82 50.2 1.03 ... 3<sup>n</sup> Com  
1898.65 51.3 1.21 7.2... 11.5 3<sup>n</sup> Cg

Discovered with the 18½-inch. Probably without change.

[β (x)...β²...Cin⁵...LM...Wilson ( )...Comstock (*Pub. Washburn Obsy.* x)...Cogshall ( )...]

**β 169.** O. Arg. S. 21760

R.A. 21<sup>h</sup> 50<sup>m</sup> 49<sup>s</sup> }  
Decl. - 21° 43' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.78 | 285.7 | 1.93 | 9.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1877.68 | 275.9 | 2.01 | 8.6... 8.7 | 1 <sup>n</sup> | Cin |
| 1892.70 | 282.6 | 2.10 | 9.0... 9.2 | 2 <sup>n</sup> | W   |
| 1893.81 | 279.6 | 2.26 | 9 ... 9    | 1 <sup>n</sup> | Sel |
| 1898.91 | 279.7 | 1.92 | 9.2... 9.2 | 3 <sup>n</sup> | D   |

Discovered with the 6-inch. The south star of a wide pair about 95" apart.

[β (III)...β (Mon. Not. xxxiv, 59)...Cin<sup>3</sup>...Cin<sup>4</sup>... Sellors (3240)...Wilson ( )...Doolittle (Pub. Flower Obsy. I)...]

**β 1214.** D.M. (33°) 4387

R.A. 21<sup>h</sup> 51<sup>m</sup> 23<sup>s</sup> }  
Decl. + 33° 45' }

A and B

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1890.65 | 205.0 | 1.39 | 9.0... 10.3 | 3 <sup>n</sup> | β   |
| 1898.72 | 201.1 | 1.65 | 9.2... 10.5 | 2 <sup>n</sup> | A   |
| 1898.79 | 202.4 | 1.25 | 8.4... 10.2 | 2 <sup>n</sup> | β   |
| 1898.89 | 207.4 | 1.55 | ...         | 1 <sup>n</sup> | Bar |

C and D

|         |       |      |              |                |     |
|---------|-------|------|--------------|----------------|-----|
| 1890.65 | 245.8 | 5.06 | 9.8... 10.8  | 3 <sup>n</sup> | β   |
| 1898.72 | 243.2 | 4.88 | 10.0... 10.8 | 2 <sup>n</sup> | A   |
| 1898.79 | 246.7 | 4.93 | 8.5... 11.2  | 2 <sup>n</sup> | β   |
| 1898.89 | 245.1 | 5.04 | ...          | 1 <sup>n</sup> | Bar |

A and C

|         |      |        |     |                |     |
|---------|------|--------|-----|----------------|-----|
| 1890.65 | 18.3 | 112.43 | ... | 3 <sup>n</sup> | β   |
| 1898.71 | 18.9 | 112.47 | ... | 1 <sup>n</sup> | A   |
| 1898.79 | 18.1 | 112.32 | ... | 2 <sup>n</sup> | β   |
| 1898.89 | 18.1 | 112.04 | ... | 1 <sup>n</sup> | Bar |

This quadruple was discovered with the 18½-inch in 1884, but not included in the Chicago catalogues. The 36-inch shows a faint star about 20" from C in the direction of 285°, and also a 5" pair of faint stars between AB and CD, with many small stars in the field. C is D.M. (33°) 4388.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Aitken (3585)...]

**β 275.** Groombridge 3634

R.A. 21<sup>h</sup> 53<sup>m</sup> 38<sup>s</sup> }  
Decl. + 60° 43' }

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1876.04 | 2.7   | 0.28 | 7.0... 7.0 | 2 <sup>n</sup> | Δ  |
| 1885.54 | 1.1   | 0.43 | ...        | 3 <sup>n</sup> | HΣ |
| 1889.70 | 5.5   | 0.27 | ...        | 7 <sup>n</sup> | Sp |
| 1890.68 | 3.8   | 0.39 | 7.6... 7.8 | 3 <sup>n</sup> | β  |
| 1898.67 | 182.4 | 0.52 | 7.5... 7.6 | 3 <sup>n</sup> | A  |

Discovered with the 9.4-inch at the Dartmouth College Observatory. A difficult pair with small apertures. The measures do not show the change which would be expected in a pair of this class.

[β (v)...β (Mon. Not. xxxv, 31)...β (3048)...β (Pub. L. O. II)...Δ (I)...Sp (III)...Aitken (3585)...HΣ ( )...]

**β 276.** η *Piscis Australis*

R.A. 21<sup>h</sup> 53<sup>m</sup> 56<sup>s</sup> }  
Decl. - 29° 2' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1876.78 | 117.4 | 1.87 | 5.0... 6.0 | 4 <sup>n</sup> | Cin |
| 1877.51 | 115.4 | 1.73 | 5.5... 6.5 | 1 <sup>n</sup> | Cin |
| 1879.66 | 111.2 | 1.69 | 6.0... 7.0 | 1 <sup>n</sup> | Cin |
| 1880.56 | 113.7 | 1.73 | 5.5... 7.0 | 1 <sup>n</sup> | Cin |
| 1884.70 | 116.2 | 1.64 | 5.2... 6.8 | 3 <sup>n</sup> | W   |
| 1885.86 | 118.1 | 1.81 | ...        | 2 <sup>n</sup> | HI  |
| 1886.78 | 115.9 | ...  | ...        | 1 <sup>n</sup> | LM  |
| 1887.79 | 115.7 | 1.81 | ...        | 2 <sup>n</sup> | HI  |
| 1888.78 | 118.5 | 1.61 | 5.5... 5.9 | 3 <sup>n</sup> | β   |
| 1888.89 | 113.3 | 1.50 | 5.0... 6.7 | 2 <sup>n</sup> | Lv  |
| 1892.67 | 112.4 | 1.16 | 6.4... 6.8 | 2 <sup>n</sup> | GI  |
| 1893.78 | 115.0 | 1.80 | ...        | 2 <sup>n</sup> | Sc  |
| 1894.75 | 111.3 | 1.70 | ...        | 4 <sup>n</sup> | Sc  |
| 1895.77 | 110.1 | 1.68 | ...        | 5 <sup>n</sup> | Sc  |
| 1897.02 | 117.3 | 1.84 | 6.5... 7.0 | 3 <sup>n</sup> | See |
| 1898.14 | 115.8 | 1.75 | 6 ... 7    | 6 <sup>n</sup> | Sc  |

Discovered with the 6-inch. A fine easy pair, and visible with a much smaller aperture. Probably unchanged. The magnitude in Cord. G. C. is 5.7. The *Cape Catalogue* gives a proper motion of 0.026 in the direction of 270°. It is very probable that this motion belongs to both stars.

[β (v)...β (Mon. Not. xxxv, 31)...β (2875)...β (Pub. L. O. II)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)... Hall (II)...LM...Lv<sup>1</sup>...Scott (Brit. Ast. Asso. v, 75; VI, 250,368) (Mon. Not. LIX, 427)...See (3496)...]

**β 694.** *Lacertae* 4

R.A. 21<sup>h</sup> 58<sup>m</sup> 6<sup>s</sup> }  
Decl. + 44° 4' }

|         |       |      |            |            |    |
|---------|-------|------|------------|------------|----|
| 1878.66 | 352.3 | 0.50 | 6.0... 8.5 | 2 <i>n</i> | β  |
| 1885.57 | 354.2 | 0.60 | ...        | 2 <i>n</i> | HΣ |
| 1891.72 | 358.5 | 0.64 | 6.7... 8.3 | 3 <i>n</i> | β  |
| 1892.98 | 353.8 | 0.59 | ...        | 5 <i>n</i> | Sp |

Discovered with the 18½-inch. The 36-inch shows a 13*m* star, 328°.1 : 24'.1, and a 13.5*m*, 277°.3 : 27'.1. B.A.C. 7681. In B.A.C. 6*m*, Argelander 6.5*m*.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...HΣ ( )...Sp (iii)...]

**β 695.** D.M. (60°) 2330

R.A. 21<sup>h</sup> 58<sup>m</sup> 33<sup>s</sup> }  
Decl. + 60° 31' }

|         |       |      |             |            |    |
|---------|-------|------|-------------|------------|----|
| 1878.54 | 147.8 | 2.54 | 8.0... 12.3 | 2 <i>n</i> | β  |
| 1885.54 | 144.8 | 2.93 | ...         | 2 <i>n</i> | HΣ |
| 1891.71 | 145.8 | 2.91 | 8.3... 10.8 | 3 <i>n</i> | β  |
| 1898.70 | 146.9 | 3.11 | 7.9... 11.0 | 3 <i>n</i> | A  |

Discovered with the 18½-inch. No sensible change.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...Aitken (3585)...HΣ ( )...]

**β 696.** D.M. (15°) 4558

R.A. 21<sup>h</sup> 58<sup>m</sup> 43<sup>s</sup> }  
Decl. + 15° 17' }

|         |       |      |            |            |       |
|---------|-------|------|------------|------------|-------|
| 1877.32 | 355.1 | 0.50 | 8.0... 8.0 | 2 <i>n</i> | Δ     |
| 1878.21 | 353.8 | 0.65 | 8.5... 9.0 | 2 <i>n</i> | β     |
| 1883.80 | 354.0 | 0.5  | ...        | 1 <i>n</i> | Perry |
| 1889.85 | 361.9 | 0.5± | ...        | 2 <i>n</i> | Sp    |
| 1893.70 | 354.8 | 0.52 | 8.5... 9.0 | 1 <i>n</i> | W     |
| 1894.57 | 361.1 | 0.5± | ...        | 3 <i>n</i> | Sp    |
| 1899.49 | 352.8 | 0.50 | 8.1... 8.5 | 3 <i>n</i> | A     |

Discovered with the 18½-inch. Apparently fixed relatively. The *s* star of a small triangle. The *Berlin A. G. Catalogue* gives this star a proper motion of 0".092 in the direction of 206°.0. Obviously the movement of both stars is the same.

[β (x)...β<sup>1</sup>...Δ (1)...Perry (*Eng. Mech.* xxxviii, 192)...Sp (iii)...Wilson ( )...Aitken ( )...]

**β 474.** O. Arg. N. 23373

R.A. 22<sup>h</sup> 1<sup>m</sup> 2<sup>s</sup> }  
Decl. + 60° 25' }

|         |       |       |             |            |   |
|---------|-------|-------|-------------|------------|---|
| 1878.67 | 345.6 | 16.28 | 8.5... 12.0 | 1 <i>n</i> | β |
| 1891.71 | 346.6 | 16.42 | 8.1... 11.8 | 3 <i>n</i> | β |

Discovered with the 6-inch.

[β (ix)...β (*Mon. Not.* xxxviii, 78)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...]

**β 697.** 19 *Cephei*

R.A. 22<sup>h</sup> 1<sup>m</sup> 27<sup>s</sup> }  
Decl. + 61° 42' }

|         |      |       |             |            |   |
|---------|------|-------|-------------|------------|---|
| 1878.66 | 95.8 | 19.75 | 6.0... 12.0 | 1 <i>n</i> | β |
| 1891.71 | 94.4 | 19.80 | 5.7... 11.5 | 3 <i>n</i> | β |
| 1898.58 | 93.1 | 20.18 | ... 12.1    | 2 <i>n</i> | β |

Discovered with the 18½-inch. This star has a proper motion of 0".081 in the direction of 114°.0 (AUWERS). It is probable that the small star does not share in this movement.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O. II*)...]

**β 990.** D.M. (62°) 2030

R.A. 22<sup>h</sup> 1<sup>m</sup> 32<sup>s</sup> }  
Decl. + 62° 30' }

|         |       |      |             |            |   |
|---------|-------|------|-------------|------------|---|
| 1880.61 | 122.3 | 0.65 | 8.3... 9.7  | 3 <i>n</i> | β |
| 1891.72 | 124.9 | 0.50 | 8.5... 9.8  | 3 <i>n</i> | β |
| 1898.49 | 121.7 | 0.51 | 8.9... 10.2 | 2 <i>n</i> | D |

Discovered with the 18½-inch in the course of an examination of Σ 2879 and the vicinity for the purpose of seeing whether there was any other pair to which certain discordant measures, credited to Σ 2879 might belong. These measures are as follows:

|         |       |      |            |        |
|---------|-------|------|------------|--------|
| 1840.61 | 129.7 | 0.91 | 1 <i>n</i> | OΣ     |
| 1856.93 | 130.5 | 0.5  | 1 <i>n</i> | Secchi |

There has been no material change in either angle or distance of Σ 2879 since the first measures, as will be seen from the following:

|         |       |      |            |   |
|---------|-------|------|------------|---|
| 1836.35 | 226.2 | 0.80 | 3 <i>n</i> | Σ |
| 1879.94 | 229.6 | 0.87 | 3 <i>n</i> | β |



It is certain that the measures of OΣ and SECCHI cannot belong to this star, unless by a curious coincidence each made the same error of about 100° in reading the position-angle. Apparently neither observer noted the discrepancy, or it would have been followed by further observations. It will be seen that the measures fairly well describe β 990, and there is at least a probability that they belong to that pair. It is a much more difficult double than Σ 2879. The magnitude of β 990 in the D.M. is 9.0. It is 5<sup>m</sup> 46<sup>s</sup> p and 18' s of Σ 2879.

[β (XII)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Doolittle (Pub. Flower Obsy. I)...]

β 170. Lalande 43158

R.A. 22<sup>h</sup> 2<sup>m</sup> 31<sup>s</sup> }  
Decl. - 19° 4' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1876.05 to 1897.78.

Discovered with the 6-inch. This star is a distant companion (40° : 160") to 35 Aquarii. There is a faint star between. The wide pair in the field nf is H 3092.

[β (III)...β (Mon. Not. xxxiv, 59)...Δ (I)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson (Cin<sup>10</sup>)...LM...Lv<sup>1</sup>...Tarrant (2991)...Sellors (3240)...Hussey (A.J. 397)...See (3496)...]

β 842. D.M. (4°) 4811

R.A. 22<sup>h</sup> 3<sup>m</sup> 31<sup>s</sup> }  
Decl. + 5° 6' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1881.73 to 1887.77.

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β<sup>4</sup>...Updegraff, Lamb, and Comstock (Pub. Washburn Obsy. v, VI)...]

β 375. O. Arg. N. 23503

R.A. 22<sup>h</sup> 4<sup>m</sup> 29<sup>s</sup> }  
Decl. + 50° 11' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1876.41 and 1891.72.

Discovered with the 6-inch.

[β (VI)...β (2062,3114)...β (Pub. L. O. II)...Δ (I)...]

β 769. Lacaille 9046

R.A. 22<sup>h</sup> 4<sup>m</sup> 37<sup>s</sup> }  
Decl. - 35° 3' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1879.69 to 1898.76.

Discovered with the 6-inch at Mt. Hamilton in 1879. Probably direct motion in angle. GOULD 6.8 m.

[β (XI)...β<sup>2</sup>...β (3114)...β (Pub. L. O. II)...See (3496)...Aitken (3585)...]

β 698. Lalande 43303

R.A. 22<sup>h</sup> 5<sup>m</sup> 55<sup>s</sup> }  
Decl. + 6° 18' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1878.74 to 1898.88.

Discovered with the 18½-inch. Fixed.

[β (X)...β<sup>5</sup>...β (3114)...β (Pub. L. O. II)...HΣ ( )...]

β 475. Lalande 43305

R.A. 22<sup>h</sup> 6<sup>m</sup> 15<sup>s</sup> }  
Decl. - 8° 36' }

Table with 6 columns: Year, R.A. (degrees), Parallax (arcseconds), Magnitude, Position angle, and Component label. Rows include years 1876.72 to 1897.89.

Discovered with the 6-inch. The measures are not very accordant in angle, and change is doubtful.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* XXXVIII, 78)... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Cin<sup>6</sup>...Wilson (Cin<sup>10</sup>)...LM...Hussey (*A. J.* 427)...]

$\beta$  436. O. Arg. N. 23612

R.A. 22<sup>h</sup> 6<sup>m</sup> 43<sup>s</sup> }  
Decl. + 57° 21'

A and B

|         |       |       |            |            |          |
|---------|-------|-------|------------|------------|----------|
| 1876.56 | 327.5 | 19.63 | 7.5...11.5 | 1 <i>n</i> | $\Delta$ |
| 1889.96 | 327.8 | 19.31 | ...12.5    | 1 <i>n</i> | Ho       |
| 1898.58 | 328.1 | 19.68 | 7.2...10.2 | 2 <i>n</i> | $\beta$  |

A and C

|         |       |       |       |            |         |
|---------|-------|-------|-------|------------|---------|
| 1889.66 | 100.5 | 19.36 | ...13 | 1 <i>n</i> | Ho      |
| 1898.58 | 100.1 | 19.54 | ...   | 2 <i>n</i> | $\beta$ |

The small star, B, was noted with the 6 inch, and the third star, C, added by HOUGH with the 18½-inch. In 1889 he measured the principal star as a close pair, 208°.5 : 0".53, on a single night, the new component being 11*m*. I could see no trace of any elongation with the 36-inch in 1890, nor at any subsequent time.

[ $\beta$  (VII)... $\beta$  (2103,3048)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...Hough (2978)...]

$\beta$  1215. S.D. (11°) 5781-

R.A. 22<sup>h</sup> 6<sup>m</sup> 47<sup>s</sup> }  
Decl. - 11° 46'

|         |      |      |           |            |         |
|---------|------|------|-----------|------------|---------|
| 1890.82 | 90.2 | 1.53 | 9.0...9.0 | 3 <i>n</i> | $\beta$ |
| 1896.78 | 91.0 | 1.54 | 9+...9+   | 3 <i>n</i> | A       |

Discovered with the 12-inch.

[ $\beta$  (XVII)... $\beta$  (3047)... $\beta$  (*Pub. L. O. II*)...Aitken (3466)...]

$\beta$  699. W<sup>2</sup> XXII. 114

R.A. 22<sup>h</sup> 7<sup>m</sup> 45<sup>s</sup> }  
Decl. + 7° 7'

|         |       |        |            |            |         |
|---------|-------|--------|------------|------------|---------|
| 1878.44 | 187.3 | 2.04   | 8.1...12.2 | 3 <i>n</i> | $\beta$ |
| 1891.72 | 185.1 | 2.43   | 8.1...12.0 | 3 <i>n</i> | $\beta$ |
| 1896.80 | 186.3 | (0.96) | ...        | 1 <i>n</i> | L       |
| 1899.54 | 184.5 | 2.46   | 7.9...12.3 | 3 <i>n</i> | A       |
| 1899.72 | 184.2 | 2.11   | 8.5...12.0 | 1 <i>n</i> | D       |

Discovered with the 18½-inch.

[ $\beta$  (X)... $\beta$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...Doolittle (*Pub. Flower Obsy.* I)...]

$\beta$  171. Lalande 43350

R.A. 22<sup>h</sup> 7<sup>m</sup> 51<sup>s</sup> }  
Decl. - 21° 38'

|         |       |       |            |            |     |
|---------|-------|-------|------------|------------|-----|
| 1878.75 | 258.9 | 11.45 | 8.3...12.0 | 3 <i>n</i> | Cin |
| 1892.70 | 259.8 | 11.66 | 8.8...12.2 | 2 <i>n</i> | W   |
| 1898.50 | 256.0 | 11.52 | 8.5...10.2 | 2 <i>n</i> | D   |
| 1898.65 | 258.1 | 11.49 | 8.0...11.2 | 3 <i>n</i> | Cg  |

Discovered with the 6-inch. This is a distant companion to 41 *Aquarii*.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* XXXIV, 59)...Cin<sup>4</sup>...Cin<sup>5</sup>...Cin<sup>6</sup>...Wilson ( )...Cogshall ( )...Doolittle (*Pub. Flower Obsy.* I)...]

$\beta$  376. Radcliffe 5607

R.A. 22<sup>h</sup> 8<sup>m</sup> 1<sup>s</sup> }  
Decl. + 59° 30'

|         |       |      |            |            |            |
|---------|-------|------|------------|------------|------------|
| 1876.24 | 149.2 | 3.57 | 8.0...11.2 | 2 <i>n</i> | $\Delta$   |
| 1885.54 | 148.2 | 3.61 | ...        | 2 <i>n</i> | H $\Sigma$ |
| 1892.75 | 150.7 | 3.68 | 7.7...10.8 | 3 <i>n</i> | W          |

Discovered with the 6-inch.  $\Sigma$  2880 is 22' *n*.

[ $\beta$  (VI)... $\beta$  (2062)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...Wilson ( )...H $\Sigma$  ( )...]

$\beta$  476. W<sup>2</sup> XXII. 180

R.A. 22<sup>h</sup> 8<sup>m</sup> 41<sup>s</sup> }  
Decl. + 30° 48'

|         |      |      |            |            |          |
|---------|------|------|------------|------------|----------|
| 1877.57 | 93.1 | 2.57 | 9.5...10.1 | 4 <i>n</i> | $\Delta$ |
| 1882.68 | 90.5 | 2.27 | 9.5...10   | 1 <i>n</i> | Perry    |
| 1893.54 | 92.5 | 2.57 | 9.4...10.0 | 4 <i>n</i> | Lv       |
| 1894.63 | 93.4 | 2.52 | 9.2...10.0 | 2 <i>n</i> | W        |

Discovered with the 6-inch.  $\beta$  477 is in a low-power field.

[ $\beta$  (IX)... $\beta$  (*Mon. Not.* XXXVIII, 78)... $\Delta$  (1)...Perry (*Eng. Mech.* xxxvi, 65)...Lv (*A. J.* 382)...Wilson ( )...]

$\beta$  991. Radcliffe 5619

R.A. 22<sup>h</sup> 9<sup>m</sup> 1<sup>s</sup> }  
Decl. + 51° 58'

|         |       |        |           |            |         |
|---------|-------|--------|-----------|------------|---------|
| 1880.16 | 150.9 | 0.59   | 8.0...8.0 | 5 <i>n</i> | $\beta$ |
| 1893.55 | 143.4 | 0.57   | 8.0...8.2 | 2 <i>n</i> | Lv      |
| 1893.66 | 145.2 | 0.73   | 8.8...8.8 | 2 <i>n</i> | W       |
| 1893.82 |       | Single |           |            | Com     |
| 1896.66 |       | Single |           |            | Com     |
| 1899.59 | 145.0 | 0.59   | ...       | 3 <i>n</i> | A       |

Discovered with the 18½-inch. There does not appear to be any material change.

[ $\beta$  (xiii)... $\beta^3$ ...Lv (*A. J.* 382)...Wilson ( )...Comstock (*Pub. Washburn Obsy.* x)...Aitken ( )...]

$\beta$  477. W<sup>2</sup> XXII. 225

R.A. 22<sup>h</sup> 10<sup>m</sup> 28<sup>s</sup> }  
Decl. + 30° 49' }

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1877.45 | 45.7 | 6.51 | 9.3...11.0 | 3 <sup>n</sup> | $\Delta$ |
| 1882.68 | 46.0 | 7.04 | 9...11     | 1 <sup>n</sup> | Perry    |
| 1893.54 | 43.5 | 6.48 | 9.0...9.8  | 3 <sup>n</sup> | Lv       |
| 1894.63 | 43.4 | 6.48 | 9.2...10.5 | 2 <sup>n</sup> | W        |
| 1899.12 | 43.6 | 6.64 | 9.2...9.7  | 4 <sup>n</sup> | D        |

Discovered with the 6-inch.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (i)...Perry (*Eng. Mech.* xxxvi, 65)...Lv (*A. J.* 382)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  377. O. Arg. N. 23765

R.A. 22<sup>h</sup> 11<sup>m</sup> 23<sup>s</sup> }  
Decl. + 54° 4' }

B and C

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1891.54 | 302.8 | 7.02 | 10.6...11.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.58 | 303.6 | 6.80 | 9.7...10.1  | 2 <sup>n</sup> | $\beta$ |

A and B

|         |      |       |        |                |         |
|---------|------|-------|--------|----------------|---------|
| 1891.54 | 65.9 | 63.88 | 8.0... | 3 <sup>n</sup> | $\beta$ |
| 1898.58 | 65.8 | 62.30 | 7.2... | 2 <sup>n</sup> | $\beta$ |

Distant double companion noted with the 6-inch. The large star has a proper motion of 0".226 in the direction of 81°.4 (*A. G. C.*). The measures of AB give for this movement 0".225 in 62°.0. The 36-inch shows six or eight stars nearer to A than B, including a faint pair, with distance less than BC, 16".5 from A in the direction of 263°.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* ii)...]

$\beta$  378. O. Arg. N. 23808

R.A. 22<sup>h</sup> 12<sup>m</sup> 50<sup>s</sup> }  
Decl. + 60° 16' }

A and B

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1876.55 | 90.8 | 3.18 | 9.2...10.2 | 2 <sup>n</sup> | $\Delta$ |
| 1878.65 | 90.4 | 3.33 | 8.2...8.5  | 1 <sup>n</sup> | $\beta$  |
| 1892.75 | 90.9 | 3.39 | 8.5...9.3  | 3 <sup>n</sup> | W        |
| 1898.70 | 88.3 | 3.44 | 8.7...9.5  | 2 <sup>n</sup> | D        |

A and C

|         |      |      |         |                |         |
|---------|------|------|---------|----------------|---------|
| 1878.65 | 29.4 | 7.48 | ...11.8 | 1 <sup>n</sup> | $\beta$ |
| 1892.74 | 31.6 | 7.06 | ...12.5 | 2 <sup>n</sup> | W       |
| 1898.70 | 29.0 | 7.42 | ...10.5 | 2 <sup>n</sup> | D       |

B was discovered with the 6-inch, and C added with the 18½-inch.

[ $\beta$  (vi)... $\beta$  (2062)... $\beta^2$ ... $\Delta$  (i)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  1216. Lalande 43605

R.A. 22<sup>h</sup> 14<sup>m</sup> 42<sup>s</sup> }  
Decl. + 28° 55' }

|         |       |       |           |                |         |
|---------|-------|-------|-----------|----------------|---------|
| 1890.51 | 317.7 | 0.64  | 8.4...8.7 | 3 <sup>n</sup> | $\beta$ |
| 1892.76 | 317.0 | 0.50± | ...       | 6 <sup>n</sup> | Sp      |
| 1895.74 | 312.5 | 0.52  | ...       | 3 <sup>n</sup> | Lew     |
| 1896.73 | 314.5 | 0.46  | ...       | 2 <sup>n</sup> | Lew     |
| 1896.90 | 315.7 | 0.57  | ...       | 4 <sup>n</sup> | A       |
| 1897.69 | 310.9 | 0.54  | ...       | 2 <sup>n</sup> | Bow     |
| 1897.76 | 311.4 | 0.35  | ...       | 1 <sup>n</sup> | Lew     |
| 1898.67 | 314.2 | 0.54  | ...       | 3 <sup>n</sup> | Lew     |

Discovered with the 16-inch of the Warner Observatory in 1885.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* ii)...Sp (iii)...Lewis and Bowyer (*Mon. Not.* lvi, 359; lix, 400) (*Greenwich Obsvs.* 1895)...Aitken (3466)...]

$\beta$  1217. Lalande 43635

R.A. 22<sup>h</sup> 15<sup>m</sup> 33<sup>s</sup> }  
Decl. + 30° 42' }

|         |       |       |            |                |         |
|---------|-------|-------|------------|----------------|---------|
| 1890.53 | 218.9 | 0.61  | 7.4...10.3 | 3 <sup>n</sup> | $\beta$ |
| 1892.93 | 225.9 | 0.55± | ...        | 5 <sup>n</sup> | Sp      |
| 1896.78 | 224.8 | 0.59  | ...        | 2 <sup>n</sup> | A       |

Discovered with the 36-inch. A difficult pair, and therefore the change in angle requires verification. The magnitude in D.M. is 7.0.

[ $\beta$  (xvii)... $\beta$  (3047)... $\beta$  (*Pub. L. O.* ii)...Sp (iii)...Aitken (3466)...]

$\beta$  379. Radcliffe 5658

R.A. 22<sup>h</sup> 16<sup>m</sup> 0<sup>s</sup> }  
Decl. + 53° 13' }

|         |       |      |           |                |          |
|---------|-------|------|-----------|----------------|----------|
| 1877.26 | 332.0 | 1.11 | 8.3...9.0 | 6 <sup>n</sup> | $\Delta$ |
| 1882.68 | 336.0 | 1.08 | 8.5...9.0 | 1 <sup>n</sup> | Perry    |
| 1891.65 | 333.7 | 1.02 | 8.4...8.6 | 3 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Without change.

[ $\beta$  (v1)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)...Perry (*Eng. Mech.* xxxvi, 65)...]

$\beta$  172. 51 *Aquarii*

R.A. 22<sup>h</sup> 17<sup>m</sup> 52<sup>s</sup> }  
Decl. — 5° 27' }

A and B

|         |      |      |            |                |          |
|---------|------|------|------------|----------------|----------|
| 1875.66 | 20.4 | 0.46 | 6.7... 6.7 | 6 <sup>n</sup> | $\Delta$ |
| 1877.76 | 20.9 | ...  | 6.0... 6.0 | 1 <sup>n</sup> | Cin      |
| 1878.19 | 24.9 | 0.58 | ...        | 4 <sup>n</sup> | $\beta$  |
| 1879.25 | 19.6 | 0.66 | 5.9... 6.0 | 4 <sup>n</sup> | Cin      |
| 1879.30 | 19.1 | 0.52 | 6.8... 6.8 | 2 <sup>n</sup> | Sp       |
| 1879.70 | 16.1 | 0.73 | 6.0... 6.0 | 1 <sup>n</sup> | $\beta$  |
| 1886.72 | 16.8 | 0.78 | 6.2... 6.4 | 2 <sup>n</sup> | LM       |
| 1888.65 | 14.1 | 0.60 | 6.8... 7.9 | 3 <sup>n</sup> | Lv       |
| 1888.74 | 18.3 | 0.60 | 6.5... 6.5 | 7 <sup>n</sup> | T        |
| 1889.53 | 12.8 | 0.53 | ...        | 2 <sup>n</sup> | Sp       |
| 1890.78 | 16.2 | 0.67 | 6.5... 6.5 | 3 <sup>n</sup> | T        |
| 1891.59 | 12.1 | 0.68 | 5.6... 6.0 | 3 <sup>n</sup> | $\beta$  |
| 1892.71 | 12.9 | 0.68 | ...        | 2 <sup>n</sup> | T        |
| 1893.82 | 9.4  | 0.55 | ...        | 3 <sup>n</sup> | Com      |
| 1895.79 | 6.2  | 0.66 | ...        | 4 <sup>n</sup> | Com      |
| 1895.83 | 7.3  | 0.57 | 5.5... 5.5 | 3 <sup>n</sup> | A        |
| 1897.71 | 5.3  | 0.73 | ...        | 3 <sup>n</sup> | A        |
| 1897.88 | 10.4 | 0.67 | ...        | 3 <sup>n</sup> | Hu       |
| 1898.79 | 10.5 | 0.88 | ...        | 2 <sup>n</sup> | Bry      |
| 1898.90 | 5.2  | 0.58 | ...        | 1 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. It conclusively appears from the measures that it is a binary system in slow retrograde movement. The proper motion is very small, 0".015 in the direction of 277°.6.

The distant stars noted by HERSCHEL I (= H<sup>v</sup> v. 95) have never been measured before, and are too remote to be of any interest.

AB and C

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1898.90 | 341.9 | 54.44 | ... 11.0 | 1 <sup>n</sup> | $\beta$ |
|---------|-------|-------|----------|----------------|---------|

AB and D

|         |       |        |          |                |         |
|---------|-------|--------|----------|----------------|---------|
| 1898.90 | 190.6 | 113.68 | ... 10.0 | 1 <sup>n</sup> | $\beta$ |
|---------|-------|--------|----------|----------------|---------|

AB and E

|         |       |        |         |                |         |
|---------|-------|--------|---------|----------------|---------|
| 1898.90 | 133.3 | 132.39 | ... 9.3 | 1 <sup>n</sup> | $\beta$ |
|---------|-------|--------|---------|----------------|---------|

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^1$ ... $\beta^2$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)... $\Delta$  (1)... $\Delta$  (2086)...Cin<sup>4</sup>...Cin<sup>5</sup>...LM...Lv<sup>1</sup>...Tarrant (2991,3186)...Sp (II, III)...Comstock (*Pub. Washburn Obsy.* x)...Aitken (3396) (*A. J.* 429)...Hussey (*A. J.* 427)...Bryant (*Mon. Not.* LIX, 400)...]

$\beta$  843. D.M. (1°) 4606

R.A. 22<sup>h</sup> 18<sup>m</sup> 42<sup>s</sup> }  
Decl. + 2° 3' }

|         |       |      |             |                |         |
|---------|-------|------|-------------|----------------|---------|
| 1881.65 | 236.1 | 3.46 | 8.4... 12.5 | 3 <sup>n</sup> | $\beta$ |
| 1886.83 | 229.5 | 3.23 | ...         | 2 <sup>n</sup> | UL      |
| 1888.01 | 233.6 | 3.26 | 8.5... 11.7 | 3 <sup>n</sup> | Com     |
| 1897.94 | 234.4 | 3.57 | ...         | 1 <sup>n</sup> | Br      |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (xII)... $\beta^4$ ...Comstock, Updegraff and Lamb (*Pub. Washburn Obsy.* v, v1)...Brown ( )...]

$\beta$  290. 34 *Pegasi*

R.A. 22<sup>h</sup> 20<sup>m</sup> 31<sup>s</sup> }  
Decl. + 3° 47' }

|         |       |      |             |                |            |
|---------|-------|------|-------------|----------------|------------|
| 1875.77 | 223.3 | 2.61 | 6.0... 13.0 | 2 <sup>n</sup> | H1         |
| 1878.49 | 218.9 | 2.62 | 6.0... 12.5 | 5 <sup>n</sup> | $\beta$    |
| 1885.74 | 214.0 | 3.07 | ...         | 1 <sup>n</sup> | H $\Sigma$ |
| 1889.63 | 218.7 | 2.71 | 5.8... 11.7 | 3 <sup>n</sup> | $\beta$    |
| 1898.61 | 217.8 | 2.83 | ... 12.0    | 3 <sup>n</sup> | $\beta$    |
| 1898.73 | 218.4 | 3.08 | 6.0... 12.8 | 2 <sup>n</sup> | A          |

Discovered with the 26-inch at the Naval Observatory. The relative change is slow, but it is certain that this is a physical system. The components have a large proper motion of 0".259 in the direction of 81°.1 (PORTER). If the small star was fixed in space, the angle and distance would increase respectively 26° and 5".5 during the time covered by the measures.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* II)...Hall (1)...Aitken (3585)...H $\Sigma$  ( )...]

$\beta$  700. D.M. (48°) 3728

R.A. 22<sup>h</sup> 21<sup>m</sup> 35<sup>s</sup> }  
Decl. + 49° 5' }

|         |       |       |             |                |          |
|---------|-------|-------|-------------|----------------|----------|
| 1877.70 | 332.4 | 10.33 | 8.0... 12.0 | 1 <sup>n</sup> | $\Delta$ |
| 1878.19 | 333.8 | 9.83  | 8.2... 12.0 | 2 <sup>n</sup> | $\beta$  |
| 1893.78 | 335.8 | 9.96  | 8.3... 12.0 | 3 <sup>n</sup> | W        |

Discovered with the 18½-inch.  $\beta$  380 is in the field 27<sup>s</sup> f and 1' n.

[ $\beta$  (x)... $\beta^1$ ... $\Delta$  (1)...Wilson ( )...]

**β 291.** W<sup>2</sup> XXII. 436

R.A. 22<sup>h</sup> 21<sup>m</sup> 39<sup>s</sup> }  
Decl. + 3° 55'

|         |       |       |        |     |                |     |
|---------|-------|-------|--------|-----|----------------|-----|
| 1875.82 | 157.8 | 0.33  | 8.4... | 8.4 | 4 <sup>n</sup> | Δ   |
| 1878.64 | 160.0 | 0.42  | 8.5... | 8.8 | 1 <sup>n</sup> | β   |
| 1880.08 | 165.5 | 0.50  | 8.2... | 8.5 | 2 <sup>n</sup> | β   |
| 1886.77 | 162.9 | 0.38  | 8.0... | 8.3 | 1 <sup>n</sup> | LM  |
| 1889.63 | 167.5 | 0.46  | 8.4... | 8.7 | 3 <sup>n</sup> | β   |
| 1890.58 | 164.8 | 0.40± | ...    |     | 7 <sup>n</sup> | Sp  |
| 1893.75 | 173.8 | 0.47  | 8.0... | 8.2 | 2 <sup>n</sup> | W   |
| 1894.74 | 168.4 | 0.30± | ...    |     | 6 <sup>n</sup> | Sp  |
| 1898.75 | 173.5 | 0.52  | 8.0... | 8.0 | 3 <sup>n</sup> | A   |
| 1898.77 | 173.2 | 0.52  | ...    |     | 2 <sup>n</sup> | Bry |

This star was suspected with the 6-inch to be a close pair in 1872, and verified by me with the 26-inch at Washington in August 1874. It is a difficult object with a small aperture. It is clearly a binary. Both angle and distance are increasing, and it is much easier now than it was at the time of discovery. AITKEN measures a 13.5<sup>m</sup> star, 125°0 : 31°06 (1898.78) 1<sup>n</sup>. This pair is within the triangle of 6<sup>m</sup> stars formed by 34, 35, and 37 *Pegasi*. The first of these bright stars is β 290, and the last Σ 2912.

[β (v)...β (*Mon. Not.* xxxv, 31)...β<sup>1</sup>...β<sup>3</sup>...β (2957)...β (*Pub. L. O.* II)...Δ (1)...LM...Sp (III)...Wilson ( ) ...Aitken (3585)...Bryant ( )...]

**β 380.** Radcliffe 5693

R.A. 22<sup>h</sup> 22<sup>m</sup> 25<sup>s</sup> }  
Decl. + 49° 6'

C and D

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1877.60 | 245.7 | 21.4  | 7.7... | 12.5 | 1 <sup>n</sup> | β |
| 1893.73 | 243.1 | 21.34 | 7.8... | 12.8 | 3 <sup>n</sup> | W |

A and B

|         |       |       |        |      |                |   |
|---------|-------|-------|--------|------|----------------|---|
| 1876.10 | 321.6 | 24.37 | ...    | 12.0 | 2 <sup>n</sup> | Δ |
| 1893.67 | 322.5 | 24.93 | 7.8... | 10.3 | 3 <sup>n</sup> | W |

A and C (= OΣ App. 234)

|         |       |       |        |     |                |    |
|---------|-------|-------|--------|-----|----------------|----|
| 1874.97 | 134.2 | 36.31 | 7.3... | 7.7 | 3 <sup>n</sup> | Δ  |
| 1886.52 | 134.2 | 36.36 | 8.0... | 8.3 | 4 <sup>n</sup> | Fr |
| 1893.67 | 134.2 | 36.15 | ...    | 8.3 | 3 <sup>n</sup> | W  |

Discovered with the 6-inch. All the measures of the OΣ stars are given.

[β (VI)...β (2062)...Δ (1)...Franz (3080)...Wilson ( )...]

**β 701.** Lalande 43867

R.A. 22<sup>h</sup> 22<sup>m</sup> 10<sup>s</sup> }  
Decl. + 11° 38'

|         |       |      |        |      |                |    |
|---------|-------|------|--------|------|----------------|----|
| 1877.82 | 283.4 | 1.24 | 7.0... | 10.0 | 2 <sup>n</sup> | Δ  |
| 1878.24 | 279.9 | 1.24 | 7.5... | 10.2 | 2 <sup>n</sup> | β  |
| 1887.59 | 273.9 | 1.31 | ...    |      | 5 <sup>n</sup> | HΣ |
| 1893.69 | 277.2 | 1.18 | 7.3... | 10.7 | 3 <sup>n</sup> | W  |
| 1897.89 | 268.0 | 1.42 | ...    |      | 1 <sup>n</sup> | Br |

Discovered with the 18½-inch. PORTER gives the principal star a proper motion of 0".166 in the direction of 79°.6. The companion is evidently moving with it.

[β (x)...β<sup>1</sup>...Δ (1)...Wilson ( )...HΣ ( )...Brown ( )...]

**β 173.** D.M. (56°) 2776

R.A. 22<sup>h</sup> 22<sup>m</sup> 24<sup>s</sup> }  
Decl. + 56° 35'

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1875.83 | 232.8 | 2.88 | 8.4... | 10.7 | 5 <sup>n</sup> | Δ |
| 1892.75 | 232.1 | 2.90 | 8.2... | 10.5 | 3 <sup>n</sup> | W |

Discovered with the 6-inch.

[β (III)...β (*Mon. Not.* xxxiv, 59)...Δ (1)...Wilson ( )...]

**β 1218.** W<sup>2</sup> XXII. 476

R.A. 22<sup>h</sup> 22<sup>m</sup> 33<sup>s</sup> }  
Decl. + 29° 5'

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1890.52 | 53.5 | 1.44 | 8.6... | 8.8 | 3 <sup>n</sup> | β   |
| 1890.95 | 51.0 | 1.15 | 8.7... | 9.0 | 2 <sup>n</sup> | Ho  |
| 1892.16 | 55.0 | 1.42 | ...    |     | 4 <sup>n</sup> | Sp  |
| 1892.93 | 57.2 | 1.10 | 8.0... | 8.5 | 2 <sup>n</sup> | J   |
| 1893.94 | 54.5 | 1.42 | ...    |     | 3 <sup>n</sup> | Sp  |
| 1895.77 | 52.8 | 1.76 | ...    |     | 2 <sup>n</sup> | Lew |
| 1896.73 | 52.1 | 1.72 | ...    |     | 1 <sup>n</sup> | Lew |
| 1896.77 | 52.7 | 1.33 | ...    |     | 3 <sup>n</sup> | A   |
| 1896.86 | 55.2 | 1.46 | ...    |     | 2 <sup>n</sup> | Bow |
| 1897.67 | 55.2 | 1.53 | ...    |     | 4 <sup>n</sup> | Bow |
| 1897.76 | 54.6 | 1.61 | ...    |     | 1 <sup>n</sup> | Lew |
| 1898.67 | 50.8 | 1.59 | ...    |     | 3 <sup>n</sup> | Lew |
| 1898.68 | 52.2 | 1.48 | ...    |     | 2 <sup>n</sup> | Bow |

Discovered with the 12-inch. Evidently unchanged.

[β (XVII)...β (3047)...β (*Pub. L. O.* II)...Hough (3234)...Sp (III)...Jones (*Proc. Haverford Coll. Obs.*, 1892)...Lewis (*Mon. Not.* LVI, 359) (*Greenwich Obsns.* 1895)...Aitken (3466)...Lewis and Bowyer ( )...]

**β 174.** Lalande 43888

R.A. 22<sup>h</sup> 22<sup>m</sup> 58<sup>s</sup> }  
Decl. — 10° 17' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1876.15 | 287.9 | 7.38 | 8.5...12.0 | 3n | Δ   |
| 1878.77 | 290.6 | 9.09 | 8.0...12.0 | 2n | Cin |
| 1881.61 | 292.6 | 9.08 | 8.1...11.3 | 3n | β   |
| 1888.77 | 291.7 | 8.62 | 8.3...10.7 | 3n | β   |
| 1898.84 | 292.4 | 9.06 | 8.0...10.5 | 2n | β   |

Discovered with the 6-inch. Probably unchanged.

[β (III)...β (*Mon. Not.* xxxiv, 59)...β (2875)...β<sup>4</sup>...β (*Pub. L. O.* II)...Δ (I)...Cin<sup>5</sup>...]

**β 478.** S.D. (8°) 5881

R.A. 22<sup>h</sup> 23<sup>m</sup> 8<sup>s</sup> }  
Decl. — 7° 56' }

A and B

|         |      |      |            |    |    |
|---------|------|------|------------|----|----|
| 1878.20 | 32.6 | 1.32 | 9.0...11.0 | 2n | β  |
| 1886.80 | 32.2 | 1.38 | 9.6...11.2 | 1n | LM |
| 1898.72 | 30.6 | 1.62 | 8.5...10.2 | 2n | Bd |
| 1898.75 | 32.4 | 1.23 | 9.2...10.3 | 3n | A  |
| 1898.84 | 30.1 | 1.24 | 8.6...9.3  | 1n | β  |

A and C

|         |       |       |         |    |    |
|---------|-------|-------|---------|----|----|
| 1877.80 | 239.0 | 28.55 | ... 9.0 | 1n | β  |
| 1898.72 | 239.4 | 28.69 | ... 8.7 | 3n | Cg |
| 1898.74 | 239.2 | 29.08 | ... 9.0 | 2n | A  |
| 1898.84 | 239.7 | 28.67 | ... 8.7 | 1n | β  |

Discovered with the 6-inch. The middle of three stars in the field. Unchanged. BOOTHROYD measures a 13.5 m star from A, 54° 7' : 18° 9' 2" (1898.71) 2 n.

[β (IX)...β (*Mon. Not.* xxxviii, 78)...β<sup>1</sup>...LM...Boothroyd ( )...Aitken (3585)...]

**β 76.** Lalande 43906

R.A. 22<sup>h</sup> 23<sup>m</sup> 22<sup>s</sup> }  
Decl. — 0° 49' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1867.86 | 332.1 | 1.50 | ...        | 1n | Hd  |
| 1876.24 | 335.3 | 1.47 | 8.2...10.1 | 4n | Δ   |
| 1879.18 | 333.6 | 1.48 | 7.7...9.8  | 4n | Cin |
| 1888.85 | 338.2 | 1.24 | 8.0...9.7  | 1n | Lv  |
| 1890.77 | 334.4 | 1.41 | 8.0...10.0 | 2n | T   |
| 1892.65 | 333.6 | 1.44 | ...        | 2n | T   |
| 1898.65 | 337.1 | 1.46 | 8.0...9.7  | 3n | Bd  |

Discovered with the 6-inch. In a low-power field with ζ *Aquarii*. No relative motion. An earlier observation is found in *Harvard Annals*, published after β (I).

[β (I)...β (*Mon. Not.* xxxiii, 351)...*Annals Harvard Obsy.* XIII...Δ (I)...Cin<sup>5</sup>...Lv<sup>1</sup>...Tarrant (3186)...Boothroyd ( )...]

**β 844.** Lalande 43912

R.A. 22<sup>h</sup> 23<sup>m</sup> 32<sup>s</sup> }  
Decl. + 5° 2' }

B and C

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.73 | 317.1 | 3.20 | 9.3...10.9 | 3n | β   |
| 1886.84 | 317.7 | 3.25 | ...        | 4n | UL  |
| 1887.79 | 316.5 | 3.44 | 9.0...10.7 | 2n | Com |
| 1888.88 | 310.7 | ...  | 8.8...11.2 | 3n | Lv  |
| 1891.86 | 316.1 | 3.30 | 9.7...10.8 | 1n | β   |

A and B

|         |      |       |        |    |    |
|---------|------|-------|--------|----|----|
| 1881.73 | 34.3 | 98.34 | 8.1... | 3n | β  |
| 1886.84 | 34.2 | 98.81 | ...    | 4n | UL |
| 1891.86 | 34.3 | 98.25 | 8.1... | 2n | β  |

Discovered with the 15½-inch at the Washburn Observatory. Without change.

[β (XII)...β<sup>4</sup>...β (3114)...β (*Pub. L. O.* II)...Lv<sup>2</sup>...Comstock, Updegraff and Lamb (*Pub. Washburn Obsy.* v, vi)...]

**β 1264.** Lalande 43933

R.A. 22<sup>h</sup> 24<sup>m</sup> 1<sup>s</sup> }  
Decl. — 0° 29' }

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1891.70 | 21.7 | 3.85 | 7.8...13.3 | 3n | β |
| 1898.83 | 19.8 | 4.17 | 7.9...13.3 | 3n | A |

Discovered with the 36-inch. It is 1<sup>m</sup> 24<sup>s</sup> f and 9' n of ζ *Aquarii*.

[β (XVIII)...β (3113)...β (*Pub. L. O.* II)...Aitken (3585)...]

**β 702.** δ *Cephei*

R.A. 22<sup>h</sup> 24<sup>m</sup> 43<sup>s</sup> }  
Decl. + 57° 48' }

A and B

|         |       |       |         |    |   |
|---------|-------|-------|---------|----|---|
| 1878.65 | 285.7 | 19.37 | ...13.0 | 2n | β |
| 1898.51 | 284.2 | 19.84 | ...13.0 | 3n | β |

A and C (=  $\Sigma$  58 App. 1)

|         |       |       |        |     |                |          |
|---------|-------|-------|--------|-----|----------------|----------|
| 1835.15 | 192.0 | 40.87 | 3.0... | 5.3 | 6 <sup>n</sup> | $\Sigma$ |
| 1867.78 | 191.9 | 40.83 | 3.2... | 5.9 | 5 <sup>n</sup> | $\Delta$ |
| 1878.65 | 191.9 | 40.88 | ...    |     | 1 <sup>n</sup> | $\beta$  |
| 1883.32 | 191.6 | 40.88 | ...    |     | 5 <sup>n</sup> | Fr       |
| 1898.51 | 191.5 | 40.94 | ...    |     | 2 <sup>n</sup> | $\beta$  |

The small star was discovered with the 18½-inch. The bright stars appear to have a common proper motion, but it is small, 0".010 in the direction of 151°9 (AUWERS). The larger star is supposed to be variable to the extent of about 1½ mag. in 5<sup>h</sup> 8<sup>m</sup> 47<sup>s</sup>.

[ $\beta$  (x)... $\beta^1$ ...]

The wide pair is  $\Sigma$  58 App. I = H<sup>v</sup> v. 14 = Sh 347 = O $\Sigma$  (App.) 235. A few only of the measures are given. The observations will be found in the double-star catalogues referred to, and in the following:

[Powell (*Mem. R. A. S.* xxv)...*Radcliffe Obsns.* xx, xxvi...Schur (2255)...Golding (2257)...Ball (*Dunsink Obsns.* v)...A (11)...Jedrzejewicz (2345)...Maiebekto (*Double Star Meas.* 1892)...Franz (2650)...Glaseapp (11)...]

$\beta$  703.  $\alpha$  *Lacertae*

R.A. 22<sup>h</sup> 26<sup>m</sup> 21<sup>s</sup> }  
Decl. + 49° 40' }

|         |       |       |     |      |                |                |         |
|---------|-------|-------|-----|------|----------------|----------------|---------|
| 1878.02 | 298.8 | 30.16 | 4   | ...  | 12.0           | 2 <sup>n</sup> | $\beta$ |
| 1888.71 | 297.8 | 31.59 | ... | 12.2 | 3 <sup>n</sup> | $\beta$        |         |

Discovered with the 18½-inch. AUWERS gives the proper motion of this star, 0".127 in the direction of 88°2. The companion is not moving with it, and it is therefore only an optical pair.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (2957)... $\beta$  (*Pub. L. O.* 11)...]

$\beta$  479. D.M. (67°) 1444

R.A. 22<sup>h</sup> 26<sup>m</sup> 29<sup>s</sup> }  
Decl. + 67° 36' }

|         |      |      |         |      |                |          |
|---------|------|------|---------|------|----------------|----------|
| 1877.10 | 29.8 | 2.41 | 9.7...  | 11.2 | 2 <sup>n</sup> | $\Delta$ |
| 1893.83 | 31.5 | 2.39 | 10.0... | 11.0 | 3 <sup>n</sup> | W        |
| 1898.70 | 29.8 | 2.22 | 9.8...  | 10.5 | 1 <sup>n</sup> | D        |

Discovered with the 6-inch. One of a small equilateral triangle of stars in the field; the other two brighter. This in D.M. is 9.2 m.

[ $\beta$  (1x)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\Delta$  (1)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  704. D.M. (66°) 1518

R.A. 22<sup>h</sup> 27<sup>m</sup> 3<sup>s</sup> }  
Decl. + 66° 56' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1877.55 | 207.3 | 2.3± | 9.0... | 11.5 | 1 <sup>n</sup> | $\beta$ |
| 1892.76 | 205.4 | 2.27 | 9.0... | 11.5 | 1 <sup>n</sup> | W       |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^1$ ...Wilson ( )...]

$\beta$  381. W<sup>2</sup> XXII. 580

R.A. 22<sup>h</sup> 27<sup>m</sup> 22<sup>s</sup> }  
Decl. + 32° 47' }

|         |       |      |        |      |                |          |
|---------|-------|------|--------|------|----------------|----------|
| 1877.04 | 230.6 | 1.48 | 8.5... | 10.0 | 3 <sup>n</sup> | $\Delta$ |
| 1882.68 | 235.5 | 1.54 | 8.0... | 10.5 | 1 <sup>n</sup> | Perry    |
| 1891.65 | 232.7 | 1.44 | 8.5... | 9.9  | 3 <sup>n</sup> | $\beta$  |

Discovered with the 6-inch. Fixed.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* 11)...Perry (*Eng. Mech.* xxxvi, 65)...]

$\beta$  770. Lalande 44060

R.A. 22<sup>h</sup> 27<sup>m</sup> 47<sup>s</sup> }  
Decl. — 23° 13' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1879.75 | 360±  | 1.2± | 8.5... | 10.8 | 1 <sup>n</sup> | $\beta$ |
| 1891.88 | 352.8 | 1.36 | 8.2... | 12.3 | 3 <sup>n</sup> | $\beta$ |
| 1898.66 | 348.5 | 1.43 | 8.0... | 12.0 | 1 <sup>n</sup> | Cg      |

Discovered with the 6-inch on Mt. Hamilton in 1879.

[ $\beta$  (xi)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 1, 11)...Cogshall ( )...]

$\beta$  77. S.D. (2°) 5780

R.A. 22<sup>h</sup> 27<sup>m</sup> 50<sup>s</sup> }  
Decl. — 2° 24' }

A and B

|         |       |      |        |      |                |          |
|---------|-------|------|--------|------|----------------|----------|
| 1876.05 | 213.0 | 2.65 | 9.5... | 10.3 | 3 <sup>n</sup> | $\Delta$ |
| 1879.58 | 213.8 | 2.62 | 8.5... | 9.0  | 1 <sup>n</sup> | Cin      |
| 1885.82 | 213.3 | 2.65 | 8.0... | 9.5  | 1 <sup>n</sup> | W        |
| 1886.81 | 212.0 | 2.71 | 8.1... | 8.7  | 4 <sup>n</sup> | LM       |
| 1888.72 | 212.4 | 2.46 | 8.2... | 9.3  | 2 <sup>n</sup> | Lv       |
| 1888.75 | 213.3 | 2.77 | 8.5... | 8.7  | 3 <sup>n</sup> | $\beta$  |
| 1890.78 | 211.5 | 2.88 | 9.5... | 10.3 | 3 <sup>n</sup> | T        |
| 1892.63 | 209.6 | 2.75 | ...    |      | 2 <sup>n</sup> | T        |
| 1898.59 | 211.1 | 2.61 | 8.8... | 9.5  | 4 <sup>n</sup> | D        |
| 1898.62 | 215.0 | 2.75 | ...    |      | 1 <sup>n</sup> | Cg       |
| 1898.63 | 214.0 | 2.71 | 8.0... | 8.5  | 2 <sup>n</sup> | Bd       |

## A and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1888.75 | 225.6 | 28.80 | ...11.0 | 3 <sup>n</sup> | $\beta$ |
| 1898.59 | 224.4 | 28.58 | ...10.8 | 4 <sup>n</sup> | D       |
| 1898.62 | 226.0 | 28.23 | ...     | 1 <sup>n</sup> | Cg      |
| 1898.63 | 225.1 | 28.33 | ...10   | 2 <sup>n</sup> | Bd      |

Discovered with the 6-inch. No sensible change. This is 12' s of 60 *Aquarii*.

[ $\beta$  (1)... $\beta$  (*Mon. Not.* xxxiii, 351)... $\beta$  (2875)... $\beta$  (*Pub. L. O. II*)... $\Delta$  (1)...Cin<sup>s</sup>...Wilson (Cin<sup>10</sup>)...LM...Lv<sup>s</sup>...Tarrant (3186)...Boothroyd and Cogshall ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

 $\beta$  705. Lalande 44111

R.A. 22<sup>h</sup> 28<sup>m</sup> 18<sup>s</sup> }  
Decl. + 40° 12' }

|         |       |           |            |                |            |
|---------|-------|-----------|------------|----------------|------------|
| 1878.53 | 158.0 | 1.5 $\pm$ | 7.0...12.5 | 1 <sup>n</sup> | $\beta$    |
| 1885.64 |       | Single    |            | 2 <sup>n</sup> | H $\Sigma$ |

Discovered with the 18½-inch. A difficult object with that aperture. I could not see it on one night in 1898 with the 40-inch. It should be watched with large instruments.

[ $\beta$  (x)... $\beta^s$ ...H $\Sigma$  ( )...]

 $\beta$  707. Lalande 44138

R.A. 22<sup>h</sup> 28<sup>m</sup> 46<sup>s</sup> }  
Decl. + 38° 43' }

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1878.47 | 46.6 | 1.86 | 8.0...12.5 | 1 <sup>n</sup> | $\beta$ |
| 1899.55 | 52.5 | 1.45 | 8.5...12.0 | 1 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^s$ ...]

 $\beta$  706. D.M. (67°) 1450

R.A. 22<sup>h</sup> 29<sup>m</sup> 30<sup>s</sup> }  
Decl. + 67° 53' }

## A and B

|         |      |      |            |                |         |
|---------|------|------|------------|----------------|---------|
| 1877.55 | 18.1 | "    | 8.0...11.8 | 1 <sup>n</sup> | $\beta$ |
| 1881.63 | 16.9 | 2.79 | 7.9...12.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.88 | 11.8 | 2.30 | 8.1...12.7 | 2 <sup>n</sup> | $\beta$ |
| 1898.64 | 17.2 | 2.66 | 7.7...10.7 | 2 <sup>n</sup> | $\beta$ |

## A and C

|         |       |       |         |                |         |
|---------|-------|-------|---------|----------------|---------|
| 1877.55 | 253.5 | 28.5  | ...10.0 | 1 <sup>n</sup> | $\beta$ |
| 1881.67 | 235.8 | 29.17 | ...11.0 | 2 <sup>n</sup> | $\beta$ |
| 1891.88 | 252.9 | 29.95 | ...11.7 | 2 <sup>n</sup> | $\beta$ |
| 1898.64 | 252.9 | 29.77 | ...10.2 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. The angle of AC in my measures of 1881 is undoubtedly an error in printing, and should be 255°8, but I have not the original record to refer to.  $\beta$  708 is closely *f*.

[ $\beta$  (x)... $\beta^s$ ... $\beta^4$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. II*)...]

 $\beta$  708. D.M. (67°) 1451

R.A. 22<sup>h</sup> 30<sup>m</sup> 42<sup>s</sup> }  
Decl. + 67° 53' }

|         |       |         |            |                |         |
|---------|-------|---------|------------|----------------|---------|
| 1877.55 | 288.6 | 8 $\pm$ | 9.0...11.5 | 1 <sup>n</sup> | $\beta$ |
| 1892.78 | 289.6 | 8.78    | 9.0...12.0 | 1 <sup>n</sup> | W       |
| 1898.63 | 288.4 | 8.56    | 8.7...12.0 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch.  $\beta$  706 is in the field *p*.

[ $\beta$  (x)... $\beta^s$ ...Wilson ( )...]

 $\beta$  175. D.M. (74°) 970

R.A. 22<sup>h</sup> 29<sup>m</sup> 49<sup>s</sup> }  
Decl. + 74° 24' }

|         |       |      |             |                |          |
|---------|-------|------|-------------|----------------|----------|
| 1875.65 | 138.9 | 1.44 | 10.3...10.0 | 3 <sup>n</sup> | $\Delta$ |
| 1893.82 | 138.4 | 1.58 | 10.0...10.0 | 3 <sup>n</sup> | W        |

Discovered with the 6-inch.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (1)...Wilson ( )...]

 $\beta$  771.  $\sigma^2$  *Gruis*

R.A. 22<sup>h</sup> 29<sup>m</sup> 58<sup>s</sup> }  
Decl. - 41° 13' }

|         |       |           |            |                |         |
|---------|-------|-----------|------------|----------------|---------|
| 1879.64 | 270.± | 1.3 $\pm$ | 6.0...10.5 |                | $\beta$ |
| 1891.82 | 259.1 | 2.22      | ...        | 2 <sup>n</sup> | Sel     |
| 1891.87 | 263.1 | 2.46      | 6.7...13.0 | 3 <sup>n</sup> | $\beta$ |
| 1897.04 | 265.1 | 2.38      | 7.0...12.5 | 3 <sup>n</sup> | See     |

Discovered with the 6-inch at Mt. Hamilton in 1879. The *Cape Catalogue* gives this star a proper motion of 0.096 in the direction of 339°4. The Cordoba magnitude is 6.0.

[ $\beta$  (XI)... $\beta^s$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O. I, II*)...Sellors (3154)...See (3496)...]

**β 1092.** Radcliffe 5777

R.A. 22<sup>h</sup> 33<sup>m</sup> 3<sup>s</sup> }  
Decl. + 72° 15' }

A and B

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1889.30 | 237.1 | 0.32 | 7.5 ... 7.5 | 2n | β |
| 1899.71 | 229.5 | 0.14 | 7+ ... 7+   | 1n | A |

AB and C (= H 3133)

|         |       |       |              |    |                |
|---------|-------|-------|--------------|----|----------------|
| 1830    | 272.0 | 12 ±  | 8.5 ... 13   | 1n | H <sup>2</sup> |
| 1889.31 | 264.0 | 29.19 | ... 12.2     | 3n | β              |
| 1898.71 | 263.6 | 30.35 | 7.2 ... 12.3 | 3n | A              |
| 1898.77 | 263.2 | 30.07 | 7.0 ... 10.8 | 1n | β              |

AB and D (= H<sup>1</sup> V. 94)

|         |       |       |             |    |                |
|---------|-------|-------|-------------|----|----------------|
| 1783.20 | 135.2 | 41.67 | ...         | 1n | H <sup>1</sup> |
| 1830    | 40.4  | 30 ±  | 8.5 ... 9.5 | 1n | H <sup>2</sup> |
| 1875.13 | 137.6 | 42.18 | 7.0 ... 7.7 | 3n | Δ              |
| 1883.18 | 137.7 | 42.19 | 7.0 ... 7.6 | 5n | Fr             |
| 1889.31 | 137.4 | 42.17 | 7.2 ... 7.2 | 3n | β              |
| 1898.66 | 137.8 | 42.42 | 7.2 ... 7.2 | 2n | A              |
| 1898.77 | 137.0 | 41.97 | ... 8.0     | 1n | β              |

The close pair was discovered with the 36-inch. The wide pair is evidently unchanged. This is, H<sup>1</sup> V. 94 = H 3133 = OΣ (App.) 236. There is an error of 90° in the angle of D as given by HERSCHEL II in his *Fifth Catalogue*. There is also an error of 7<sup>m</sup> R.A. and 29' Decl. in the place of this star, as given by HERSCHEL I. The foregoing are all the measures of the distant companions. D is Radcliffe 5779. The very recent measures of AB by AITKEN with the 36-inch (power 1900) show decided change in angle and distance. It is probably in rapid motion.

[β (xv)...β (2929)...β (Pub. L. O. II)...Franz (2650)...Δ (i)...Aitken ( )...]

**β 277.** Lalande 44348

R.A. 22<sup>h</sup> 34<sup>m</sup> 14<sup>s</sup> }  
Decl. + 40° 45' }

|         |       |      |             |    |       |
|---------|-------|------|-------------|----|-------|
| 1875.35 | 199.4 | 0.50 | 8.2 ... 8.4 | 2n | Δ     |
| 1879.46 | 199.3 | 0.59 | 8.0 ... 8.3 | 1n | β     |
| 1882.68 | 168.5 | 0.55 | 8.2 ... 8.4 | 1n | Perry |
| 1893.54 | 201.9 | 0.49 | 8.0 ... 8.4 | 1n | Lv    |
| 1893.65 | 204.6 | 0.58 | 8.2 ... 8.4 | 3n | W     |

Discovered with the 6-inch. Very little, if any, change. A faint star about 30" distant. It is the *p* star of a wide pair.

[β (v)...β (Mon. Not. xxxv, 31)...β<sup>3</sup>...Δ (i)...Perry (Eng. Mech. xxxvi, 65)...Lv (A. J. 382)...Wilson ( )...]

**β 480.** W<sup>1</sup> XXII. 716

R.A. 22<sup>h</sup> 35<sup>m</sup> 18<sup>s</sup> }  
Decl. + 4° 6' }

|         |      |      |             |    |   |
|---------|------|------|-------------|----|---|
| 1877.51 | 65.6 | 0.86 | 9.0 ... 9.8 | 3n | Δ |
| 1891.56 | 63.5 | 0.80 | 8.9 ... 9.2 | 3n | β |

Discovered with the 6-inch. So far unchanged.

[β (ix)...β (Mon. Not. xxxviii, 78)...β (3114)...β (Pub. L. O. II)...Δ (i)...]

**β 1265.** D.M. (60°) 2425

R.A. 22<sup>h</sup> 35<sup>m</sup> 18<sup>s</sup> }  
Decl. + 60° 47' }

B and C

|         |       |      |             |    |   |
|---------|-------|------|-------------|----|---|
| 1891.58 | 251.4 | 0.56 | 9.1 ... 9.2 | 3n | β |
| 1898.79 | 251.2 | 0.56 | 9.7 ... 9.7 | 3n | A |

A and BC

|         |       |       |         |    |   |
|---------|-------|-------|---------|----|---|
| 1891.58 | 346.3 | 39.69 | 8.8 ... | 3n | β |
| 1898.79 | 346.7 | 39.76 | 9.0 ... | 3n | A |

Discovered with the 36-inch. So far without sensible change.

[β (xviii)...β (3113)...β (Pub. L. O. II)...Aitken ( )...]

**β 709.** S.D. (4°) 5487

R.A. 22<sup>h</sup> 35<sup>m</sup> 26<sup>s</sup> }  
Decl. — 3° 11' }

|         |      |       |             |    |    |
|---------|------|-------|-------------|----|----|
| 1878.17 | 8.9  | 2.04  | 8.5 ... 9.7 | 3n | β  |
| 1886.79 | 6.0  | 2.13  | 8.2 ... 9.0 | 2n | LM |
| 1888.89 | 5.1  | 1.50  | 8.3 ... 9.5 | 1n | Lv |
| 1893.71 | 14.1 | 1.6 ± | 9.1 ... 9.6 | 2n | G1 |
| 1896.81 | 5.4  | 2.04  | 8.3 ... 9.4 | 3n | Lv |
| 1898.64 | 6.0  | 1.99  | 8.0 ... 8.7 | 3n | Cg |

Discovered with the 18½-inch. Apparently unchanged.

[β (x)...β<sup>2</sup>...LM...Lv<sup>2</sup>...Lv (A. J. 407)...Glasenapp (III)...Cogshall ( )...]

**$\beta$  845.** O. Arg. N. 24536

R.A.  $22^{\text{h}} 36^{\text{m}} 27^{\text{s}}$  }  
Decl.  $+67^{\circ} 53'$  }

## A and B

|         |       |      |            |            |         |
|---------|-------|------|------------|------------|---------|
| 1881.53 | 195.4 | 5.69 | 8.2...12.1 | 3 <i>n</i> | $\beta$ |
| 1888.06 | 197.1 | 6.13 | 8.5...11.9 | 3 <i>n</i> | Com     |
| 1892.92 | 195.3 | 6.02 | 8.0...11.5 | 1 <i>n</i> | W       |

## A and C

|         |      |       |         |            |         |
|---------|------|-------|---------|------------|---------|
| 1881.54 | 9.1  | 15.50 | ...13.2 | 2 <i>n</i> | $\beta$ |
| 1887.79 | 11.9 | 15.38 | ...11.7 | 3 <i>n</i> | Com     |
| 1892.92 | 12.0 | 15.39 | ...12.0 | 1 <i>n</i> | W       |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...Wilson ( )...]

 **$\beta$  710.** D.M. ( $28^{\circ}$ ) 4439

R.A.  $22^{\text{h}} 36^{\text{m}} 57^{\text{s}}$  }  
Decl.  $+29^{\circ} 5'$  }

|         |       |           |            |            |         |
|---------|-------|-----------|------------|------------|---------|
| 1878.66 | 231.2 | 0.59      | 8.5... 8.6 | 1 <i>n</i> | $\beta$ |
| 1889.89 | 232.5 | 0.4 $\pm$ | ...        | 9 <i>n</i> | Sp      |
| 1891.76 | 235.3 | 0.39      | 8.3... 8.5 | 2 <i>n</i> | $\beta$ |
| 1895.81 | 232.3 | 0.43      | ...        | 1 <i>n</i> | Lew     |
| 1897.76 | 237.8 | 0.47      | ...        | 1 <i>n</i> | Lew     |
| 1898.64 | 239.3 | 0.32      | 8.8... 8.8 | 3 <i>n</i> | A       |
| 1898.67 | 235.1 | 0.39      | ...        | 3 <i>n</i> | Lew     |

Discovered with the  $18\frac{1}{2}$ -inch. There is little change in the angle, but the distance is less, and it is probably a binary. It is about  $30'$  s of  $\eta$  Pegasi.

[ $\beta$  (x)... $\beta^4$ ... $\beta$  (3114) (*Pub. L. O.* II)...Sp (III)...Lewis (*Mon. Not.* LVI, 359; LIX, 400) (*Greenwich Obsns.* 1895)...Aitken (3585)...Lewis ( )...]

 **$\beta$  176.** D.M. ( $38^{\circ}$ ) 4848

R.A.  $22^{\text{h}} 37^{\text{m}} 5^{\text{s}}$  }  
Decl.  $+38^{\circ} 40'$  }

|         |      |      |            |            |          |
|---------|------|------|------------|------------|----------|
| 1877.78 | 42.0 | 2.50 | 8.7... 9.0 | 1 <i>n</i> | $\beta$  |
| 1878.18 | 39.7 | 1.89 | 8.8... 9.3 | 3 <i>n</i> | $\Delta$ |
| 1883.69 | 49.3 | 1.84 | 8.9... 9.9 | 5 <i>n</i> | En       |
| 1892.73 | 41.9 | 2.21 | 9.0... 9.3 | 1 <i>n</i> | W        |
| 1899.13 | 43.2 | 2.26 | 8.8... 9.1 | 4 <i>n</i> | D        |

Discovered with the 6-inch.  $\Sigma$  2942 (= O $\Sigma$  478) is  $1^{\text{m}} 35^{\text{s}}$  f and  $10'$  n.

[ $\beta$  (III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^1$ ... $\Delta$  (1)...Engelmann (2678)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  1144.**  $\eta$  Pegasi

R.A.  $22^{\text{h}} 37^{\text{m}} 23^{\text{s}}$  }  
Decl.  $+29^{\circ} 36'$  }

## B and C

|         |      |           |             |             |         |
|---------|------|-----------|-------------|-------------|---------|
| 1889.53 | 83.3 | 0.29      | 10.1...10.1 | 4 <i>n</i>  | $\beta$ |
| 1890.23 | 63.9 | 0.3 $\pm$ | ...         | 12 <i>n</i> | Sp      |
| 1892.13 | 62.0 | 0.3 $\pm$ | ...         | 4 <i>n</i>  | Sp      |
| 1893.73 | 77.3 | 0.3 $\pm$ | ...         | 1 <i>n</i>  | W       |
| 1894.06 | 82.3 | 0.33      | ...         | 9 <i>n</i>  | Bar     |
| 1897.76 | 82.9 | 0.24      | ...         | 1 <i>n</i>  | Lew     |
| 1898.63 | 81.6 | 0.28      | 9.3... 9.3  | 4 <i>n</i>  | A       |
| 1898.67 | 90.0 | 0.36      | ...         | 3 <i>n</i>  | Lew     |

A and BC (= H<sup>1</sup> VI. 21 = S 816)

|         |       |       |             |            |         |
|---------|-------|-------|-------------|------------|---------|
| 1824.85 | 338.0 | 89.82 | 4 ... 12-15 | 2 <i>n</i> | S       |
| 1889.53 | 339.0 | 90.38 | ...         | 4 <i>n</i> | $\beta$ |
| 1893.73 | 339.0 | 90.25 | ...         | 1 <i>n</i> | W       |
| 1897.76 | 339.1 | 90.42 | ...         | 2 <i>n</i> | Bar     |
| 1898.60 | 338.6 | 91.04 | ...         | 2 <i>n</i> | A       |

The close pair was discovered with the 36-inch. The measures show no change. The wide pair was first noted by H<sup>1</sup>, but not measured. The only measures preceding my own are those of SOUTH in 1824. The principal star has a proper motion of  $0^{\circ}.038$  in the direction of  $183^{\circ}.9$  (AUWERS).

[ $\beta$  (XVI)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* II)...Sp (III)...Wilson ( )...Barnard (*A. J.* 447)...Lewis (*Mon. Not.* LIX, 400)...Aitken (3585)...Barnard ( )...]

 **$\beta$  450.** B.A.C. 7931

R.A.  $22^{\text{h}} 38^{\text{m}} 40^{\text{s}}$  }  
Decl.  $+38^{\circ} 50'$  }

## A and C

|         |       |       |          |            |         |
|---------|-------|-------|----------|------------|---------|
| 1876.79 | 232.0 | 10.23 | 7.0...12 | 1 <i>n</i> | $\beta$ |
| 1878.13 | 232.4 | 10.93 | ...12    | 2 <i>n</i> | $\beta$ |
| 1879.47 | 233.4 | 11.08 | ...12.5  | 1 <i>n</i> | $\beta$ |
| 1893.53 | 231.8 | 10.86 | ...12.5  | 1 <i>n</i> | Lv      |

A and B (= Σ 2942)

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1831.61 | 282.1 | 2.66 | 7.0... | 9.2 | 4 <sup>n</sup> | Σ   |
| 1869.52 | 280.3 | 2.83 | 6.2... | 8.5 | 6 <sup>n</sup> | Δ   |
| 1878.97 | 280.2 | 2.68 | 6.8... | 8.5 | 2 <sup>n</sup> | β   |
| 1883.21 | 282.0 | 3.04 | 6.8... | 9.6 | 6 <sup>n</sup> | En  |
| 1895.91 | 277.1 | 2.85 | ...    |     | 2 <sup>n</sup> | Maw |

The small star was noted with the 18½-inch. There is no change in AB (=Σ 2942 = H 1802 = OΣ 478). Only a few of the measures are given.

[β (VIII)...β (*Am. Jour. Sci.* July 1877)...β<sup>1</sup>...β<sup>3</sup>...Lv (*A. J.* 382)...Madler (*Fixstern-Systeme 1*) (*Dorpat Obsns.* XI)...Dawes (*Mem. R. A. S.* XXXV)...*Obsns. at Barclay's Obsy.* I...OΣ (*Poulkova Obsns.* IX)...Δ (II)...Δ (1736,1979)...Wilson and Seabroke (*Mem. R. A. S.* XLII)...Bigourdan (*Paris Obsns.* 1883)...Engelmann (2678)...Glase-napp (III)...Maw (*Mem. R. A. S.* LIII)...]

β 711. D.M. (10°) 4812

R.A. 22<sup>h</sup> 39<sup>m</sup> 29<sup>s</sup> }  
Decl. + 10° 34' }

|         |      |      |        |        |                |     |
|---------|------|------|--------|--------|----------------|-----|
| 1878.59 | 79.9 | 0.72 | 8.5... | 10.5   | 1 <sup>n</sup> | β   |
| 1891.88 | 55.3 | 0.83 | 9.0... | 9.9    | 3 <sup>n</sup> | β   |
| 1893.70 | 53.4 | 1.24 | 9.5... | 10.5   | 1 <sup>n</sup> | W   |
| 1897.76 | 46.4 | 0.72 | ...    |        | 1 <sup>n</sup> | Bow |
| 1897.83 | 46.6 | 0.96 | 10     | ... 11 | 1 <sup>n</sup> | Br  |
| 1898.73 | 42.7 | 1.00 | ...    |        | 1 <sup>n</sup> | Bow |
| 1898.74 | 47.6 | 0.99 | ...    |        | 3 <sup>n</sup> | A   |
| 1898.79 | 45.1 | 1.00 | ...    |        | 1 <sup>n</sup> | Bry |
| 1898.89 | 39.8 | 0.82 | ...    |        | 1 <sup>n</sup> | Lew |

Discovered with the 18½-inch. There is considerable angular motion, an unusual condition in a pair of stars of this magnitude, and suggesting comparative nearness. The magnitude in D.M. is 9.1. It is 27<sup>s</sup> p a 7 m star.

[β (X)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* II)...Wilson ( )...Aitken (3585)...Lewis, Bowyer and Bryant (*Mon. Not.* LIX, 400)...Brown ( )...]

β 1037. W<sup>1</sup> XXII. 854

R.A. 22<sup>h</sup> 41<sup>m</sup> 56<sup>s</sup> }  
Decl. + 12° 22' }

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1888.81 | 224.4 | 0.66 | 8.7... | 10.8 | 4 <sup>n</sup> | β |
| 1899.52 | 215.2 | 0.72 | 8.9... | 11.5 | 1 <sup>n</sup> | A |

Discovered with the 36-inch. The p star of a wide pair. Change in angle ?

[β (XIV)...β (2875)...β (*Pub. L. O.* II)...Aitken ( )...]

β 1219. S.D. (11°) 5931

R.A. 22<sup>h</sup> 42<sup>m</sup> 27<sup>s</sup> }  
Decl. - 11° 42' }

|         |       |      |        |     |                |   |
|---------|-------|------|--------|-----|----------------|---|
| 1890.82 | 307.9 | 0.54 | 8.7... | 9.4 | 3 <sup>n</sup> | β |
| 1896.87 | 299.3 | 0.48 | ...    |     | 3 <sup>n</sup> | A |

Discovered with the 12-inch; a difficult pair with that aperture. There is a 6" pair np 5'.

[β (XVII)...β (3047)...β (*Pub. L. O.* II)...Aitken (3466)...]

β 1145. O. Arg. N. 24690

R.A. 22<sup>h</sup> 42<sup>m</sup> 45<sup>s</sup> }  
Decl. + 57° 55' }

A and B

|         |       |      |        |      |                |   |
|---------|-------|------|--------|------|----------------|---|
| 1889.59 | 153.0 | 1.03 | 8.2... | 11.0 | 3 <sup>n</sup> | β |
| 1898.88 | 156.3 | 1.06 | 8.0... | 11.2 | 2 <sup>n</sup> | A |

A and C

|         |       |       |     |      |                |   |
|---------|-------|-------|-----|------|----------------|---|
| 1889.59 | 179.5 | 21.99 | ... | 9.5  | 3 <sup>n</sup> | β |
| 1898.82 | 179.7 | 22.27 | ... | 10.0 | 3 <sup>n</sup> | A |

Discovered with the 36-inch.

[β (XVI)...β (2956)...β (*Pub. L. O.* II)...Aitken (3585)...]

β 1146. W<sup>2</sup> XXII. 971

R.A. 22<sup>h</sup> 42<sup>m</sup> 49<sup>s</sup> }  
Decl. + 30° 28' }

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1889.55 | 335.3 | 0.23 | 7.2... | 8.2 | 3 <sup>n</sup> | β   |
| 1897.80 | 331.1 | 0.15 | ...    |     | 1 <sup>n</sup> | Lew |
| 1899.56 | 313.6 | 0.18 | 7.6... | 8.0 | 4 <sup>n</sup> | A   |

Discovered with the 36-inch. Change in angle is probable.

[β (XVI)...β (2956)...β (*Pub. L. O.* II)...Lewis (*Mon. Not.* LIX, 400)...Aitken ( )...]

β 846. Lalande 44688

R.A. 22<sup>h</sup> 44<sup>m</sup> 34<sup>s</sup> }  
Decl. + 23° 54' }

|         |      |      |        |      |                |     |
|---------|------|------|--------|------|----------------|-----|
| 1881.57 | 93.4 | 1.73 | 8.6... | 12.2 | 3 <sup>n</sup> | β   |
| 1886.84 | 94.8 | 2.11 | ...    |      | 3 <sup>n</sup> | UL  |
| 1888.82 | 92.2 | 1.67 | 8.2... | 12.3 | 3 <sup>n</sup> | Com |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β<sup>4</sup>...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...]

**β 177.** O, Arg. S. 22454

R.A. 22<sup>h</sup> 45<sup>m</sup> 55<sup>s</sup> }  
Decl. — 22° 21' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1867.86 | 276.6 | 3.07 | 9 ... 9     | 1 <sup>n</sup> | Hd  |
| 1876.51 | 278.7 | 2.63 | 7.5 ... 8.0 | 3 <sup>n</sup> | Cin |
| 1877.71 | 278.6 | 2.78 | 8.0 ... 8.0 | 2 <sup>n</sup> | Cin |
| 1892.70 | 278.6 | 2.94 | 8.2 ... 8.2 | 2 <sup>n</sup> | W   |
| 1893.84 | 276.1 | 2.55 | 8 ... 8     | 2 <sup>n</sup> | Sel |
| 1898.68 | 276.4 | 2.79 | 8.0 ... 8.1 | 3 <sup>n</sup> | Bd  |

Discovered with the 6-inch. Without change.

[β (III)...β (*Mon. Not.* xxxiv, 59)...*Annals Harvard Obsy.* XIII...Cin<sup>3</sup>...Cin<sup>4</sup>...Sellors (3240)...Wilson ( )...Boothroyd ( )...]

**β 451.** 15 *Lacertae*

R.A. 22<sup>h</sup> 46<sup>m</sup> 37<sup>s</sup> }  
Decl. + 42° 40' }

|         |       |       |             |                |   |
|---------|-------|-------|-------------|----------------|---|
| 1888.71 | 128.5 | 29.60 | 5 ... 12.0  | 3 <sup>n</sup> | β |
| 1898.61 | 130.6 | 29.24 | 5.4 ... 9.6 | 4 <sup>n</sup> | D |
| 1899.55 | 131.1 | 28.84 | ... 12.5    | 2 <sup>n</sup> | β |

Discovered with the 18½-inch. This star has a proper motion of 0".097 in the direction of 85°9 (AUWERS).

[β (VIII)...β (*Am. Jour. Sci.* July 1877)...β (2875)...β (*Pub. L. O.* II)...Doolittle (*Pub. Flower Obsy.* I)...]

**β 382.** B.A.C. 7983

R.A. 22<sup>h</sup> 48<sup>m</sup> 18<sup>s</sup> }  
Decl. + 44° 7' }

A and B

|         |       |      |             |                |       |
|---------|-------|------|-------------|----------------|-------|
| 1876.39 | 205.7 | 1.07 | 6.0 ... 8.0 | 7 <sup>n</sup> | Δ     |
| 1881.70 | 210.1 | 1.09 | 6.9 ... 8.5 | 3 <sup>n</sup> | β     |
| 1882.68 | 219.0 | 1.13 | 6 ... 8     | 1 <sup>n</sup> | Perry |
| 1883.74 | 217.1 | 1.33 | 6.1 ... 8.0 | 6 <sup>n</sup> | En    |
| 1885.64 | 210.3 | 1.11 | ...         | 2 <sup>n</sup> | HΣ    |
| 1889.44 | 219.3 | 1.03 | ...         | 2 <sup>n</sup> | Maw   |
| 1889.53 | 217.6 | 0.98 | 7 3 ... 8.8 | 3 <sup>n</sup> | β     |
| 1893.53 | 221.3 | 0.91 | 6 2 ... 8.0 | 3 <sup>n</sup> | Lv    |
| 1893.97 | 226.0 | 1.00 | ...         | 8 <sup>n</sup> | Bar   |
| 1893.99 | 223.5 | 0.87 | ...         | 5 <sup>n</sup> | Sp    |
| 1896.56 | 223.8 | 0.73 | ...         | 1 <sup>n</sup> | Lew   |
| 1897.82 | 225.7 | 0.97 | ...         | 1 <sup>n</sup> | Dy    |
| 1897.86 | 221.2 | 1.07 | ...         | 3 <sup>n</sup> | A     |
| 1897.96 | 225.1 | 0.64 | ...         | 1 <sup>n</sup> | Bow   |
| 1898.00 | 228.9 | 1.06 | ...         | 1 <sup>n</sup> | Maw   |

## AB and C (= H 1828)

|         |       |       |            |                |                |
|---------|-------|-------|------------|----------------|----------------|
| 1828    | 350.4 | 20±   | 6-7 ... 11 | 1 <sup>n</sup> | H <sup>2</sup> |
| 1876.24 | 353.6 | 26.43 | ... 10.7   | 3 <sup>n</sup> | Δ              |
| 1881.70 | 353.8 | 27.01 | ... 10.7   | 3 <sup>n</sup> | β              |
| 1882.68 | 357.0 | 27.78 | ...        | 1 <sup>n</sup> | Perry          |
| 1885.68 | 354.3 | 26.85 | ...        | 1 <sup>n</sup> | HΣ             |
| 1889.53 | 353.7 | 26.92 | ... 10.0   | 2 <sup>n</sup> | β              |
| 1898.02 | 354.4 | 27.18 | ...        | 1 <sup>n</sup> | Maw            |

The close pair was discovered with the 6-inch. This is a binary in direct angular motion. A naked-eye star in *Lacerta*; the Harvard photometric magnitude is 5.7. The distant companion discovered by HERSCHEL is evidently fixed. It is called blue by Δ. All the measures of this star are given. The principal star is Groombridge 3918.

[β (VI)...β (2062,2957)...β<sup>4</sup>...β (*Pub. L. O.* II)...Δ (1)...Perry (*Eng. Mech.* xxxvi, 65)...Engelmann (2678)...Maw (*Mem. R. A. S. I.*)...Lv (*A. J.* 382)...Barnard (*A. J.* 447)...Sp (III)...Aitken (*A. J.* 429)...Lewis, Dyson and Bowyer (*Mon. Not.* LIX, 400)...HΣ ( )...Maw (*Mem. R. A. S.* LIII)...]

**β 847.** W<sup>2</sup> XXII. 1103

R.A. 22<sup>h</sup> 48<sup>m</sup> 45<sup>s</sup> }  
Decl. + 19° 42' }

|         |      |      |              |                |     |
|---------|------|------|--------------|----------------|-----|
| 1881.64 | 37.4 | 6.39 | 8.5 ... 9.2  | 3 <sup>n</sup> | β   |
| 1883.79 | 37.5 | 6.51 | 8.5 ... 9.7  | 5 <sup>n</sup> | En  |
| 1886.85 | 36.4 | 6.69 | ...          | 4 <sup>n</sup> | UL  |
| 1887.82 | 36.0 | 6.75 | 8.3 ... 9.2  | 3 <sup>n</sup> | Com |
| 1891.88 | 35.5 | 6.41 | 8.6 ... 10.7 | 1 <sup>n</sup> | β   |

Discovered with the 15½-inch at the Washburn Observatory.

[β (XII)...β<sup>4</sup>...β (3114)...β (*Pub. L. O.* II)...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...Engelmann (2678)...]

**β 178.** *Aquarii* 252

R.A. 22<sup>h</sup> 48<sup>m</sup> 57<sup>s</sup> }  
Decl. — 5° 38' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1875.37 | 324.6 | Cin  | 6.0 ... 8.0 | 3 <sup>n</sup> | Δ   |
| 1877.84 | 326.1 | ...  | 6.2 ... 8.2 | 2 <sup>n</sup> | Cin |
| 1879.58 | 319.0 | 0.78 | 6.0 ... 8.0 | 1 <sup>n</sup> | Cin |
| 1884.87 | 321.5 | 0.68 | 6.0 ... 9.0 | 1 <sup>n</sup> | Ho  |
| 1886.77 | 322.1 | 0.86 | 6.0 ... 8.5 | 3 <sup>n</sup> | LM  |
| 1888.87 | 322.2 | 0.70 | 6.0 ... 8.0 | 2 <sup>n</sup> | Lv  |
| 1889.47 | 320.4 | 0.59 | ...         | 4 <sup>n</sup> | Sp  |
| 1890.78 | 321.3 | 0.80 | 6.0 ... 8.0 | 2 <sup>n</sup> | T   |
| 1898.66 | 324.5 | 0.79 | 6.5 ... 9.0 | 1 <sup>n</sup> | Cg  |

Discovered with the 6-inch. The change, if any, is slow, but it can hardly fail to prove a binary. This is a naked-eye star in *Aquarius*. The Harvard photometric magnitude is 5.8. This star is B.A.C. 7986 (= Piazzì xxii. 250).

[ $\beta$  (iii)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\Delta$  (i)...Cin<sup>4</sup>...Cin<sup>5</sup>... Hough (2978)...LM...Lv<sup>1</sup>...Sp (iii)...Tarrant (3186)...Cogshall ( )...]

$\beta$  1010. Lalande 44832

R.A. 22<sup>h</sup> 49<sup>m</sup> 17<sup>s</sup> }  
Decl. — 6° 13' }

|         |       |      |        |     |    |         |
|---------|-------|------|--------|-----|----|---------|
| 1881.85 | 136.5 | 1.21 | 8.5... | 8.9 | 2n | $\beta$ |
| 1886.55 | ...   | 1.28 | 9.0... | 9.2 | 1n | LM      |
| 1892.89 | 134.8 | 1.28 | 8.7... | 9.0 | 1n | Ho      |
| 1899.72 | 136.8 | 1.11 | 8.8... | 9.3 | 2n | D       |

Discovered with the 12-inch at Mt. Hamilton in 1881.

[ $\beta$  (xiii)... $\beta^3$ ...LM...Hough (3234)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  772.  $\delta$  *Piscis Australis*

R.A. 22<sup>h</sup> 49<sup>m</sup> 18<sup>s</sup> }  
Decl. — 33° 11' }

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1877.70 | 236.5 | 4.73 | 5.0... | 10.5 | 1n | Cin     |
| 1879.69 | 238.4 | 5±   | 5.5... | 12.2 | 5n | $\beta$ |
| 1881.84 | 235.8 | 4.91 | 5.0... | 11.0 | 5n | $\beta$ |
| 1891.88 | 239.7 | 4.78 | 5.0... | 11.8 | 3n | $\beta$ |
| 1896.71 | 235.6 | 5.14 | ...    |      | 2n | See     |
| 1898.64 | 236.9 | 5.21 | 3.8... | 11.0 | 3n | Cg      |

Discovered with the 6-inch at Mt. Hamilton. There seems to be no material change. The *Cape Catalogue* gives the large star a proper motion of 0.09 in the direction of 360°.

[ $\beta$  (xi)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Cin<sup>4</sup>... See (3496)...Cogshall ( )...]

$\beta$  383. Lalande 44855

R.A. 22<sup>h</sup> 49<sup>m</sup> 57<sup>s</sup> }  
Decl. + 8° 49' }

A and B

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1877.82 | 119.6 | 2.67 | 8.0... | 11.0 | 1n | $\beta$ |
| 1891.80 | 118.7 | 2.58 | 8.0... | 12.7 | 3n | $\beta$ |

A and C

|         |       |       |     |      |    |         |
|---------|-------|-------|-----|------|----|---------|
| 1877.81 | 240.3 | 15.59 | ... | 12.4 | 2n | $\beta$ |
| 1891.80 | 239.0 | 15.43 | ... | 12.4 | 3n | $\beta$ |

The distant star, C, was discovered with the 6-inch, and B added subsequently with the 18½-inch.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta^2$ ... $\beta$  (*Pub. L. O.* II)...]

$\beta$  848. D.M. (57°) 2639

R.A. 22<sup>h</sup> 49<sup>m</sup> 58<sup>s</sup> }  
Decl. + 57° 44' }

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1881.67 | 5.8   | 2.77 | 8.4... | 12.8 | 3n | $\beta$ |
| 1888.94 | 0.4   | 2.35 | 8.3... | 12.3 | 3n | Com     |
| 1895.84 | 358.9 | 2.64 | ...    |      | 2n | Com     |
| 1896.66 | 2.4   | 2.50 | ...    |      | 1n | Com     |
| 1898.82 | 359.6 | 2.80 | 8.5... | 12.5 | 1n | A       |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (xii)... $\beta^4$ ...Comstock (*Sid. Mess* IX, 77) (*Pub. Washburn Obsy.* VI, x)...Aitken ( )...]

$\beta$  712. D.M. (58°) 2508

R.A. 22<sup>h</sup> 49<sup>m</sup> 58<sup>s</sup> }  
Decl. + 58° 36' }

|         |       |      |        |      |    |          |
|---------|-------|------|--------|------|----|----------|
| 1877.58 | 291.6 | 1.02 | 9.0... | 9.5  | 1n | $\beta$  |
| 1877.70 | 290.3 | 1.14 | 9.7... | 10.2 | 1n | $\Delta$ |
| 1893.72 | 293.5 | 1.24 | 9.5... | 10.1 | 3n | W        |
| 1899.66 | 288.7 | 0.94 | 9.0... | 10.0 | 1n | D        |

Discovered with the 18½-inch. In a small cluster.

[ $\beta$  (x)... $\beta^2$ ... $\Delta$  (i)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  713. Lalande 44872

R.A. 22<sup>h</sup> 50<sup>m</sup> 55<sup>s</sup> }  
Decl. — 3° 53' }

B and C

|         |      |       |     |      |    |         |
|---------|------|-------|-----|------|----|---------|
| 1877.95 | 95.9 | 8.31  | ... | 12.5 | 1n | $\beta$ |
| 1891.82 | 94.1 | 10.18 | ... | 13.3 | 3n | $\beta$ |
| 1898.54 | 95.9 | 10.51 | ... | 12.5 | 2n | $\beta$ |

A and B (= H<sup>1</sup> N. 15 =  $\Sigma$  2959)

|         |       |       |            |                |          |
|---------|-------|-------|------------|----------------|----------|
| 1832.10 | 96.7  | 15.66 | 6.5...10.5 | 4 <sup>n</sup> | $\Sigma$ |
| 1864.78 | 102.7 | 14.21 | 6.5...10.7 | 5 <sup>n</sup> | $\Delta$ |
| 1877.87 | 102.2 | 13.77 | ...        | 2 <sup>n</sup> | $\beta$  |
| 1891.82 | 103.3 | 13.31 | ...10.7    | 3 <sup>n</sup> | $\beta$  |
| 1898.54 | 105.7 | 13.13 | ...9.7     | 2 <sup>n</sup> | $\beta$  |

The faint star, C, was detected with the 18½-inch. The change in AB is obviously due to proper motion, and curiously this movement seems to belong, not to the large star, but to the small star B. The measures of 1832 and 1898 give for the apparent movement of B, 0.°051 in the direction of 239.4, and this substantially accounts for the change in BC. A few of the measures of AB are given above.

[ $\beta$ (x)... $\beta^1$ ... $\beta$ (3114)... $\beta$ (*Pub. L. O.* 11)...Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* xi, xiii)... $\Delta$ (11)... $\Delta$ (1573)...Pritchett (*Pub. Morrison Obsy.* 1)...Cin<sup>4</sup>...Hall (11)...Glaserapp (11)...Solá (3497)...]

 $\beta$  849. O. Arg. N. 24920

R.A. 22<sup>h</sup> 51<sup>m</sup> 47<sup>s</sup> }  
Decl. + 66° 11' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.53 | 127.0 | 3.74 | 8.4...12.3 | 4 <sup>n</sup> | $\beta$ |
| 1888.39 | 128.0 | 4.15 | 8.2...11.9 | 4 <sup>n</sup> | Com     |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$ (xii)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...]

 $\beta$  452. Lalande 44915

R.A. 22<sup>h</sup> 51<sup>m</sup> 58<sup>s</sup> }  
Decl. + 42° 22' }

|         |       |      |            |                |            |
|---------|-------|------|------------|----------------|------------|
| 1877.71 | 255.3 | 6.29 | 7.0...12.0 | 1 <sup>n</sup> | $\Delta$   |
| 1880.71 | 256.6 | 6.74 | 7.0...11.1 | 2 <sup>n</sup> | $\beta$    |
| 1885.64 | 254.9 | 6.67 | ...        | 2 <sup>n</sup> | H $\Sigma$ |
| 1892.84 | 256.2 | 6.78 | 7.0...11.5 | 2 <sup>n</sup> | W          |

Discovered with the 18½-inch.

[ $\beta$ (viii)... $\beta$ (*Am. Jour. Sci.* July 1877)... $\beta^3$ ... $\Delta$ (1)...Wilson ( )...H $\Sigma$ ( )...]

 $\beta$  850. Lalande 44985

R.A. 22<sup>h</sup> 54<sup>m</sup> 22<sup>s</sup> }  
Decl. + 13° 13' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.57 | 119.8 | 3.05 | 8.1...10.6 | 3 <sup>n</sup> | $\beta$ |
| 1886.84 | 118.1 | 3.08 | ...        | 3 <sup>n</sup> | UL      |
| 1888.03 | 119.1 | 3.29 | 8.0...10.0 | 3 <sup>n</sup> | Com     |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$ (xii)... $\beta^4$ ...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...]

 $\beta$  179. O. Arg. S. 22553

R.A. 22<sup>h</sup> 54<sup>m</sup> 26<sup>s</sup> }  
Decl. — 22° 54' }

|         |       |       |           |                |     |
|---------|-------|-------|-----------|----------------|-----|
| 1878.10 | 115.7 | 13.35 | 8.4...9.2 | 3 <sup>n</sup> | Cin |
| 1892.70 | 116.9 | 13.26 | 8.5...9.5 | 2 <sup>n</sup> | W   |
| 1892.75 | 114.7 | 12.74 | 8.2...9.4 | 2 <sup>n</sup> | Gl  |
| 1896.84 | 115.3 | 13.65 | 7.9...9.3 | 2 <sup>n</sup> | See |

An unimportant pair noted with the 6-inch. KUSTNER gives the principal star a proper motion of 0.°09 in the direction of 180°.

[ $\beta$ (111)... $\beta$ (*Mon. Not.* xxxiv, 59)...Cin<sup>3</sup>...Cin<sup>4</sup>...Cin<sup>5</sup>...Wilson ( )...See (3496)...Glaserapp (11)...]

 $\beta$  1011. Lacaille 9343

R.A. 22<sup>h</sup> 55<sup>m</sup> 53<sup>s</sup> }  
Decl. — 37° 4' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1881.85 | 301.7 | 2.16 | 7.2...10.5 | 3 <sup>n</sup> | $\beta$ |
| 1886.95 | 301.2 | 2.26 | 7.0...10.0 | 1 <sup>n</sup> | Pol     |
| 1891.81 | 293.0 | 1.94 | 7.0...10.0 | 1 <sup>n</sup> | Sel     |
| 1896.72 | 291.5 | 1.61 | 6.3...8.2  | 4 <sup>n</sup> | See     |
| 1898.73 | 297.4 | 2.14 | 7.0...11.0 | 1 <sup>n</sup> | Bd      |
| 1898.74 | 300.9 | 2.28 | 7.0...10.0 | 3 <sup>n</sup> | A       |

Discovered with the 12-inch at Mt. Hamilton in 1881. Apparently fixed. The Cordoba magnitude is 6.6; YARNALL 6.4.

[ $\beta$ (xiii)... $\beta^3$ ...Pollock (*Pub. Sydney Obsy.* 1891) (*Mem. R. A. S. L.*)...Sellors (3154)...See (3496)...Boothroyd ( )...Aitken (3585)...]

 $\beta$  384. *Aquarii* 265

R.A. 22<sup>h</sup> 56<sup>m</sup> 14<sup>s</sup> }  
Decl. — 19° 10' }

|         |      |      |           |                |          |
|---------|------|------|-----------|----------------|----------|
| 1876.78 | 75.0 | 1.08 | 7.0...9.0 | 1 <sup>n</sup> | Cin      |
| 1877.14 | 72.2 | 1.27 | 7.2...9.2 | 3 <sup>n</sup> | $\Delta$ |
| 1877.63 | 72.4 | 1.23 | 6.7...9.0 | 2 <sup>n</sup> | Cin      |
| 1886.81 | 70.4 | 1.27 | 6.8...8.8 | 1 <sup>n</sup> | LM       |
| 1888.85 | 73.4 | 1.03 | 7.0...9.4 | 1 <sup>n</sup> | Lv       |
| 1897.66 | 69.1 | 1.37 | 6.0...9.2 | 1 <sup>n</sup> | See      |
| 1898.68 | 66.7 | 1.32 | 7.7...9.5 | 2 <sup>n</sup> | Bd       |

Discovered with the 6-inch. In GOULD 6.9 m.  
Lalande 45047.

[ $\beta$  (VI)... $\beta$  (2062)...4 (I)...Cin<sup>3</sup>...Cin<sup>4</sup>...LM...Lv<sup>1</sup>...  
See (3496)...Boothroyd ( )...]

$\beta$  481. W<sup>1</sup> XXII. 1162

R.A. 22<sup>h</sup> 56<sup>m</sup> 23<sup>s</sup> }  
Decl. - 11° 53' }

|         |      |      |        |      |    |         |
|---------|------|------|--------|------|----|---------|
| 1878.19 | 51.8 | 1.30 | 9.0... | 9.5  | 2n | $\beta$ |
| 1886.74 | 54.9 | ...  | 9.5... | 10.5 | 1n | LM      |
| 1891.88 | 53.1 | 1.19 | 9.1... | 9.6  | 3n | $\beta$ |
| 1898.76 | 51.7 | 1.31 | 9.7... | 10.0 | 3n | Cg      |

Discovered with the 6-inch.  $\Sigma$  2970 is 17<sup>s</sup>  $p$   
and 4' s.

[ $\beta$  (IX)... $\beta$  (Mon. Not. xxxviii, 78)... $\beta^2$ ... $\beta$  (3114)... $\beta$   
(Pub. L. O. II)...LM...Cogshall ( )...]

$\beta$  1147. 2 *Andromedae*

R.A. 22<sup>h</sup> 57<sup>m</sup> 5<sup>s</sup> }  
Decl. + 42° 7' }

|         |       |       |        |     |    |         |
|---------|-------|-------|--------|-----|----|---------|
| 1889.54 | 317.8 | 0.28  | 5.0... | 8.7 | 3n | $\beta$ |
| 1890.62 | 313.0 | 0.27  | 5.2... | 9.0 | 3n | $\beta$ |
| 1891.72 | 323.4 | 0.23  | 5.7... | 8.5 | 3n | $\beta$ |
| 1892.99 | 318.2 | 0.40± | ...    |     | 3n | Sp      |
| 1893.46 | 323.9 | 0.50± | ...    |     | 2n | Sp      |
| 1896.03 | 322.0 | 0.42± | ...    |     | 1n | Sp      |
| 1898.79 | 329.6 | 0.36  | ...    |     | 2n | A       |

This star was suspected to be a close pair with  
the 12-inch, and verified with the 36-inch. It is  
difficult with the large aperture. AUWERS gives the  
proper motion of 2 *Andromedae*, 0.041 in the direc-  
tion of 109°.8. This belongs to both stars. It is a  
physical system, and should be in rapid motion.

[ $\beta$  (xvi)... $\beta$  (2956,3048,3114)... $\beta$  (Pub. L. O. II)...Sp (III)  
...Aitken (3585)...]

$\beta$  851. O. Arg. N. 25054

R.A. 22<sup>h</sup> 57<sup>m</sup> 36<sup>s</sup> }  
Decl. + 75° 29' }

|         |       |      |        |      |    |            |
|---------|-------|------|--------|------|----|------------|
| 1881.67 | 158.0 | 1.69 | 7.5... | 13.0 | 3n | $\beta$    |
| 1885.58 | 157.0 | 2.02 | ...    |      | 2n | H $\Sigma$ |
| 1888.92 | 160.4 | 2.14 | 7.3... | 13.0 | 3n | Com        |

Discovered with the 15½-inch at the Washburn  
Observatory.

[ $\beta$  (xii)... $\beta^3$ ...Comstock (Pub. Washburn Obsy. vi)...H $\Sigma$   
( )...]

$\beta$  773. v *Gruis*

R.A. 23<sup>h</sup> 0<sup>m</sup> 12<sup>s</sup> }  
Decl. - 39° 32' }

This star was suspected to be a close pair with  
the 6-inch at Mt. Hamilton in 1879. With the 12-  
inch in 1891 I could not be certain of any real  
elongation. It should receive further attention in  
southern latitudes.

[ $\beta$  (xi)... $\beta^2$ ...]

$\beta$  1025. Lalande 45242

R.A. 22<sup>h</sup> 1<sup>m</sup> 38<sup>s</sup> }  
Decl. + 12° 1' }

A and B

|         |       |      |        |      |    |         |
|---------|-------|------|--------|------|----|---------|
| 1891.57 | 268.6 | 0.77 | 8.0... | 10.8 | 3n | $\beta$ |
| 1897.82 | 271.4 | 0.88 | ...    |      | 3n | A       |
| 1898.61 | 273.1 | 0.82 | 8.0... | 9.7  | 2n | $\beta$ |

A and C

|         |      |       |     |      |    |         |
|---------|------|-------|-----|------|----|---------|
| 1891.57 | 84.3 | 22.16 | ... | 11.9 | 3n | $\beta$ |
| 1898.29 | 83.9 | 21.96 | ... | 12.0 | 3n | $\beta$ |

Discovered with the 18½-inch.

[ $\beta$  (xiii)... $\beta^3$  (App.)... $\beta$  (3114)... $\beta$  (Pub. L. O. II)...Aitken  
(A. J. 429)...]

$\beta$  78. W<sup>2</sup> XXII. 1393

R.A. 23<sup>h</sup> 2<sup>m</sup> 9<sup>s</sup> }  
Decl. + 30° 49' }

A and B

|         |      |       |        |      |    |         |
|---------|------|-------|--------|------|----|---------|
| 1879.57 | 55.0 | 17.22 | 7.2... | 11.0 | 1n | $\beta$ |
| 1893.25 | 54.9 | 18.18 | 7.0... | 11.0 | 2n | W       |

A and C

|         |      |       |     |      |    |         |
|---------|------|-------|-----|------|----|---------|
| 1879.57 | 61.9 | 48.07 | ... | 11.5 | 1n | $\beta$ |
| 1893.25 | 62.2 | 47.28 | ... | 11.5 | 2n | W       |

Two distant companions noted with the 6-inch.  
In my measure of AB, the double distance, 34".44,  
is given in  $\beta^3$ .

[ $\beta$  (1)... $\beta$  (Mon. Not. xxxiii, 351)... $\beta^3$ ...Wilson ( )...]

**β 180.** O. Arg. N. 25161

R.A. 23<sup>h</sup> 2<sup>m</sup> 9<sup>s</sup> }  
Decl. + 60° 11' }

A and B

|         |       |       |        |     |                |    |
|---------|-------|-------|--------|-----|----------------|----|
| 1875.08 | 176.8 | 0.57  | 7.5... | 8.0 | 3 <sup>n</sup> | Δ  |
| 1885.55 | 177.5 | 0.71  | ...    | ... | 3 <sup>n</sup> | HΣ |
| 1888.95 | 177.5 | 0.55± | ...    | ... | 4 <sup>n</sup> | Sp |
| 1890.65 | 175.2 | 0.62  | 8.0... | 9.2 | 3 <sup>n</sup> | β  |
| 1891.98 | 176.4 | 0.42± | ...    | ... | 1 <sup>n</sup> | Sp |

AB and C

|         |       |       |     |      |                |    |
|---------|-------|-------|-----|------|----------------|----|
| 1875.54 | 106.3 | 34.30 | ... | 10.5 | 2 <sup>n</sup> | Δ  |
| 1885.54 | 106.8 | 34.29 | ... | ...  | 1 <sup>n</sup> | HΣ |
| 1890.65 | 106.6 | 34.43 | ... | 9.4  | 3 <sup>n</sup> | β  |
| 1891.98 | 105.6 | ...   | ... | ...  | 1 <sup>n</sup> | Sp |

Discovered with the 6-inch. Apparently unchanged.

[β (III)...β (Mon. Not. xxxiv, 59)...β (3048)...β (Pub. L. O. II)...Δ (2086)...Δ (I)...Sp (III)...HΣ ( )...]

**β 385.** W<sup>2</sup> XXIII. 40

R.A. 23<sup>h</sup> 4<sup>m</sup> 31<sup>s</sup> }  
Decl. + 31° 50' }

A and B

|         |       |      |        |     |                |                   |
|---------|-------|------|--------|-----|----------------|-------------------|
| 1876.40 | 135.8 | 0.42 | 7.1... | 7.9 | 6 <sup>n</sup> | Δ                 |
| 1880.77 | 128.9 | 0.51 | ...    | ... | 1 <sup>n</sup> | Perry             |
| 1881.75 | 139.0 | ...  | ...    | ... | 1 <sup>n</sup> | Big               |
| 1882.62 | 131.4 | 0.50 | 7      | ... | 8              | 1 <sup>n</sup> OΣ |
| 1883.82 | 131.0 | 0.4  | ...    | ... | 1 <sup>n</sup> | Perry             |
| 1885.46 | 143.2 | 0.41 | 7.2... | 7.2 | 4 <sup>n</sup> | En                |
| 1885.73 | 131.2 | 0.54 | ...    | ... | 2 <sup>n</sup> | HΣ                |
| 1888.69 | 132.3 | 0.4± | ...    | ... | 8 <sup>n</sup> | Sp                |
| 1890.68 | 130.4 | 0.46 | 7.6... | 8.1 | 3 <sup>n</sup> | β                 |

AB and C (= H 5532)

|         |      |        |     |     |                |                |                |
|---------|------|--------|-----|-----|----------------|----------------|----------------|
| 1825    | 105± | Cl. VI | 7   | ... | 9              | 1 <sup>n</sup> | H <sup>2</sup> |
| 1876.72 | 77.1 | 58.05  | ... | 9.0 | 2 <sup>n</sup> | Δ              |                |
| 1882.62 | 77.5 | 57.81  | ... | 8.5 | 1 <sup>n</sup> | OΣ             |                |
| 1885.71 | 77.1 | 57.93  | ... | ... | 1 <sup>n</sup> | HΣ             |                |
| 1886.01 | 77.4 | 58.15  | ... | 9.3 | 2 <sup>n</sup> | En             |                |
| 1890.68 | 77.3 | 58.03  | ... | 8.8 | 3 <sup>n</sup> | β              |                |

Discovered with the 6-inch. Change is doubtful. The foregoing are all the measures of the distant star making H 5532.

[β (VI)...β (2062,3048)...β (Pub. L. O. II)...Δ (I)...Perry (Eng. Mech. xxxv, 65; xxxix, II)...Bigourdan (Paris Obsns. 1883)...OΣ (Poulkova Obsns. x)...Engelmann (2786)...Sp (III)...HΣ ( )...]

**β 852.** Pegasi 306

R.A. 23<sup>h</sup> 4<sup>m</sup> 51<sup>s</sup> }  
Decl. + 25° 52' }

A and BC

|         |       |       |        |     |                |     |
|---------|-------|-------|--------|-----|----------------|-----|
| 1881.61 | 282.6 | 58.55 | 7.0... | ... | 3 <sup>n</sup> | β   |
| 1881.80 | 283.3 | 58.25 | 7.0... | ... | 2 <sup>n</sup> | Ho  |
| 1886.86 | 283.0 | 58.32 | ...    | ... | 1 <sup>n</sup> | UL  |
| 1887.80 | 283.1 | 58.62 | 7.0... | ... | 3 <sup>n</sup> | Com |
| 1898.83 | 282.9 | 58.75 | 7.0... | ... | 3 <sup>n</sup> | A   |

B and C

|         |      |      |         |      |                |     |
|---------|------|------|---------|------|----------------|-----|
| 1881.62 | 11.2 | 1.20 | 10.8... | 11.3 | 3 <sup>n</sup> | β   |
| 1881.79 | 10.0 | 1.47 | 9.0...  | 9.5  | 2 <sup>n</sup> | Ho  |
| 1886.86 | 10.6 | 1.24 | ...     | ...  | 1 <sup>n</sup> | UL  |
| 1888.21 | 9.9  | 1.66 | 10.3... | 10.8 | 3 <sup>n</sup> | Com |
| 1898.84 | 5.3  | 1.49 | 10.8... | 11.7 | 3 <sup>n</sup> | A   |

Discovered with the 15½-inch of the Washburn Observatory. AITKEN measures a 14 m star from BC, 207° 8 : 18' 0 (1898.87) 1<sup>n</sup>. Lalande 45362.

[β (XII)...β<sup>4</sup>...Hough (2978)...Updegraff, Lamb and Comstock (Pub. Washburn Obsy. v, VI)...Aitken (3585)...]

**β 181.** Aquarii 286

R.A. 23<sup>h</sup> 7<sup>m</sup> 31<sup>s</sup> }  
Decl. - 14° 3' }

A and B

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1876.26 | 309.2 | 1.51 | 7.1... | 10.4 | 4 <sup>n</sup> | Δ   |
| 1878.75 | 307.8 | 1.44 | 6.9... | 8.7  | 2 <sup>n</sup> | Cin |
| 1884.87 | 307.7 | 1.46 | 7.0... | 11.0 | 2 <sup>n</sup> | Ho  |
| 1885.16 | 314.6 | 1.47 | 7.2... | 9.1  | 4 <sup>n</sup> | W   |
| 1886.82 | 309.1 | 1.57 | 7.0... | 9.3  | 3 <sup>n</sup> | LM  |
| 1888.77 | 305.3 | 1.31 | 7.2... | 9.8  | 1 <sup>n</sup> | Lv  |
| 1892.68 | 308.8 | 1.63 | 7.0... | 10.5 | 3 <sup>n</sup> | T   |
| 1898.86 | 311.6 | 1.45 | 7.0... | 10.0 | 1 <sup>n</sup> | β   |

A and C

|         |       |       |     |      |                |     |
|---------|-------|-------|-----|------|----------------|-----|
| 1877.74 | 234.9 | 18.78 | ... | 12   | 1 <sup>n</sup> | β   |
| 1878.75 | 237.1 | 19.24 | ... | 12.2 | 2 <sup>n</sup> | Cin |
| 1884.87 | 236.3 | 19.74 | ... | 13   | 1 <sup>n</sup> | Ho  |
| 1898.90 | 239.1 | 19.18 | ... | 11.4 | 3 <sup>n</sup> | β   |

Discovered with the 6-inch. Probably unchanged.  
Lalande 45443.

(III)... $\beta$  (*Mon. Not.* xxxiv, 59)... $\beta^1$ ... $\Delta$  (1)...Cin<sup>5</sup>...  
Hough (2978)...Wilson (Cin<sup>10</sup>)...LM...Lv<sup>4</sup>...Tarrant  
(3186)...]

$\beta$  714. B.A.C. 8084

R.A. 23<sup>h</sup> 7<sup>m</sup> 56<sup>s</sup> }  
Decl. — 3° 17' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1878.64 | 145.5 | 0.57 | 7.0...10.0 | 1 <sup>n</sup> | $\beta$ |
| 1877.79 | 150.1 | ...  | 6.5...10.0 | 1 <sup>n</sup> | Cin     |
| 1879.76 | 156.6 | ...  | 7.0...11.0 | 1 <sup>n</sup> | Cin     |
| 1886.73 | 146.4 | 0.48 | 7.1...10.4 | 2 <sup>n</sup> | LM      |
| 1898.84 | 139.5 | 0.59 | 7.0... 9.7 | 2 <sup>n</sup> | A       |

Discovered with the 18½-inch.

[ $\beta$  (x)... $\beta^1$ ...Cin<sup>4</sup>...Cin<sup>6</sup>...LM...Aitken (3585)...]

$\beta$  715. *Aquarii* 290

R.A. 23<sup>h</sup> 8<sup>m</sup> 25<sup>s</sup> }  
Decl. — 11° 20' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.79 | 258.0 | 3.47 | 7.0...11.0 | 1 <sup>n</sup> | Cin     |
| 1878.29 | 256.0 | 3.35 | 7.0...11.5 | 4 <sup>n</sup> | $\beta$ |
| 1879.77 | 257.2 | 3.08 | 6.0...11.5 | 2 <sup>n</sup> | Cin     |
| 1890.65 | 256.9 | 3.50 | 6.6...11.7 | 3 <sup>n</sup> | $\beta$ |
| 1898.69 | 257.2 | 3.51 | 6.8...13.2 | 3 <sup>n</sup> | Bd      |

Discovered with the 18½-inch. The Cin observers in 1879 thought the principal star was a close pair. This star was perfectly round with the 36-inch in 1891, and Lv found it so in 1886. BOOTHROYD thought there might be an elongation in 280° (1898). Lalande 45490.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>4</sup>...Cin<sup>6</sup>...  
LM...Boothroyd ( )...]

$\beta$  716.

R.A. 23<sup>h</sup> 9<sup>m</sup> 15<sup>s</sup> }  
Decl. — 9° 43' }

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1877.61 | 208.6 | 1.70 | 9.5...10.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.88 | 204.1 | 1.79 | 9.3...10.0 | 3 <sup>n</sup> | $\beta$ |
| 1898.81 | 207.9 | 1.35 | 9.0...11.5 | 2 <sup>n</sup> | Cg      |

Discovered with the 18½-inch. It is 21<sup>s</sup>  $p$   $\psi^1$  *Aquarii* ( $\beta$  1220). This star is not in the S.D.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cogshall  
( )...]

$\beta$  1220.  $\psi^1$  *Aquarii*

R.A. 23<sup>h</sup> 9<sup>m</sup> 36<sup>s</sup> }  
Decl. — 9° 44' }

B and C

|         |       |      |            |                |         |
|---------|-------|------|------------|----------------|---------|
| 1890.63 | 101.1 | 0.22 | 9.1... 9.2 | 3 <sup>n</sup> | $\beta$ |
| 1891.57 | 94.3  | 0.22 | 9.5... 9.5 | 4 <sup>n</sup> | $\beta$ |
| 1894.66 | 99.1  | 0.28 | ...        | 5 <sup>n</sup> | Bar     |
| 1898.84 | 94.8  | 0.39 | 9.2... 9.3 | 4 <sup>n</sup> | A       |

A and BC (=  $\Sigma$  12 App. 11)

|         |       |       |            |                |               |
|---------|-------|-------|------------|----------------|---------------|
| 1836.66 | 312.2 | 49.63 | 4.5... 8.5 | 4 <sup>n</sup> | $\Sigma$      |
| 1868.20 | 312.1 | 49.39 | ... 8.5    | 5 <sup>n</sup> | $\mathcal{J}$ |
| 1880.88 | 312.6 | 49.66 | ... 8.5    | 4 <sup>n</sup> | $\beta$       |
| 1889.68 | 311.8 | 49.33 | ...        | 3 <sup>n</sup> | $\beta$       |

A and D

|         |       |       |          |                |         |
|---------|-------|-------|----------|----------------|---------|
| 1877.69 | 275.0 | 63.0  | ...      | 1 <sup>n</sup> | $\beta$ |
| 1880.91 | 274.3 | 64.96 | ... 13.5 | 1 <sup>n</sup> | $\beta$ |
| 1891.89 | 274.6 | 68.45 | ... 11.5 | 2 <sup>n</sup> | $\beta$ |

BC and E

|         |      |       |          |                |         |
|---------|------|-------|----------|----------------|---------|
| 1877.69 | 34.9 | 18.4  | ...      | 1 <sup>n</sup> | $\beta$ |
| 1891.89 | 16.7 | 19.25 | ... 12.5 | 2 <sup>n</sup> | $\beta$ |
| 1898.98 | 9.2  | 18.26 | ... 13.5 | 1 <sup>n</sup> | A       |

As a wide pair this is H<sup>1</sup> IV. 12 =  $\Sigma$  12 App II = S 827. The duplicity of the HERSCHEL companion was discovered with the 36-inch. It is a difficult pair and beyond the reach of ordinary apertures. The large star has considerable proper motion, 0".348 in the direction of 92°.1 (PORTER), and the old companion is traveling at precisely the same rate, so that it is certain that ABC constitute a vast physical system. The two small stars, D and E, on the contrary, are strangers to the system, and are fixed in space, the change shown by the measures being due to the proper motion of the other stars.

[ $\beta$  (XVII)... $\beta$  (3047,3114)... $\beta^1$ ... $\beta^3$ ... $\beta$  (*Ast. Reg.* XIX, 41)  
... Barnard (*A. J.* 447)... Aitken (3585)...]

The following references include the measures of the HERSCHEL star :

[Herschel (*Cape Obsns.*)... Jacob (*Mem. R. A. S.* xvii)...  
*Radcliffe Obsns.* XXI, XXV... Engelhardt (*Obsns. Astron.* II)...  
O $\Sigma$  (*Poulkowa Obsns.* X)... Jedrzejewicz (2407)... Glasenapp  
(11)...]

**β 992.** O. Arg. N. 25354

R.A. 23<sup>h</sup> 10<sup>m</sup> 48<sup>s</sup> }  
Decl. + 63° 28' }

|         |       |       |        |     |                |    |
|---------|-------|-------|--------|-----|----------------|----|
| 1880.59 | 170.5 | 0.41  | 8.0... | 8.2 | 5 <sup>n</sup> | β  |
| 1890.64 | 161.5 | 0.34  | 8.2... | 8.3 | 3 <sup>n</sup> | β  |
| 1894.20 | 157.1 | 0.23± | ...    |     | 5 <sup>n</sup> | Sp |
| 1898.94 | 159.5 | 0.33  | 8.0... | 8.0 | 3 <sup>n</sup> | A  |

Discovered with the 18½-inch. Retrograde motion.

[β (XIII)...β<sup>3</sup>...β (3048)...β (Pub. L. O. II)...Sp (III)...  
Aitken ( )...]

**β 182.** W<sup>1</sup> XXIII. 175

R.A. 23<sup>h</sup> 10<sup>m</sup> 52<sup>s</sup> }  
Decl. — 14° 28' }

|         |      |      |        |     |                |     |
|---------|------|------|--------|-----|----------------|-----|
| 1876.28 | 42.3 | 0.83 | 8.7... | 8.9 | 3 <sup>n</sup> | Δ   |
| 1877.79 | 44.3 | ...  | 8.0... | 8.3 | 1 <sup>n</sup> | Cin |
| 1879.68 | 44.6 | 0.72 | 8.5... | 8.5 | 1 <sup>n</sup> | Cin |
| 1884.87 | 44.1 | 0.62 | 8.0... | 8.0 | 1 <sup>n</sup> | Ho  |
| 1886.77 | 43.1 | 0.85 | 8.0... | 8.2 | 3 <sup>n</sup> | LM  |
| 1888.77 | 45.4 | 0.74 | 8.2... | 8.2 | 2 <sup>n</sup> | Lv  |
| 1891.59 | 48.8 | 0.63 | 8.3... | 8.4 | 3 <sup>n</sup> | β   |
| 1892.63 | 45.4 | 0.79 | 8.5... | 8.5 | 2 <sup>n</sup> | T   |
| 1898.66 | 48.0 | 0.58 | 8.2... | 8.6 | 2 <sup>n</sup> | β   |

Discovered with the 6-inch. It is the preceding star of a small equilateral triangle. The *Radcliffe Catalogue* for 1890 gives the star a large proper motion, 1".331 in the direction of 202°.5. This is undoubtedly a binary, and one of more than ordinary interest if this motion in space is correct. For the purpose of a speedy determination of this, I have measured a 12.5 m star:

|         |      |       |                |     |
|---------|------|-------|----------------|-----|
| 1898.66 | 79.9 | 68.04 | 2 <sup>n</sup> | β   |
| 1899.75 | 78.5 | 68.66 | 3 <sup>n</sup> | Bar |

An interval of only a year is too short to give a reliable proper motion from two sets of measures; but they confirm the movement given from the meridian observations both as to direction and amount.

[β (III)...β (Mon. Not. xxxiv, 59)...β (3114)...β (Pub. L. O. II)...Δ (I)...Cin<sup>4</sup>...Cin<sup>5</sup>...Hough (2978)...LM...Lv<sup>4</sup>...Tarrant (3186)...Barnard ( )...]

**β 79.** Lalande 45585

R.A. 23<sup>h</sup> 11<sup>m</sup> 24<sup>s</sup> }  
Decl. — 2° 10' }

A and B

|         |       |      |        |      |                |     |
|---------|-------|------|--------|------|----------------|-----|
| 1876.35 | 115.3 | 1.03 | 7.9... | 9.6  | 4 <sup>n</sup> | Δ   |
| 1877.81 | 114.3 | ...  | 8.2... | 10.0 | 1 <sup>n</sup> | Cin |
| 1879.64 | 108.5 | 0.81 | 7.5... | 8.5  | 2 <sup>n</sup> | Cin |
| 1886.63 | 102.4 | 1.02 | 7.5... | 9.2  | 2 <sup>n</sup> | LM  |
| 1891.54 | 94.6  | 0.88 | 8.0... | 8.6  | 3 <sup>n</sup> | β   |
| 1893.54 | 87.7  | 0.86 | 8.0... | 9.0  | 1 <sup>n</sup> | Lv  |
| 1893.63 | 90.3  | 1.03 | 7.8... | 9.8  | 2 <sup>n</sup> | W   |
| 1893.95 | 94.0  | 0.82 | ...    |      | 4 <sup>n</sup> | Sp  |
| 1894.64 | 90.7  | 1.01 | ...    |      | 4 <sup>n</sup> | Bar |
| 1895.88 | 89.8  | 0.63 | ...    |      | 1 <sup>n</sup> | Sp  |
| 1897.71 | 86.4  | 0.98 | ...    |      | 3 <sup>n</sup> | A   |
| 1897.88 | 85.3  | 1.08 | ...    |      | 1 <sup>n</sup> | Br  |
| 1898.79 | 84.1  | 0.81 | ...    |      | 1 <sup>n</sup> | Bry |
| 1898.82 | 105.0 | 0.74 | ...    |      | 3 <sup>n</sup> | Bow |
| 1898.85 | 87.8  | 0.75 | 8.0... | 9.1  | 2 <sup>n</sup> | β   |

AB and C

|         |       |       |     |      |                |     |
|---------|-------|-------|-----|------|----------------|-----|
| 1894.67 | 157.3 | 16.00 | ... | 16.5 | 2 <sup>n</sup> | Bar |
|---------|-------|-------|-----|------|----------------|-----|

Discovered with the 6-inch. A binary in retrograde movement, with a common proper motion of the components.

|         |   |   |   |       |          |
|---------|---|---|---|-------|----------|
| Stumpe  | - | - | - | 0.212 | in 119.7 |
| Bossert | - | - | - | 0.232 | in 115.5 |
| Porter  | - | - | - | 0.239 | in 107.5 |

More rapid angular motion may be expected hereafter. The very faint star, C, was detected by Barnard with the 36-inch. Σ 2995 is in the field, 1<sup>m</sup> ρ and 5' s.

[β (I)...β (Mon. Not. xxxiii, 351)...β (3114)...β (Pub. L. O. II)...Δ (I)...Cin<sup>4</sup>...Cin<sup>5</sup>...LM...Lv... (A. J. 382)...  
Wilson ( )...Sp (III)...Barnard (A. J. 447)...Aitken (A. J. 429)...Bryant and Bowyer ( )...Brown ( )...]

**β 853.** O. Arg. N. 25370

R.A. 23<sup>h</sup> 11<sup>m</sup> 37<sup>s</sup> }  
Decl. + 61° 9' }

A and B

|         |       |      |        |     |                |     |
|---------|-------|------|--------|-----|----------------|-----|
| 1881.64 | 228.8 | 0.62 | 8.7... | 8.7 | 2 <sup>n</sup> | β   |
| 1888.37 | 224.5 | 0.55 | 8.2... | 8.6 | 3 <sup>n</sup> | Com |
| 1899.27 | 225.8 | 0.74 | 9.0... | 9.1 | 2 <sup>n</sup> | A   |

AB and C

|         |      |      |          |    |     |
|---------|------|------|----------|----|-----|
| 1881.67 | 67.3 | 7.34 | ... 13.0 | 1n | β   |
| 1888.00 | 69.8 | 6.74 | ... 12.5 | 2n | Com |
| 1899.27 | 69.6 | 7.02 | ... 12.0 | 2n | A   |

Discovered with the 15½-inch at the Washburn Observatory. So far without change.

[β (x11)...β<sup>4</sup>...Comstock (*Pub. Washburn Obsy.* vi)...Aitken ( )...]

β 717. 8 *Andromedae*

R.A. 23<sup>h</sup> 12<sup>m</sup> 11<sup>s</sup> }  
Decl. + 48° 22' }

|         |       |      |             |    |    |
|---------|-------|------|-------------|----|----|
| 1878.88 | 161.4 | 7.55 | 5.0... 13.0 | 4n | β  |
| 1885.61 | 159.8 | 7.84 | ...         | 1n | HΣ |
| 1891.81 | 161.8 | 7.43 | 5.3... 12.7 | 3n | β  |
| 1898.76 | 162.3 | 7.62 | 5.5... 13.0 | 2n | β  |

Discovered with the 18½-inch. The large star has a proper motion of 0".024 in the direction of 119°.8 (AUWERS). The measures appear to indicate a common movement of the components. The principal star is No. 267 of SCHJELLERUP'S *Catalogue of Red Stars*.

[β (x) ... β<sup>1</sup> ... β<sup>3</sup> ... β (3114)...β (*Pub. L. O.* II)...HΣ ( )...]

β 80. Lalande 45638

R.A. 23<sup>h</sup> 12<sup>m</sup> 45<sup>s</sup> }  
Decl. + 4° 45' }

|         |       |       |            |    |     |
|---------|-------|-------|------------|----|-----|
| 1875.80 | 300.4 | 1.07  | 8.2... 9.1 | 4n | Δ   |
| 1877.79 | 306.1 | 1.24  | 8.5... 11  | 2n | β   |
| 1881.69 | 312.2 | 0.91  | 8.0... 8.8 | 3n | β   |
| 1886.94 | 316.1 | 0.84  | 7.7... 8.7 | 1n | LM  |
| 1888.71 | 319.5 | 0.92  | 8.2... 8.9 | 4n | β   |
| 1888.79 | 319.5 | 0.84  | 8.0... 9.1 | 3n | Lv  |
| 1891.57 | 322.5 | 0.69  | 8.0... 8.6 | 3n | β   |
| 1892.97 | 327.2 | 0.60  | ...        | 3n | Sp  |
| 1893.54 | 328.0 | 0.81  | 8.4... 9.0 | 1n | Lv  |
| 1893.66 | 329.1 | 0.85  | 8.3... 9.2 | 3n | W   |
| 1893.96 | 325.8 | 0.55± | ...        | 3n | Sp  |
| 1894.84 | 325.1 | 0.63  | 8.1... 8.7 | 1n | Lew |
| 1898.76 | 347.8 | 0.56  | 8.2... 8.5 | 1n | β   |
| 1898.78 | 330.0 | 0.60  | ...        | 1n | Bow |
| 1898.78 | 343.1 | 0.62  | 8.1... 9.0 | 4n | A   |
| 1898.99 | 339.6 | 0.51  | ...        | 1n | Bry |

AB and C

|         |     |        |             |    |     |
|---------|-----|--------|-------------|----|-----|
| 1891.80 | 5.3 | 103.81 | 8.0... 10.5 | 2n | Eng |
| 1898.66 | 4.1 | 104.08 | ... 10.5    | 2n | β   |

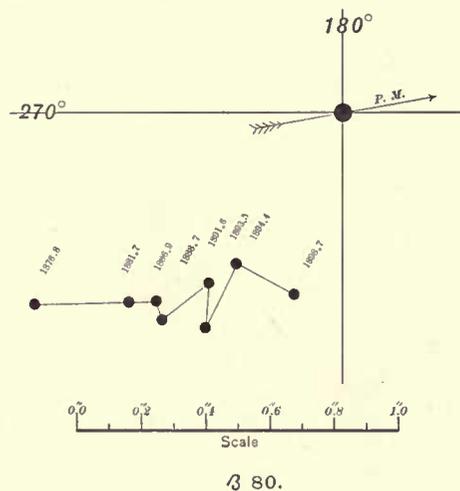
AB and D

|         |       |        |         |    |     |
|---------|-------|--------|---------|----|-----|
| 1891.80 | 333.2 | 183.57 | ... 9.5 | 2n | Eng |
| 1898.66 | 332.4 | 186.36 | ... 9.0 | 2n | β   |

Discovered with the 6-inch. One of the most interesting binaries from the rapid relative motion, and the large movement of the system in space. The components have a large common proper motion:

|         |   |   |          |       |
|---------|---|---|----------|-------|
| Stumpe  | - | - | 0.534 in | 102.3 |
| Boss    | - | - | 0.509 in | 101.2 |
| Porter  | - | - | 0.480 in | 100.5 |
| Bossert | - | - | 0.478 in | 104.5 |

The distance is decreasing, with a corresponding increase in the angular motion. It will probably soon become a difficult object to measure. The principal measured positions are shown on the accompanying diagram:



A continuation of the measures of the distant stars will give independent data for the determination of the proper motion. The above observations give for the movement of A, 0".44 in the direction of 105°.9.

[β (1)...β (*Mon. Not.* XXXIII, 351)...β<sup>1</sup>...β<sup>4</sup>...β (2875,3114) β (*Pub. L. O.* II)...Δ (1)...LM...Lv...Lv (*Sid. Mess.* VIII, 77)...Sp (III)...Lv (*A. J.* 382)...Wilson ( )...Lewis, Bowyer and Bryant (*Greenwich Obsns.* 1894) (*Mon. Not.* LVI, 359; LIX, 400)...Aitken (3585)...Engelhardt (*Obsns. Astron.* III)...]

**$\beta$  229.** Lalande 45726

R.A.  $23^{\text{h}} 14^{\text{m}} 27^{\text{s}}$  }  
Decl.  $+ 56^{\circ} 35'$  }

|         |                |                        |            |            |          |
|---------|----------------|------------------------|------------|------------|----------|
| 1876.68 | $37.9^{\circ}$ | $17.55^{\prime\prime}$ | 7.0...11.7 | 2 <i>n</i> | $\Delta$ |
| 1888.69 | 36.7           | 17.93                  | 7.0...11.9 | 2 <i>n</i> | T        |
| 1898.99 | 36.7           | 17.75                  | 6.9...11.0 | 4 <i>n</i> | D        |

Discovered with the 6-inch. No change.

[ $\beta$  (1*v*)... $\beta$  (*Mon. Not.* xxxiv, 382)... $\Delta$  (1)...Tarrant (2991)...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  278.** B.A.C. 8138

R.A.  $23^{\text{h}} 15^{\text{m}} 20^{\text{s}}$  }  
Decl.  $+ 61^{\circ} 33'$  }

|         |                 |                        |            |            |           |
|---------|-----------------|------------------------|------------|------------|-----------|
| 1876.45 | $351.9^{\circ}$ | $14.76^{\prime\prime}$ | 6.5...11.5 | 1 <i>n</i> | $O\Sigma$ |
| 1890.64 | 173.9           | 12.66                  | 6.6...11.8 | 3 <i>n</i> | $\beta$   |
| 1898.59 | 174.8           | 12.86                  | 6.7...12.1 | 3 <i>n</i> | $\beta$   |

Discovered with the 9.4-inch at the Dartmouth College Observatory. Evidently an error of  $180^{\circ}$  in the measure of  $O\Sigma$ . The proper motion of this star is very small,  $0.015$  in the direction of  $247^{\circ}.2$  (AUWERS). A naked-eye star in *Cassiopeia*; HEIS 6*m*; Harvard photometry 6.3*m*.

[ $\beta$  (v)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 11)... $O\Sigma$  (*Poulkova Obsns.* x)...]

 **$\beta$  718.** 64 *Pegasi*

R.A.  $23^{\text{h}} 16^{\text{m}} 3^{\text{s}}$  }  
Decl.  $+ 31^{\circ} 9'$  }

|         |      |                       |            |            |           |
|---------|------|-----------------------|------------|------------|-----------|
| 1878.74 | 88.3 | $0.47^{\prime\prime}$ | 5.0... 8.7 | 4 <i>n</i> | $\beta$   |
| 1878.74 | 88.7 | 0.56                  | 5.0... 7.0 | 1 <i>n</i> | $\Delta$  |
| 1882.62 | 85.9 | 0.60                  | 6.0... 8.0 | 1 <i>n</i> | $O\Sigma$ |
| 1884.72 | 86.5 | 0.73                  | ...        | 2 <i>n</i> | $H\Sigma$ |
| 1888.73 | 85.8 | 0.63                  | ...        | 3 <i>n</i> | Sp        |
| 1888.80 | 85.4 | 0.67                  | 5.8... 7.8 | 4 <i>n</i> | $\beta$   |
| 1889.50 | 86.2 | 0.69                  | 5.8... 8.8 | 3 <i>n</i> | $\beta$   |
| 1898.59 | 85.5 | 0.72                  | 5 ... 8    | 1 <i>n</i> | A         |

Discovered with the  $18\frac{1}{2}$ -inch. There is no material relative change, but the components have a common proper motion of  $0.020$  in the direction of  $144^{\circ}.2$  (AUWERS), and they therefore form a binary system.

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2875,2957)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)... $O\Sigma$  (*Poulkova Obsns.* x)...Sp (III)...Aitken ( )... $H\Sigma$  ( )...]

 **$\beta$  854.** D.M. ( $5^{\circ}$ ) 5164

R.A.  $23^{\text{h}} 18^{\text{m}} 14^{\text{s}}$  }  
Decl.  $+ 5^{\circ} 23'$  }

|         |                |                       |            |            |         |
|---------|----------------|-----------------------|------------|------------|---------|
| 1881.66 | $90.0^{\circ}$ | $2.10^{\prime\prime}$ | 8.7... 8.7 | 3 <i>n</i> | $\beta$ |
| 1886.86 | 89.7           | 2.44                  | ...        | 5 <i>n</i> | UL      |
| 1887.70 | 87.9           | 2.38                  | 8.4... 8.6 | 3 <i>n</i> | Com     |
| 1888.82 | 88.3           | 1.89                  | 8.5... 8.5 | 1 <i>n</i> | Lv      |
| 1899.32 | 88.3           | 2.47                  | 9.9... 9.0 | 6 <i>n</i> | D       |

Discovered with the  $15\frac{1}{2}$ -inch at the Washburn Observatory. Apparently without change.

[ $\beta$  (xii)... $\beta^4$ ...Updegraff, Lamb and Comstock (*Pub. Washburn Obsy.* v, vi)...Lv<sup>1</sup>...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  719.** W<sup>1</sup> XXIII. 342

R.A.  $23^{\text{h}} 18^{\text{m}} 22^{\text{s}}$  }  
Decl.  $+ 13^{\circ} 49'$  }

|         |                |                       |            |            |         |
|---------|----------------|-----------------------|------------|------------|---------|
| 1877.86 | $10.9^{\circ}$ | $1.11^{\prime\prime}$ | 8.0...11.0 | 1 <i>n</i> | $\beta$ |
| 1887.79 | 8.3            | 1.31                  | 7.2...11.0 | 2 <i>n</i> | Ho      |
| 1891.60 | 3.6            | 1.34                  | 7.6...11.5 | 3 <i>n</i> | $\beta$ |
| 1895.71 | 354.6          | 1.27                  | 7 ... 11   | 1 <i>n</i> | Ho      |
| 1897.83 | 358.8          | 1.47                  | ...        | 1 <i>n</i> | Br      |
| 1899.72 | 2.2            | 1.46                  | 7.2...11.7 | 2 <i>n</i> | D       |

Discovered with the  $18\frac{1}{2}$ -inch. In an unequal pair of this class, the apparent change in angle needs confirming. In my *Tenth Catalogue* this star was erroneously identified as W<sup>1</sup> XXIII. 363, and given with an error of  $1^{\circ} 11'$  in the Decl. It was found independently by HOUGH, and is Ho 301.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Hough (2977,3558)...Brown ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

 **$\beta$  386.** B.A.C. 8173

R.A.  $23^{\text{h}} 21^{\text{m}} 13^{\text{s}}$  }  
Decl.  $+ 70^{\circ} 1'$  }

|         |                 |                        |            |            |          |
|---------|-----------------|------------------------|------------|------------|----------|
| 1876.97 | $312.3^{\circ}$ | $20.08^{\prime\prime}$ | 6.5...11.9 | 4 <i>n</i> | $\Delta$ |
| 1888.71 | 313.1           | 20.69                  | 7.2...11.2 | 3 <i>n</i> | $\beta$  |
| 1899.05 | 313.0           | 19.94                  | 6.6...10.8 | 3 <i>n</i> | D        |

Discovered with the 6-inch. The principal star has a proper motion of  $0.026$  in the direction of  $96^{\circ}.7$  (A.G.C).

[ $\beta$  (vi)... $\beta$  (2062,2875)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 1148.** Groombridge 4070

R.A. 23<sup>h</sup> 22<sup>m</sup> 2<sup>s</sup> }  
Decl. + 64° 58'

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1889.60 | 73.9 | 2.13 | 7.1...13.0 | 3 <sup>n</sup> | β |
| 1898.68 | 77.3 | 2.47 | 6.5...13.0 | 1 <sup>n</sup> | A |

Discovered with the 36-inch. In D.M. 6.5 in.

[β (xvi)...β (2956)...β (*Pub. L. O.* II)...Aitken ( )...]

**β 1221.** D.M. (41°) 4788

R.A. 23<sup>h</sup> 22<sup>m</sup> 12<sup>s</sup> }  
Decl. + 41° 46'

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1890.50 | 145.2 | 1.91 | 9.3...10.5 | 3 <sup>n</sup> | β |
| 1896.93 | 145.9 | 1.73 | ...        | 3 <sup>n</sup> | A |

Discovered with the 16-inch at the Warner Observatory in 1885.

[β (xvii)...β (3047)...β (*Pub. L. O.* II)...Aitken (3466)...]

**β 1222.** D.M. (2°) 4669

R.A. 23<sup>h</sup> 22<sup>m</sup> 23<sup>s</sup> }  
Decl. + 2° 54'

|         |      |      |            |                |     |
|---------|------|------|------------|----------------|-----|
| 1890.82 | 37.4 | 1.14 | 8.9... 9.0 | 3 <sup>n</sup> | β   |
| 1896.87 | 35.2 | 0.92 | ...        | 4 <sup>n</sup> | A   |
| 1898.74 | 31.8 | 1.04 | ...        | 1 <sup>n</sup> | Bow |

Discovered with the 12-inch.

[β (xviii)...β (3047)...β (*Pub. L. O.* II)...Aitken (3466)...  
Bowyer (*Mon. Not.* LIX, 400)...]

**β 1149.** D.M. (57°) 2746

R.A. 23<sup>h</sup> 24<sup>m</sup> 11<sup>s</sup> }  
Decl. + 58° 1'

|         |       |      |            |                |    |
|---------|-------|------|------------|----------------|----|
| 1889.58 | 309.1 | 0.52 | 9.4... 9.8 | 3 <sup>n</sup> | β  |
| 1898.81 | 308.9 | 0.56 | ...        | 2 <sup>n</sup> | Hu |

Discovered with the 36-inch. In the field with the multiple star, OΣ 496.

OΣ 496 (A) and β 1149 (AB)

|         |       |        |     |                |   |
|---------|-------|--------|-----|----------------|---|
| 1889.58 | 277.6 | 231.07 | ... | 1 <sup>n</sup> | β |
|---------|-------|--------|-----|----------------|---|

[β (xvi)...β (2956)...β (*Pub. L. O.* II)...Hussey ( )...]

**β 1266.** D.M. (30°) 4963

R.A. 23<sup>h</sup> 24<sup>m</sup> 29<sup>s</sup> }  
Decl. + 30° 10'

A and B

|         |      |        |            |                |     |
|---------|------|--------|------------|----------------|-----|
| 1891.69 | 74.0 | 0.24   | 7.4... 7.4 | 3 <sup>n</sup> | β   |
| 1893.54 | 65.9 | 0.23   | ...        | 1 <sup>n</sup> | Lv  |
| 1893.64 | 73.3 | 0.26   | 8.0... 8.0 | 2 <sup>n</sup> | W   |
| 1893.67 | 60.3 | 0.22 ± | ...        | 7 <sup>n</sup> | Sp  |
| 1895.96 | 55.5 | 0.20 ± | ...        | 2 <sup>n</sup> | Sp  |
| 1896.78 | 52.0 | 0.28   | ...        | 2 <sup>n</sup> | Lew |
| 1897.94 | 41.6 | 0.36   | ...        | 1 <sup>n</sup> | Lew |
| 1898.71 | 54.0 | 0.35   | ...        | 1 <sup>n</sup> | Lew |
| 1899.55 | 45.5 | 0.24   | 7.7... 7.8 | 3 <sup>n</sup> | A   |

AB and C (= Σ 3018)

|         |       |       |            |                |     |
|---------|-------|-------|------------|----------------|-----|
| 1830.52 | 204.0 | 18.92 | 7.2... 9.5 | 2 <sup>n</sup> | Σ   |
| 1843.74 | 203.4 | 19.41 | ...        | 1 <sup>n</sup> | Ma  |
| 1864.45 | 204.0 | 18.98 | 7.2... 9.0 | 3 <sup>n</sup> | Δ   |
| 1870.07 | 203.8 | 18.83 | 7.9... 9.8 | 4 <sup>n</sup> | Dun |
| 1879.57 | 202.9 | 19.19 | 7.0... 9.5 | 1 <sup>n</sup> | Cin |
| 1891.69 | 203.5 | 18.92 | ... 9.0    | 3 <sup>n</sup> | β   |
| 1894.44 | 203.6 | 18.79 | ...        | 2 <sup>n</sup> | Sp  |
| 1897.86 | 204.0 | 18.95 | ...        | 3 <sup>n</sup> | Lew |
| 1899.54 | 203.4 | 18.77 | ...        | 1 <sup>n</sup> | A   |

The larger component of Σ 3018 was found to be a close pair with the 36-inch. The measures show rapid motion. It is a binary, and probably of short period. There is no change in C since the observations of STRUVE. All the measures are given.

[β (xviii)...β (3113)...β (*Pub. L. O.* II)...Lv (*A. J.* 382)  
...Sp (III)...Wilson ( )...Lewis (*Mon. Not.* LIX, 400)  
...Madler (*Fixstern-Systeme* 1) (*Dorpat Obsns.* XI)...  
Herschel (*Mem. R. A. S.* IV)...Δ (II)...Duner (*Mesures Microm.* Lund, 1876)...Cin<sup>5</sup>...Aitken ( )...]

**β 1150.** O. Arg. N. 25672

R.A. 23<sup>h</sup> 24<sup>m</sup> 46<sup>s</sup> }  
Decl. + 64° 24'

|         |      |      |            |                |   |
|---------|------|------|------------|----------------|---|
| 1889.60 | 44.0 | 0.61 | 8.7... 9.0 | 3 <sup>n</sup> | β |
| 1898.68 | 49.7 | 0.57 | 8.5... 9.0 | 1 <sup>n</sup> | A |

Discovered with the 36-inch.

[β (xvi)...β (2956)...β (*Pub. L. O.* II)...Aitken ( )...]

$\beta$  1151.

R.A.  $23^{\text{h}} 25^{\text{m}} 6^{\text{s}}$  }  
Decl.  $+ 57^{\circ} 43'$  }

|         |                 |             |              |                |         |
|---------|-----------------|-------------|--------------|----------------|---------|
| 1889.59 | $293.7^{\circ}$ | $0.64^{\#}$ | 9.7... 9.7   | 3 <sup>n</sup> | $\beta$ |
| 1899.59 | 291.4           | 0.67        | 10.5... 11.0 | 1 <sup>n</sup> | A       |

Discovered with the 36-inch. A difficult pair, and so far without change.

It is too faint to be included in the D.M. In the field with  $\Sigma$  3022.

$\Sigma$  3022 (A) and  $\beta$  1151 (AB)

1889.58  $189.7^{\circ}$   $116.88^{\#}$  3<sup>n</sup>  $\beta$

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Aitken ( )...]

 $\beta$  774. D.M. ( $63^{\circ}$ ) 2006

R.A.  $23^{\text{h}} 25^{\text{m}} 19^{\text{s}}$  }  
Decl.  $+ 63^{\circ} 40'$  }

|         |               |             |            |                |         |
|---------|---------------|-------------|------------|----------------|---------|
| 1880.58 | $6.7^{\circ}$ | $0.51^{\#}$ | 8.4... 8.8 | 3 <sup>n</sup> | $\beta$ |
| 1890.64 | 4.1           | 0.52        | 8.3... 8.6 | 3 <sup>n</sup> | $\beta$ |
| 1892.16 | 1.8           | $0.45 \pm$  | ...        | 5 <sup>n</sup> | Sp      |
| 1898.68 | 359.1         | 0.66        | 8.2... 8.8 | 3 <sup>n</sup> | A       |

Discovered with the 6-inch at Mt. Hamilton in 1879. It is a difficult pair with a much larger aperture. Retrograde motion?

[ $\beta$  (xi)... $\beta^2$ ... $\beta^3$ ... $\beta$  (3048)... $\beta$  (*Pub. L. O.* 11)...Sp (III)  
...Aitken (3585)...]

 $\beta$  720. 72 Pegasus

R.A.  $23^{\text{h}} 28^{\text{m}} 0^{\text{s}}$  }  
Decl.  $+ 30^{\circ} 40'$  }

|         |                 |             |            |                |            |
|---------|-----------------|-------------|------------|----------------|------------|
| 1878.74 | $127.7^{\circ}$ | $0.40^{\#}$ | 6.0... 6.0 | 3 <sup>n</sup> | $\beta$    |
| 1878.74 | 128.7           | 0.37        | 5.5... 6.0 | 1 <sup>n</sup> | $\Delta$   |
| 1880.01 | 311.0           | 0.41        | 6.0... 6.1 | 3 <sup>n</sup> | $\beta$    |
| 1882.62 | 308.9           | 0.48        | 6.0... 7.0 | 1 <sup>n</sup> | O $\Sigma$ |
| 1883.40 | 147.6           | 0.25        | ...        | 7 <sup>n</sup> | En         |
| 1886.61 | 141.6           | 0.45        | ...        | 5 <sup>n</sup> | H $\Sigma$ |
| 1887.60 | 141.8           | $0.3 \pm$   | ...        | 3 <sup>n</sup> | Sp         |
| 1888.93 | 142.1           | $0.4 \pm$   | ...        | 8 <sup>n</sup> | Sp         |
| 1889.50 | 146.0           | 0.38        | 6.0... 6.0 | 3 <sup>n</sup> | $\beta$    |
| 1890.55 | 148.3           | 0.37        | ...        | 3 <sup>n</sup> | $\beta$    |
| 1891.67 | 149.5           | 0.33        | ...        | 3 <sup>n</sup> | $\beta$    |
| 1893.54 | 151.3           | 0.30        | 6.5... 6.0 | 1 <sup>n</sup> | Lv         |
| 1893.67 | 150.9           | 0.42        | 6.2... 6.0 | 3 <sup>n</sup> | W          |

|         |                 |                 |            |                |     |
|---------|-----------------|-----------------|------------|----------------|-----|
| 1893.97 | $160.7^{\circ}$ | $0.35 \pm^{\#}$ | ...        | 1 <sup>n</sup> | Sp  |
| 1894.42 | 153.8           | 0.37            | ...        | 6 <sup>n</sup> | Bar |
| 1896.67 | 157.0           | 0.39            | 6.0... 6.5 | 3 <sup>n</sup> | Lv  |
| 1896.76 | 157.7           | 0.37            | ...        | 3 <sup>n</sup> | Lew |
| 1897.82 | 164.5           | 0.43            | ...        | 1 <sup>n</sup> | Dy  |
| 1897.83 | 158.4           | 0.41            | ...        | 3 <sup>n</sup> | Hu  |
| 1897.93 | 158.6           | 0.38            | ...        | 1 <sup>n</sup> | A   |
| 1897.93 | 160.2           | 0.33            | ...        | 2 <sup>n</sup> | Lew |
| 1898.67 | 161.2           | 0.50            | 6.5... 6.5 | 3 <sup>n</sup> | A   |
| 1898.78 | 158.2           | 0.50            | ...        | 1 <sup>n</sup> | Lew |
| 1898.91 | 159.2           | 0.39            | ...        | 1 <sup>n</sup> | Bow |
| 1898.97 | 151.1           | 0.34            | ...        | 1 <sup>n</sup> | Bry |

Discovered with the  $18\frac{1}{2}$ -inch. A binary in direct motion. So far the change has been about  $1^{\circ}5$  per year. The system has an annual proper motion of  $0''.025$  in the direction of  $101^{\circ}5$  (AUWERS).

[ $\beta$  (x)... $\beta^1$ ... $\beta^3$ ... $\beta$  (2957,3048,3114)... $\beta$  (*Pub. L. O.* 11)...  
 $\Delta$  (1)...O $\Sigma$  (*Poulkova Obsns.* x)...Engelmann (2678)...  
Sp (III)...Lv (*A. J.* 382,407)...Wilson ( )...Barnard (*A. J.* 447)...Gore (*Mon. Not.* XLVII, 62)...Lewis and Dyson (*Mon. Not.* LIX, 400)...H $\Sigma$  ( )...Hussey (*A. J.* 427)...Aitken (*A. J.* 429) (3585)...]

 $\beta$  387. Lalande 46162

R.A.  $23^{\text{h}} 28^{\text{m}} 8^{\text{s}}$  }  
Decl.  $- 10^{\circ} 22'$  }

|         |                |             |             |                |          |
|---------|----------------|-------------|-------------|----------------|----------|
| 1876.67 | $71.6^{\circ}$ | $5.73^{\#}$ | 8.7... 10.2 | 3 <sup>n</sup> | $\Delta$ |
| 1877.77 | 69.5           | 5.94        | 8.0... 9.0  | 2 <sup>n</sup> | Cin      |
| 1891.87 | 70.8           | 5.82        | 8.1... 9.0  | 2 <sup>n</sup> | $\beta$  |
| 1898.65 | 70.0           | 5.91        | 8.2... 9.2  | 3 <sup>n</sup> | Bd       |

Discovered with the 6-inch. Without change.

[ $\beta$  (vi)... $\beta$  (2062,3114)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Cin<sup>4</sup>  
Boothroyd ( )...]

 $\beta$  388. W<sup>2</sup> XXIII. 590

R.A.  $23^{\text{h}} 28^{\text{m}} 52^{\text{s}}$  }  
Decl.  $+ 37^{\circ} 22'$  }

|         |                 |              |             |                |          |
|---------|-----------------|--------------|-------------|----------------|----------|
| 1876.46 | $334.3^{\circ}$ | $21.77^{\#}$ | 6.5... 12.0 | 1 <sup>n</sup> | $\Delta$ |
| 1897.82 | 333.5           | 20.53        | ...         | 2 <sup>n</sup> | $\beta$  |
| 1898.68 | 333.5           | 21.28        | 6.3... 10.8 | 4 <sup>n</sup> | D        |

Discovered with the 6-inch. HEIS gives this as a naked-eye star in *Andromeda*, 6-7 m.

[ $\beta$  (vi)... $\beta$  (2062)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 81.** W<sup>1</sup> XXIII. 562

R.A. 23<sup>h</sup> 28<sup>m</sup> 59<sup>s</sup> }  
Decl. — 12° 14' }

|         |      |      |             |                |     |
|---------|------|------|-------------|----------------|-----|
| 1876.08 | 10.5 | 1.53 | 8.3... 9.8  | 3 <sup>n</sup> | Δ   |
| 1877.86 | 14.8 | 1.96 | 8.2... 9.7  | 2 <sup>n</sup> | Cin |
| 1886.40 | 13.4 | 1.96 | 8.2... 11.0 | 3 <sup>n</sup> | LM  |
| 1897.94 | 14.6 | 2.01 | ...         | 1 <sup>n</sup> | Br  |

Discovered with the 6-inch. Probably fixed.

[β (1)...β (Mon. Not. xxxiii, 351)...Δ (1)...Cin<sup>4</sup>...LM... Brown ( )...]

**β 721.** W<sup>1</sup> XXIII. 592

R.A. 23<sup>n</sup> 30<sup>m</sup> 7<sup>s</sup> }  
Decl. — 7° 47' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1878.22 | 138.2 | 0.51 | 9.0... 9.0 | 1 <sup>n</sup> | β   |
| 1879.16 | 145.5 | 0.44 | 8.0... 9.0 | 2 <sup>n</sup> | Cin |
| 1886.77 | 134.6 | 0.38 | 8.0... 8.3 | 2 <sup>n</sup> | LM  |
| 1898.68 | 117.1 | 0.73 | 8.0... 8.5 | 1 <sup>n</sup> | Bd  |
| 1899.68 | 131.7 | 0.32 | 8.6... 8.6 | 3 <sup>n</sup> | A   |

Discovered with the 18½-inch. The change, if any, is in the distance. There is a faint star in the *n* *p* quadrant:

|         |       |       |          |                |    |
|---------|-------|-------|----------|----------------|----|
| 1898.68 | 301.7 | 21.38 | ... 12.5 | 1 <sup>n</sup> | Bd |
| 1899.63 | 301.1 | 22.19 | ... 14.0 | 1 <sup>n</sup> | A  |

[β (x)...β<sup>1</sup>...Cin<sup>5</sup>...LM...Boothroyd ( )...Aitken ( )...]

**β 775 = β 1012.** Lacaille 9534

R.A. 23<sup>h</sup> 30<sup>m</sup> 45<sup>s</sup> }  
Decl. — 32° 32' }

|         |       |      |             |                |     |
|---------|-------|------|-------------|----------------|-----|
| 1881.45 | 251.0 | 5.35 | 7.2... 10.5 | 4 <sup>n</sup> | β   |
| 1886.92 | 248.0 | 5.60 | 7.0... 9.5  | 2 <sup>n</sup> | Pol |
| 1898.70 | 251.2 | 5.28 | 7.0... 11.0 | 3 <sup>n</sup> | Cg  |
| 1898.74 | 250.6 | 5.28 | 7.0... 10.0 | 3 <sup>n</sup> | A   |

Discovered with the 6-inch at Mt. Hamilton in 1879, and again independently with the 12-inch in 1881. In Cord. G. C. 6½ m. Without change.

[β (xi, xiii)...β<sup>2</sup>...β<sup>3</sup>...Pollock (Pub. Sydney Obsy. 1891) (Mem. R. A. S. L)...Cogshall ( )...Aitken (3585)...]

**β 855.** D.M. (67°) 1546

R.A. 23<sup>h</sup> 32<sup>m</sup> 23<sup>s</sup> }  
Decl. + 67° 33' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.53 | 204.2 | 0.82 | 8.5... 8.8 | 4 <sup>n</sup> | β   |
| 1888.51 | 199.1 | 0.79 | 8.5... 9.3 | 3 <sup>n</sup> | Com |
| 1898.53 | 201.2 | 0.94 | 8.8... 9.2 | 3 <sup>n</sup> | D   |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...Doolittle (Pub. Flower Obsy. i)...]

**β 722.** D.M. (41°) 4886

R.A. 23<sup>h</sup> 32<sup>m</sup> 33<sup>s</sup> }  
Decl. + 41° 51' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.53 | 348.6 | 7.45 | 6.8... 12.5 | 1 <sup>n</sup> | β  |
| 1885.82 | 348.5 | 7.38 | ...         | 2 <sup>n</sup> | HΣ |
| 1897.82 | 348.9 | 7.26 | ...         | 2 <sup>n</sup> | β  |

Discovered with the 18½-inch. Without change.

[β (x)...β<sup>1</sup>...HΣ ( )...]

**β 856.** O. Arg. N. 25859

R.A. 23<sup>h</sup> 33<sup>m</sup> 3<sup>s</sup> }  
Decl. + 69° 58' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1881.55 | 266.0 | 0.58 | 8.1... 9.1 | 2 <sup>n</sup> | β   |
| 1886.89 | 267.8 | 0.66 | 8.2... 9.5 | 3 <sup>n</sup> | Com |
| 1898.53 | 265.3 | 0.62 | 8.5... 9.3 | 3 <sup>n</sup> | D   |

Discovered with the 15½-inch at the Washburn Observatory.

[β (xii)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...Doolittle (Pub. Flower Obsy. i)...]

**β 723.** Lalande 46375

R.A. 23<sup>h</sup> 34<sup>m</sup> 32<sup>s</sup> }  
Decl. — 0° 15' }

|         |       |      |             |                |    |
|---------|-------|------|-------------|----------------|----|
| 1878.25 | 168.5 | 3.78 | 7.0... 11.3 | 4 <sup>n</sup> | β  |
| 1888.93 | 168.2 | ...  | 7.0... 12.0 | 1 <sup>n</sup> | Lv |
| 1891.77 | 167.8 | 3.66 | 7.1... 11.5 | 3 <sup>n</sup> | β  |

Discovered with the 18½-inch. Fixed.

[β (x)...β<sup>1</sup>...β(3114)...β (Pub. L. O. II)...Lv<sup>1</sup>...]

$\beta$  724 W<sup>1</sup> XXIII. 691

R.A. 23<sup>h</sup> 34<sup>m</sup> 46<sup>s</sup> }  
Decl. + 7° 19' }

|         |      |      |        |      |                |         |
|---------|------|------|--------|------|----------------|---------|
| 1878.73 | 85.7 | 0.75 | 9.0... | 9.5  | 1 <sup>n</sup> | $\beta$ |
| 1889.88 | 88.7 | 0.5± | ...    |      | 1 <sup>n</sup> | Sp      |
| 1891.77 | 87.4 | 0.64 | 8.7... | 9.1  | 3 <sup>n</sup> | $\beta$ |
| 1898.73 | 89.1 | 0.78 | 9.0... | 10.0 | 3 <sup>n</sup> | Cg      |
| 1898.85 | 88.7 | 0.60 | 8.8... | 9.5  | 3 <sup>n</sup> | A       |

Discovered with the 18½-inch. Unchanged.

[ $\beta$  (x)... $\beta^c$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Sp (III)...  
Cogshall ( )...Aitken (3585)...]

 $\beta$  857. D.M. (66°) 1630

R.A. 23<sup>h</sup> 34<sup>m</sup> 58<sup>s</sup> }  
Decl. + 66° 53' }

|         |       |      |        |     |                |         |
|---------|-------|------|--------|-----|----------------|---------|
| 1881.53 | 296.9 | 1.39 | 8.5... | 8.9 | 4 <sup>n</sup> | $\beta$ |
| 1887.77 | 296.6 | 1.66 | 8.4... | 9.3 | 3 <sup>n</sup> | Com     |
| 1898.54 | 297.0 | 1.43 | 8.6... | 9.5 | 3 <sup>n</sup> | D       |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (XII)... $\beta^d$ ...Comstock (*Pub. Washburn Obsy.* VI)...Doolittle (*Pub. Flower Obsy.* 1)...]

 $\beta$  858. Lalande 46423

R.A. 23<sup>h</sup> 35<sup>m</sup> 18<sup>s</sup> }  
Decl. + 31° 54' }

A and B (=  $\beta$  858)

|         |       |      |        |     |                |            |
|---------|-------|------|--------|-----|----------------|------------|
| 1881.57 | 276.6 | 0.48 | 7.7... | 8.2 | 3 <sup>n</sup> | $\beta$    |
| 1881.72 | 273.9 | 0.53 | 7.0... | 7.0 | 1 <sup>n</sup> | Ho         |
| 1885.83 | 267.7 | 0.67 | ...    |     | 2 <sup>n</sup> | H $\Sigma$ |
| 1887.74 | 272.4 | 0.71 | 8.4... | 9.1 | 3 <sup>n</sup> | Com        |
| 1891.64 | 268.9 | 0.65 | 8.0... | 8.2 | 2 <sup>n</sup> | $\beta$    |
| 1893.55 | 263.7 | 0.54 | ...    |     | 5 <sup>n</sup> | Sp         |
| 1896.72 | 268.0 | 0.61 | ...    |     | 1 <sup>n</sup> | Lew        |
| 1897.79 | 261.9 | 0.67 | ...    |     | 3 <sup>n</sup> | Bow        |
| 1897.82 | 269.6 | 0.71 | ...    |     | 1 <sup>n</sup> | Dys        |
| 1897.87 | 262.6 | 0.70 | ...    |     | 3 <sup>n</sup> | A          |
| 1898.72 | 267.1 | 0.75 | ...    |     | 1 <sup>n</sup> | Lew        |
| 1898.87 | 267.4 | 0.81 | ...    |     | 1 <sup>n</sup> | Bow        |

AB and C (=  $\beta$  389)

|         |      |       |     |      |                |         |
|---------|------|-------|-----|------|----------------|---------|
| 1881.62 | 51.0 | 23.66 | ... | 12.8 | 3 <sup>n</sup> | $\beta$ |
| 1881.76 | 50.5 | 23.78 | ... | 13.0 | 1 <sup>n</sup> | Ho      |

|         |      |       |     |      |                |            |
|---------|------|-------|-----|------|----------------|------------|
| 1885.83 | 53.3 | 23.64 | ... |      | 2 <sup>n</sup> | H $\Sigma$ |
| 1888.31 | 52.4 | 24.06 | ... | 12.0 | 2 <sup>n</sup> | Com        |
| 1891.64 | 52.1 | 23.24 | ... | 12.7 | 2 <sup>n</sup> | $\beta$    |

The distant star was noted with the 6-inch, and the principal star subsequently found to be a close pair with the 15½-inch. The latter is a binary in slow retrograde motion.

[ $\beta$  (VI, XII)... $\beta$  (2062,3114)... $\beta^d$ ... $\beta$  (*Pub. L. O.* 11)...Sp (III)...Comstock (*Pub. Washburn Obsy.* VI)...Aitken (*A. J.* 429)...H $\Sigma$  ( )...Lewis, Bowyer and Dvson (*Mon. Not.* LIX, 400)...]

 $\beta$  279.  $\omega^2$  Aquarii

R.A. 23<sup>h</sup> 36<sup>m</sup> 30<sup>s</sup> }  
Decl. - 15° 12' }

|         |      |      |        |      |                |         |
|---------|------|------|--------|------|----------------|---------|
| 1875.54 | 87.8 | 5.68 | 5.0... | 11.0 | 4 <sup>n</sup> | J       |
| 1877.82 | 84.5 | 5.66 | 5.2... | 9.3  | 3 <sup>n</sup> | Cin     |
| 1888.71 | 83.3 | 5.86 | 5.2... | 11.0 | 3 <sup>n</sup> | $\beta$ |
| 1888.77 | 86.0 | 5.43 | 5.0... | 10.5 | 4 <sup>n</sup> | T       |
| 1888.93 | 85.4 | 5.11 | 5.0... | 10.8 | 1 <sup>n</sup> | Lv      |
| 1898.64 | 85.6 | 5.70 | ...    | 10.2 | 2 <sup>n</sup> | $\beta$ |
| 1898.65 | 83.9 | 5.32 | 4.5... | 10.7 | 3 <sup>n</sup> | Cg      |

Discovered with the 9.4-inch at the Dartmouth College Observatory. The bright star has a proper motion of 0.091 in the direction of 131°4 (AUWERS). This is sufficiently large to show that the companion is moving with the primary. In twenty-three years there is no material relative change in the components. They appear to have a common proper motion.

[ $\beta$  (V)... $\beta$  (*Mon. Not.* xxxv, 31)... $\beta$  (2875)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)... $\Delta$  (2086)...Cin<sup>4</sup>...Tarrant (2991)...Lv<sup>2</sup>...Cogshall ( )...]

 $\beta$  725. Lalande 46464

R.A. 23<sup>h</sup> 36<sup>m</sup> 36<sup>s</sup> }  
Decl. - 12° 0' }

|         |       |      |        |      |                |         |
|---------|-------|------|--------|------|----------------|---------|
| 1877.79 | 243.8 | 4.59 | 8.0... | 11.0 | 1 <sup>n</sup> | Cin     |
| 1877.82 | 237.3 | 4.30 | 7.0... | 11.0 | 2 <sup>n</sup> | $\beta$ |
| 1891.89 | 241.1 | 4.12 | 7.9... | 12.5 | 3 <sup>n</sup> | $\beta$ |
| 1898.85 | 238.0 | 4.24 | 8.0... | 12.0 | 2 <sup>n</sup> | $\beta$ |

Discovered with the 18½-inch. Probably fixed.

[ $\beta$  (x)... $\beta^c$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Cin<sup>4</sup>...]

**β 993.** *Cephei* 301

R.A. 23<sup>h</sup> 36<sup>m</sup> 42<sup>s</sup> }  
Decl. + 63° 51' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.75 | 279.7 | 2.67 | 7.0...11.4 | 4 <sup>n</sup> | β |
| 1892.73 | 277.4 | 2.79 | 7.0...12.0 | 1 <sup>n</sup> | W |
| 1898.66 | 274.0 | 2.48 | 7.0...11.0 | 3 <sup>n</sup> | D |

Discovered with the 18½-inch. Magnitude in Argelander 6.0; Harvard 6.9; A.G.C. 6.5. Groombridge 4130.

[β (xiii)...β<sup>3</sup>... Wilson ( )... Doolittle (*Pub. Flower Obsy.* 1)...]

**β 994.** *Lalande* 46490

R.A. 23<sup>h</sup> 37<sup>m</sup> 31<sup>s</sup> }  
Decl. + 24° 26' }

|         |       |      |            |                |   |
|---------|-------|------|------------|----------------|---|
| 1880.63 | 306.5 | 1.38 | 7.9...11.0 | 4 <sup>n</sup> | β |
| 1893.77 | 315.1 | 1.45 | 8.0...10.8 | 3 <sup>n</sup> | W |

Discovered with the 18½-inch.

[β (xiii)...β<sup>3</sup>... Wilson ( )...]

**β 1223.** *D.M.* (4°) 5046

R.A. 23<sup>h</sup> 39<sup>m</sup> 10<sup>s</sup> }  
Decl. + 4° 27' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1890.82 | 298.6 | 1.33 | 8.1...10.8 | 3 <sup>n</sup> | β   |
| 1892.46 | 297.2 | 1.32 | ...        | 4 <sup>n</sup> | Sp  |
| 1896.88 | 291.2 | 1.16 | ...        | 2 <sup>n</sup> | A   |
| 1897.96 | 294.8 | 1.19 | ...        | 1 <sup>n</sup> | Lew |

Discovered with the 12-inch. Change in angle?

[β (xvii)...β (3047)...β (*Pub. L. O.* 11)...Aitken (3466)... Sp (iii)...Lewis (*Mon. Not.* LIX, 400)...]

**β 726.** *S.D.* (13°) 6461

R.A. 23<sup>h</sup> 40<sup>m</sup> 24<sup>s</sup> }  
Decl. - 13° 25' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1877.86 | 324.2 | 0.91 | 8.5...10.5 | 1 <sup>n</sup> | β   |
| 1879.77 | 326.6 | ...  | 8.0...10.2 | 2 <sup>n</sup> | Cin |
| 1886.85 | 324.5 | 0.68 | 8.1...10.2 | 2 <sup>n</sup> | LM  |
| 1898.76 | 326.3 | 0.89 | 8.5...10.5 | 1 <sup>n</sup> | Bd  |
| 1898.86 | 320.2 | 0.67 | 8.0...10.0 | 2 <sup>n</sup> | A   |
| 1898.72 | 322.5 | 0.65 | 8.5... 9.5 | 3 <sup>n</sup> | Hu  |

Discovered with the 18½-inch.

[β (x)...β<sup>1</sup>... Cin<sup>6</sup>... LM... Boothroyd ( )...Aitken (3585)...Hussey ( )...]

**β 727.** *W*<sup>2</sup> XXIII. 866

R.A. 23<sup>h</sup> 41<sup>m</sup> 26<sup>s</sup> }  
Decl. + 24° 55' }

|         |       |       |            |                |    |
|---------|-------|-------|------------|----------------|----|
| 1878.69 | 313.4 | 17.47 | 7.0...12.5 | 2 <sup>n</sup> | β  |
| 1885.82 | 313.6 | 16.86 | ...        | 2 <sup>n</sup> | HΣ |
| 1891.64 | 315.2 | 16.83 | 7.3...13.5 | 3 <sup>n</sup> | β  |
| 1899.72 | 316.2 | 17.08 | 7.0...11.8 | 2 <sup>n</sup> | D  |

Discovered with the 18½-inch. The distance printed in β (x) should be doubled.

[β (x)...β<sup>1</sup>...β (3114)...β (*Pub. L. O.* 11)...HΣ ( )... Doolittle (*Pub. Flower Obsy.* 1)...]

**β 390.** *Lalande* 46617

R.A. 23<sup>h</sup> 41<sup>m</sup> 33<sup>s</sup> }  
Decl. + 48° 38' }

|         |       |       |            |                |     |
|---------|-------|-------|------------|----------------|-----|
| 1879.59 | 233.9 | 18.35 | 8.0...12.0 | 1 <sup>n</sup> | Cin |
| 1880.74 | 233.9 | 18.02 | 8.3...11.8 | 1 <sup>n</sup> | β   |
| 1892.84 | 233.3 | 17.28 | 8.2...11.2 | 2 <sup>n</sup> | W   |
| 1899.68 | 232.2 | 17.58 | 7.6...11.2 | 2 <sup>n</sup> | D   |

Discovered with the 6-inch. Change in distance?

[β (vi)...β (2062)...β<sup>3</sup>...Cin<sup>5</sup>...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

**β 995.** *Groombridge* 4139

R.A. 23<sup>h</sup> 41<sup>m</sup> 35<sup>s</sup> }  
Decl. + 46° 10' }

|         |       |      |            |                |     |
|---------|-------|------|------------|----------------|-----|
| 1879.61 | 240.0 | 0.73 | 6.0... 9.0 | 1 <sup>n</sup> | Cin |
| 1880.01 | 245.4 | 0.88 | 6.5... 8.5 | 2 <sup>n</sup> | β   |
| 1889.48 | 243.4 | 0.93 | 6.2...10.2 | 3 <sup>n</sup> | β   |
| 1891.75 | 239.8 | 0.77 | 6.7... 9.5 | 3 <sup>n</sup> | β   |
| 1894.60 | 238.4 | 0.73 | ...        | 7 <sup>n</sup> | Sp  |
| 1898.65 | 237.5 | 0.81 | 6.2... 8.4 | 4 <sup>n</sup> | A   |

Discovered with the 18½-inch. This is a naked-eye star in *Andromeda*. Change in angle is probable.

[β (xiii)...β<sup>3</sup>...β (2957,3114)...β (*Pub. L. O.* 11)...Cin<sup>5</sup>... Sp (iii)...Aitken (3585)...]

**$\beta$  1152.** Groombridge 4142

R.A.  $23^{\text{h}} 42^{\text{m}} 18^{\text{s}}$  }  
Decl.  $+ 63^{\circ} 9'$  }

B and C

|         |                 |        |                 |                |         |
|---------|-----------------|--------|-----------------|----------------|---------|
| 1889.60 | $102.4^{\circ}$ | $0.64$ | $9.2 \dots 9.2$ | $3^{\text{n}}$ | $\beta$ |
| 1898.78 | $102.8$         | $0.60$ | $9.0 \dots 9.1$ | $2^{\text{n}}$ | A       |

A and BC

|         |                 |         |             |                |         |
|---------|-----------------|---------|-------------|----------------|---------|
| 1889.60 | $136.3^{\circ}$ | $74.28$ | $7.5 \dots$ | $3^{\text{n}}$ | $\beta$ |
| 1898.68 | $136.1$         | $74.42$ | $7.0 \dots$ | $3^{\text{n}}$ | A       |

Discovered with the 36-inch. Unchanged.

[ $\beta$  (xvi)... $\beta$  (2956)...Aitken (3585)...] **$\beta$  1013.**  $\delta$  *Sculptoris*

R.A.  $23^{\text{h}} 42^{\text{m}} 40^{\text{s}}$  }  
Decl.  $- 28^{\circ} 48'$  }

A and B

|         |                 |        |                  |                |         |
|---------|-----------------|--------|------------------|----------------|---------|
| 1881.86 | $228.2^{\circ}$ | $3.36$ | $5.0 \dots 13.0$ | $2^{\text{n}}$ | $\beta$ |
| 1891.64 | $228.9$         | $3.34$ | $4.7 \dots 12.5$ | $2^{\text{n}}$ | $\beta$ |
| 1899.68 | $229.9$         | $3.32$ | $5.5 \dots 13.5$ | $2^{\text{n}}$ | A       |

A and C (= H 3216)

|         |                 |          |              |                |         |
|---------|-----------------|----------|--------------|----------------|---------|
| 1830    | $300.6^{\circ}$ | $80 \pm$ | $5 \dots 10$ | $1^{\text{n}}$ | H       |
| 1881.88 | $296.6$         | $74.31$  | $\dots 8.9$  | $3^{\text{n}}$ | $\beta$ |
| 1891.64 | $296.7$         | $74.03$  | $\dots 8.8$  | $2^{\text{n}}$ | $\beta$ |
| 1898.74 | $296.7$         | $74.23$  | $\dots 8.0$  | $2^{\text{n}}$ | Bd      |

The close star was discovered with the 12-inch on Mt. Hamilton in 1881. AUWERS gives the proper motion of  $\delta$  *Sculptoris*  $0''.108$  in the direction of  $154^{\circ}0$ . The close star is moving with the other, and it is doubtless a physical system. All the measures of the Herschel star are given above. His estimate of the distance in 1830 must be too large. The three sets of measures seem to indicate common proper motion, as otherwise the distance should have increased about  $1''.3$  from 1881 to 1898.

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* II)...Boothroyd ( )...Aitken ( )...] **$\beta$  728.** Lalande 46752

R.A.  $23^{\text{h}} 46^{\text{m}} 7^{\text{s}}$  }  
Decl.  $+ 42^{\circ} 50'$  }

|         |                 |        |                 |                |         |
|---------|-----------------|--------|-----------------|----------------|---------|
| 1878.23 | $352.6^{\circ}$ | $1.14$ | $8.3 \dots 8.3$ | $2^{\text{n}}$ | $\beta$ |
| 1883.34 | $351.9$         | $1.20$ | $8.2 \dots 8.3$ | $7^{\text{n}}$ | En      |
| 1892.73 | $353.7$         | $1.37$ | $9.0 \dots 9.5$ | $1^{\text{n}}$ | W       |
| 1898.54 | $354.0$         | $1.26$ | $8.1 \dots 8.1$ | $4^{\text{n}}$ | D       |

Discovered with the 18½-inch. In A.G.C. 7.1 III.

[ $\beta$  (x)... $\beta^1$ ...Engelmann (2678)...Wilson ( )...Doolittle (*Pub. Flower Obsy.* 1)...] **$\beta$  996.** Piazzii XXIII. 218

R.A.  $23^{\text{h}} 46^{\text{m}} 34^{\text{s}}$  }  
Decl.  $+ 74^{\circ} 53'$  }

|         |                |        |                  |                |         |
|---------|----------------|--------|------------------|----------------|---------|
| 1880.64 | $64.7^{\circ}$ | $5.52$ | $6.8 \dots 11.7$ | $4^{\text{n}}$ | $\beta$ |
| 1888.74 | $67.1$         | $5.43$ | $7.2 \dots 12.0$ | $3^{\text{n}}$ | $\beta$ |
| 1889.51 | $68.0$         | $5.77$ | $6.4 \dots 12.5$ | $3^{\text{n}}$ | $\beta$ |
| 1898.62 | $70.9$         | $5.72$ | $6.5 \dots 11.4$ | $2^{\text{n}}$ | $\beta$ |

Discovered with the 18½-inch. The large star has a considerable proper motion,  $0''.288$  in the direction of  $81^{\circ}8$  (PORTER). This is evidently a binary in slow direct angular motion, with a large movement in space common to both components.

ENGELHARDT (*Obsns. Astron.* 111) measures a distant star, D.M. ( $74^{\circ}$ ) 1049,  $130^{\circ}6 : 165''.74$  (1894.11)  $2^{\text{n}}$ .

[ $\beta$  (xiii)... $\beta^3$ ... $\beta$  (2875,2957)... $\beta$  (*Pub. L. O.* II)...] **$\beta$  859.** W<sup>2</sup> XXIII. 961

R.A.  $23^{\text{h}} 46^{\text{m}} 35^{\text{s}}$  }  
Decl.  $+ 22^{\circ} 18'$  }

|         |                 |        |                 |                |         |
|---------|-----------------|--------|-----------------|----------------|---------|
| 1881.67 | $217.3^{\circ}$ | $0.63$ | $8.5 \dots 8.5$ | $3^{\text{n}}$ | $\beta$ |
| 1887.81 | $214.8$         | $0.64$ | $9.0 \dots 9.0$ | $3^{\text{n}}$ | Com     |
| 1898.74 | $215.5$         | $0.72$ | $9.0 \dots 9.0$ | $2^{\text{n}}$ | D       |

Discovered with the 15½-inch at the Washburn Observatory.

[ $\beta$  (xii)... $\beta^4$ ...Comstock (*Pub. Washburn Obsy.* vi)...Doolittle (*Pub. Flower Obsy.* 1)...] **$\beta$  1153.**

R.A.  $23^{\text{h}} 46^{\text{m}} 45^{\text{s}}$  }  
Decl.  $+ 60^{\circ} 2'$  }

A and B

|         |                 |        |                  |                |         |
|---------|-----------------|--------|------------------|----------------|---------|
| 1889.68 | $318.5^{\circ}$ | $0.43$ | $9.7 \dots 9.9$  | $4^{\text{n}}$ | $\beta$ |
| 1899.58 | $318.6$         | $0.43$ | $9.7 \dots 10.2$ | $2^{\text{n}}$ | A       |

AB and C

|         |                 |         |              |                |         |
|---------|-----------------|---------|--------------|----------------|---------|
| 1889.68 | $339.5^{\circ}$ | $13.72$ | $\dots 10.1$ | $3^{\text{n}}$ | $\beta$ |
| 1899.58 | $339.6$         | $13.84$ | $\dots 10.0$ | $2^{\text{n}}$ | A       |

AB and OΣ 511 (A)

|         |      |        |     |     |    |   |
|---------|------|--------|-----|-----|----|---|
| 1889.69 | 66.0 | 176.51 | ... | 6.8 | 2n | β |
|---------|------|--------|-----|-----|----|---|

A very difficult pair of small stars, discovered with the 36-inch. Too faint to be given in the D.M. I have connected it with another pair in the field, OΣ 511.

[β (xvi)...β (2956)...β (Pub. L. O. II)...Aitken ( )...]

β 729. O. Arg. S. 23124

R.A. 23<sup>h</sup> 49<sup>m</sup> 14<sup>s</sup> }  
Decl. — 18° 30' }

|         |       |       |            |    |   |
|---------|-------|-------|------------|----|---|
| 1877.70 | 346.4 | 11.42 | 8.0...12.0 | 1n | β |
| 1891.89 | 344.9 | 11.22 | 8.0...12.7 | 2n | β |
| 1898.85 | 344.9 | 11.47 | 8.0...11.2 | 2n | β |

Discovered with the 18½-inch. Without change. The magnitude in O. Arg. is 7.0.

[β (x)...β<sup>t</sup>...β (3114)...β (Pub. L. O. II)...]

β 1224. Lalande 46942

R.A. 23<sup>h</sup> 50<sup>m</sup> 53<sup>s</sup> }  
Decl. + 55° 10' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1890.74 | 203.3 | 3.94 | 6.6...13.3 | 3n | β |
| 1899.63 | 201.4 | 4.10 | 6.5...13.8 | 3n | A |

Discovered with the 36-inch. In D.M. 7.5 m. Piazzì XXIII. 236.

[β (xvii)...β (3047)...β (Pub. L. O. II)...Aitken ( )...]

β 280. D.M. (56°) 3120

R.A. 23<sup>h</sup> 51<sup>m</sup> 50<sup>s</sup> }  
Decl. + 56° 43' }

A and C

|         |       |      |         |    |    |
|---------|-------|------|---------|----|----|
| 1880.74 | 185.9 | 8.08 | ...12.5 | 1n | β  |
| 1886.90 | 193.2 | 8.27 | ...     | 2n | H1 |
| 1891.80 | 189.8 | 7.90 | ...12.2 | 2n | β  |
| 1898.61 | 186.2 | 8.24 | ...13.0 | 2n | D  |

A and B (= Σ 3047)

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1832.20 | 65.6 | 1.18 | 8.7... 8.7 | 3n | Σ |
| 1869.68 | 67.5 | 1.02 | 8.7... 9.1 | 4n | Δ |

|         |      |      |            |    |   |
|---------|------|------|------------|----|---|
| 1880.74 | 70.3 | 0.89 | ...        | 1n | β |
| 1891.80 | 73.1 | 0.92 | 8.1... 8.4 | 2n | β |
| 1898.61 | 71.0 | 1.14 | 8.2... 8.2 | 2n | D |

The small star was discovered with the 9.4-inch of the Dartmouth College Observatory. The close pair is probably a binary, but the motion is very slow. The relation of the third star to the system is still uncertain.

[β (v)...β (Mon. Not. xxxv, 31)...β<sup>3</sup>...β (3114)...β (Pub. L. O. II)...Hall (II)...Doolittle (Pub. Flower Obsv. 1)...]

The measures given of AB, and others, will be found in the following additional references :

[Madler (*Fixstern-Systeme* II) (*Dorpat Obsns.* XI, XIII, XV) ...Herschel (*Mem. R. A. S.* IV)...Secchi (*Catalogo di 1321 Stelle Doppie*)...OΣ (*Poulkowa Obsns.* IX)...Gledhill, Wilson and Seabroke (*Mem. R. A. S.* XLII)...Δ (II)...Glasenapp (III)...]

β 730. 27 Piscium

R.A. 23<sup>h</sup> 52<sup>m</sup> 32<sup>s</sup> }  
Decl. — 4° 13' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1878.39 | 265.8 | 1.42 | 5.5...10.8 | 3n | β   |
| 1879.03 | 264.0 | 1.40 | 4.9... 9.5 | 3n | Cin |
| 1879.84 | 264.4 | 1.60 | 5.5...11.2 | 2n | β   |
| 1886.88 | 269.1 | 1.78 | 5.0... 9.6 | 2n | LM  |
| 1889.57 | 267.4 | 1.50 | 5.0...11.3 | 3n | β   |
| 1898.66 | 272.8 | 1.66 | 6.0...11.7 | 3n | Cg  |

Discovered with the 18½-inch. Certainly a physical system, since the components have a common proper motion of 0.094 in the direction of 232°7 (AUWERS). There is very little relative change.

[β (x)...β<sup>t</sup>...β<sup>3</sup>...β (2957)...β (Pub. L. O. II)...Cin<sup>5</sup>... I.M...Cogshall ( )...]

β 1154. D.M. (73°) 1068

R.A. 23<sup>h</sup> 53<sup>m</sup> 12<sup>s</sup> }  
Decl. + 74° 10' }

|         |       |      |            |    |   |
|---------|-------|------|------------|----|---|
| 1889.51 | 310.1 | 0.98 | 8.0... 8.2 | 3n | β |
| 1892.87 | 129.7 | 0.91 | 8.0... 8.2 | 2n | J |
| 1895.90 | 308.0 | 0.77 | 8+... 8+   | 3n | A |
| 1896.93 | 309.4 | 0.88 | ...        | 3n | A |

Discovered with the 12-inch. Unchanged.

[ $\beta$  (xvi)... $\beta$  (2956)... $\beta$  (*Pub. L. O.* 11)...Jones (*Proc. Harvard Coll. Obsy.* 1892)...Aitken (3396,3466)...]

$\beta$  731. Lalande 47033

R.A.  $23^{\text{h}} 53^{\text{m}} 27^{\text{s}}$  }  
Decl.  $- 8^{\circ} 28'$  }

|         |                 |      |            |            |    |         |
|---------|-----------------|------|------------|------------|----|---------|
| 1878.28 | $257.8^{\circ}$ | "    | 1.57       | 8.7...10.0 | 2n | $\beta$ |
| 1886.80 | 262.0           | 1.67 | 8.5... 9.3 | 4n         | LM |         |
| 1888.84 | 262.1           | 1.36 | 8.2... 9.1 | 2n         | Lv |         |
| 1898.70 | 264.6           | 1.59 | 8.8... 9.7 | 3n         | A  |         |
| 1898.72 | 265.8           | 1.60 | 8.5... 9.2 | 3n         | Cg |         |

Discovered with the 18½-inch. Some motion in angle seems probable.

[ $\beta$  (x)... $\beta^1$ ...LM...Lv<sup>1</sup>...Aitken (3585)...Cogshall ( )...]

$\beta$  860. *Andromedae* 6

R.A.  $23^{\text{h}} 53^{\text{m}} 53^{\text{s}}$  }  
Decl.  $+ 38^{\circ} 12'$  }

|         |                 |      |            |            |            |         |
|---------|-----------------|------|------------|------------|------------|---------|
| 1881.72 | $107.2^{\circ}$ | "    | 6.70       | 6.8...11.6 | 4n         | $\beta$ |
| 1881.83 | 105.4           | 6.32 | 6.5...11.0 | 2n         | Ho         |         |
| 1885.82 | 107.9           | 6.66 | ...        | 2n         | H $\Sigma$ |         |
| 1888.47 | 106.4           | 6.85 | 6.3...11.9 | 4n         | Com        |         |
| 1898.61 | 106.7           | 6.91 | 6.3...11.0 | 3n         | D          |         |

Discovered with the 15½-inch at the Washburn Observatory. Lalande 47049.

[ $\beta$  (xii)... $\beta^4$ ...Hough (2978)...Comstock (*Pub. Washburn Obsy.* vi)...H $\Sigma$  ( )...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  732. W<sup>1</sup> XXIII. 1086

R.A.  $23^{\text{h}} 54^{\text{m}} 18^{\text{s}}$  }  
Decl.  $+ 7^{\circ} 50'$  }

|         |                 |      |            |            |         |         |
|---------|-----------------|------|------------|------------|---------|---------|
| 1878.35 | $152.4^{\circ}$ | "    | 6.10       | 8.5...10.7 | 3n      | $\beta$ |
| 1891.87 | 152.9           | 5.95 | 8.5... 9.5 | 2n         | $\beta$ |         |
| 1898.57 | 151.8           | 5.84 | 8.8...10.3 | 3n         | D       |         |
| 1898.84 | 151.7           | 5.95 | 8.5...10.7 | 1n         | $\beta$ |         |

Discovered with the 18½-inch. Without change. The  $n$  star of a wide pair.

[ $\beta$  (x)... $\beta^1$ ... $\beta$  (3114)... $\beta$  (*Pub. L. O.* 11)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  482. D.M. (62°) 2350

R.A.  $23^{\text{h}} 55^{\text{m}} 45^{\text{s}}$  }  
Decl.  $+ 62^{\circ} 39'$  }

A and B

|         |                 |      |            |            |         |          |
|---------|-----------------|------|------------|------------|---------|----------|
| 1877.23 | $342.6^{\circ}$ | "    | 4.07       | 9.7...11.0 | 2n      | $\Delta$ |
| 1880.74 | 341.6           | 4.28 | 9.5... 9.8 | 1n         | $\beta$ |          |
| 1888.71 | 343.8           | 4.60 | 9.0...10.0 | 3n         | $\beta$ |          |
| 1898.56 | 343.0           | 4.75 | 9.0... 9.5 | 2n         | D       |          |

A and C

|         |                 |      |         |         |         |         |
|---------|-----------------|------|---------|---------|---------|---------|
| 1880.74 | $125.9^{\circ}$ | "    | 9.46    | ...11.8 | 1n      | $\beta$ |
| 1888.71 | 123.9           | 9.79 | ...11.2 | 3n      | $\beta$ |         |
| 1898.56 | 122.9           | 9.96 | ...10.8 | 2n      | D       |         |

Discovered with the 6-inch. No material change. In D.M. 8.9 m.

[ $\beta$  (ix)... $\beta$  (*Mon. Not.* xxxviii, 78)... $\beta^3$ ... $\beta$  (2875)... $\beta$  (*Pub. L. O.* 11)... $\Delta$  (1)...Doolittle (*Pub. Flower Obsy.* 1)...]

$\beta$  733. 85 *Pegasi*

R.A.  $23^{\text{h}} 55^{\text{m}} 54^{\text{s}}$  }  
Decl.  $+ 26^{\circ} 27'$  }

A and B

|         |                 |      |         |            |            |         |
|---------|-----------------|------|---------|------------|------------|---------|
| 1878.73 | $274.0^{\circ}$ | "    | 0.67    | 6.0...12.5 | 3n         | $\beta$ |
| 1879.46 | 284.6           | 0.75 | ...11.3 | 5n         | $\beta$    |         |
| 1880.59 | 298.3           | 0.65 | ...10.5 | 5n         | $\beta$    |         |
| 1880.79 | 297.2           | 0.66 | ...     | 3n         | H1         |         |
| 1881.54 | 311.5           | 0.58 | ...11.0 | 1n         | $\beta$    |         |
| 1882.62 | 89.4            | 0.64 | ... 9.0 | 1n         | O $\Sigma$ |         |
| 1883.75 | 333±            | ...  | ...     | 1n         | $\beta$    |         |
| 1885.93 | 107.0           | 0.5± | ...     | 1n         | H $\Sigma$ |         |
| 1886.81 | 115.0           | 0.68 | ...     | 2n         | H $\Sigma$ |         |
| 1886.90 | 109.7           | 0.79 | ...     | 3n         | H1         |         |
| 1886.98 | 111.0           | 0.58 | ...     | 1n         | Sp         |         |
| 1887.91 | 119.3           | 0.66 | ...     | 1n         | Sp         |         |
| 1888.69 | 126.7           | 0.95 | ...     | 5n         | $\beta$    |         |
| 1888.95 | 124.1           | 0.83 | ...     | 3n         | H1         |         |
| 1888.96 | 128.3           | 0.70 | ...     | 7n         | Sp         |         |
| 1889.59 | 134.7           | 0.94 | ...11.2 | 5n         | $\beta$    |         |
| 1889.81 | 132.2           | 0.82 | ...     | 1n         | H $\Sigma$ |         |
| 1889.90 | 137.0           | 0.70 | ...     | 5n         | Sp         |         |
| 1890.55 | 139.0           | 0.78 | ...     | 4n         | $\beta$    |         |
| 1890.96 | 146.4           | 0.71 | ...     | 6n         | Sp         |         |
| 1891.56 | 151.8           | 0.79 | ...11.0 | 3n         | $\beta$    |         |
| 1891.94 | 152.8           | 0.83 | ...     | 2n         | Sp         |         |

|         |       |      |            |                 |              |
|---------|-------|------|------------|-----------------|--------------|
| 1892.88 | 165.4 | 0.73 | ...        | 1 <sup>n</sup>  | Bar          |
| 1892.97 | 167.3 | 0.73 | ...        | 4 <sup>n</sup>  | Sp           |
| 1893.64 | 168.3 | 0.90 | ...        | 2 <sup>n</sup>  | Schaeb       |
| 1893.92 | 174.0 | 0.88 | ...        | 3 <sup>n</sup>  | Bar          |
| 1893.96 | 176.1 | 0.69 | ...        | 6 <sup>n</sup>  | Sp           |
| 1894.53 | 178.6 | 0.84 | ...        | 5 <sup>n</sup>  | Bar          |
| 1894.59 | 181.3 | 0.89 | ...        | 4 <sup>n</sup>  | Schaeb       |
| 1894.93 | 188.6 | 0.65 | ...        | 2 <sup>n</sup>  | Sp           |
| 1894.98 | 177.6 | 0.65 | 6.0...11.0 | 2 <sup>n</sup>  | Lew          |
| 1895.53 | 191.2 | 1.02 | ...        | 4 <sup>n</sup>  | Schaeb       |
| 1895.64 | 190.5 | 0.83 | ...        | 10 <sup>n</sup> | Bar          |
| 1895.71 | 185.8 | 0.86 | 5.5...11.8 | 6 <sup>n</sup>  | A            |
| 1895.73 | 198.4 | 0.73 | ...        | 2 <sup>n</sup>  | See          |
| 1895.74 | 204.8 | 0.7± | ...        | 1 <sup>n</sup>  | Moul-<br>ton |
| 1895.86 | 196.3 | 0.47 | ...        | 2 <sup>n</sup>  | Lew          |
| 1896.04 | 201.6 | 0.73 | ...        | 6 <sup>n</sup>  | Sp           |
| 1896.75 | 200.8 | 0.54 | ...        | 3 <sup>n</sup>  | A            |
| 1896.81 | 205.5 | 0.76 | ...        | 3 <sup>n</sup>  | Schaeb       |
| 1896.86 | 208.6 | 0.60 | ...        | 2 <sup>n</sup>  | Hussey       |
| 1897.59 | 212.5 | 0.79 | ...        | 8 <sup>n</sup>  | Schaeb       |
| 1897.70 | 207.5 | 0.89 | ...        | 1 <sup>n</sup>  | Dob          |
| 1897.72 | 209.9 | 0.70 | ...        | 3 <sup>n</sup>  | A            |
| 1897.74 | 226.3 | 0.83 | ...        | 1 <sup>n</sup>  | Doo          |
| 1897.75 | 209.9 | 0.74 | ...        | 4 <sup>n</sup>  | Hussey       |
| 1897.96 | 218.0 | 0.61 | ...        | 3 <sup>n</sup>  | Sp           |
| 1897.97 | 216.1 | 0.76 | ...        | 1 <sup>n</sup>  | Lew          |
| 1898.44 | 217.5 | 0.79 | ...        | 3 <sup>n</sup>  | A            |
| 1898.80 | 225.5 | 0.59 | ...        | 2 <sup>n</sup>  | Lew          |
| 1898.89 | 224.8 | 0.5± | ...        | 1 <sup>n</sup>  | Doo          |
| 1898.94 | 225.8 | 0.67 | ...        | 3 <sup>n</sup>  | Sp           |
| 1899.51 | 225.6 | 0.78 | 6.0...11.1 | 4 <sup>n</sup>  | A            |

A and C

|         |       |       |            |                 |     |
|---------|-------|-------|------------|-----------------|-----|
| 1851.96 | 114.1 | 33.03 | 6.0... 8.5 | 1 <sup>n</sup>  | OΣ  |
| 1852.67 | 113.9 | 32.60 | ...        | 1 <sup>n</sup>  | OΣ  |
| 1865.91 | 92.1  | 18.89 | ...        | 1 <sup>n</sup>  | OΣ  |
| 1868.77 | 82.4  | 17.03 | ...        | 1 <sup>n</sup>  | OΣ  |
| 1869.98 | 77.8  | 16.13 | ...        | 20 <sup>n</sup> | Bru |
| 1870.65 | 74.4  | 15.47 | ...        | 25 <sup>n</sup> | Bru |
| 1874.66 | 54.4  | 13.92 | ...        | 1 <sup>n</sup>  | OΣ  |
| 1876.77 | 40.3  | 14.02 | ...        | 1 <sup>n</sup>  | OΣ  |
| 1877.94 | 39.8  | 14.0  | ...        | 1 <sup>n</sup>  | Flm |
| 1878.54 | 33.6  | 14.40 | ... 9.0    | 4 <sup>n</sup>  | β   |
| 1878.74 | 32.8  | 14.76 | ... 9.0    | 1 <sup>n</sup>  | Δ   |
| 1879.27 | 30.4  | 14.96 | ... 9.0    | 8 <sup>n</sup>  | β   |
| 1880.57 | 25.0  | 15.41 | ...        | 4 <sup>n</sup>  | β   |
| 1881.54 | 20.8  | 16.29 | ...        | 4 <sup>n</sup>  | β   |
| 1881.88 | 19.8  | 16.54 | ...        | 1 <sup>n</sup>  | Big |
| 1882.62 | 15.2  | 16.98 | ...        | 1 <sup>n</sup>  | OΣ  |

|         |       |       |         |                |      |
|---------|-------|-------|---------|----------------|------|
| 1882.77 | 17.1  | 17.34 | ...     | 3 <sup>n</sup> | β    |
| 1883.54 | 11.3  | 17.34 | ...     | 1 <sup>n</sup> | Seag |
| 1886.24 | 7.6   | 19.84 | ...     | 3 <sup>n</sup> | HΣ   |
| 1886.99 | 6.1   | 21.15 | ...     | 3 <sup>n</sup> | Eng  |
| 1888.67 | 0.9   | 21.71 | ...     | 5 <sup>n</sup> | β    |
| 1889.50 | 358.7 | 22.66 | ... 9.0 | 4 <sup>n</sup> | β    |
| 1889.82 | 358.4 | 22.70 | ...     | 2 <sup>n</sup> | Lv   |
| 1890.52 | 356.7 | 23.59 | ...     | 3 <sup>n</sup> | β    |
| 1891.56 | 354.7 | 24.58 | ...     | 3 <sup>n</sup> | β    |
| 1891.94 | 354.3 | 25.02 | ...     | 8 <sup>n</sup> | β    |
| 1895.06 | 350.0 | 28.86 | ...     | 1 <sup>n</sup> | Lew  |
| 1895.68 | 348.7 | 29.27 | ... 8.8 | 3 <sup>n</sup> | A    |
| 1896.75 | 347.8 | 30.48 | ...     | 2 <sup>n</sup> | A    |
| 1897.56 | 346.1 | 31.49 | ...     | 2 <sup>n</sup> | A    |
| 1897.82 | 345.7 | 31.74 | ...     | 2 <sup>n</sup> | β    |
| 1898.49 | 344.4 | 32.53 | ...     | 3 <sup>n</sup> | β    |
| 1898.69 | 344.5 | 32.90 | ...     | 2 <sup>n</sup> | A    |

A and D

|         |       |       |          |                |   |
|---------|-------|-------|----------|----------------|---|
| 1878.96 | 277.1 | 61.73 | ... 13   | 1 <sup>n</sup> | β |
| 1880.56 | 278.0 | 64.25 | ... 12.5 | 1 <sup>n</sup> | β |
| 1888.69 | 283.8 | 72.02 | ... 12   | 1 <sup>n</sup> | β |
| 1891.90 | 285.4 | 75.09 | ... 13.2 | 4 <sup>n</sup> | β |
| 1897.56 | 288.0 | 81.89 | ...      | 2 <sup>n</sup> | A |
| 1897.82 | 288.0 | 82.54 | ...      | 2 <sup>n</sup> | β |
| 1898.47 | 288.4 | 83.29 | ...      | 2 <sup>n</sup> | β |
| 1898.69 | 288.5 | 83.86 | ... 13.0 | 2 <sup>n</sup> | A |

One of the most important and most interesting of the known binary systems. The shortness of its period, the rapid movement in space of both components, the relative nearness of this system to our own, and the extreme inequality in magnitude and closeness of the stars, all combine to give this a leading place among the binary stars. It is at all times an object of considerable difficulty, and the reliable observations will necessarily be confined to the larger refractors. It is an excellent test for the definition of any object glass, however large, and no instrument, whatever its aperture, can deal with a pair of this class unless the figure of the objective will compare favorably with the Alvan Clark standard.

The close companion was discovered with the 18½-inch of the Dearborn Observatory while measuring the 9m optical companion. The distant companion had been measured on two nights before the close star was detected. The third night was perhaps of unusual steadiness, as, in addition to 85 *Pegasi*, four other first-class stars were discovered

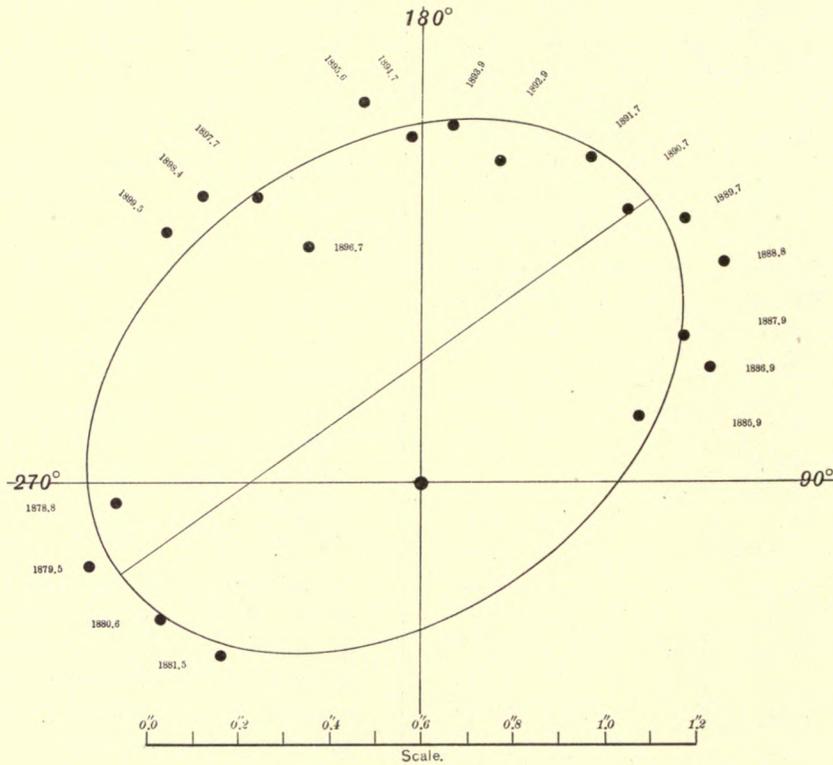
on the same night—64 *Pegasi*, 72 *Pegasi*,  $\eta$  *Piscium*, and B.A.C. 1101 ( $\beta$  533).

Four orbits have been computed of this pair. The dates of the last measures made use of, and the periods are:

|      |            |            |  |
|------|------------|------------|--|
| 1888 | Schaeberle | 22.3 years | <i>A. J.</i> 185                       |
| 1892 | Glasenapp  | 17.49 "    | <i>A. N.</i> 3145                      |
| 1895 | See        | 24.0 "     | <i>Evolution of the Binary Systems</i> |
| 1899 | Burnham    | 25.7 "     |  |

The principal results, including some from meridian observations, are:

|            |   |   |          |       |
|------------|---|---|----------|-------|
| Argelander | - | - | 1 390 in | 135.1 |
| Madler     | - | - | 1.376 "  | 133.3 |
| Brunnow    | - | - | 1.259 "  | 133.6 |
| Schaeberle | - | - | 1.305 "  | 140.3 |
| Gore       | - | - | 1.221 "  | 141.2 |
| O. Struve  | - | - | 1.289 "  | 139.2 |
| Burnham    | - | - | 1.286 "  | 139.5 |
| Auwers     | - | - | 1.288 "  | 139.5 |
| Porter     | - | - | 1.287 "  | 138.9 |



85 *Pegasi*.  $\beta$  733.

The elements of the several orbits are:

|                      | <i>P</i> | <i>T</i> | <i>e</i> | <i>a</i> | $\Omega$ | <i>i</i> | $\lambda$ |
|----------------------|----------|----------|----------|----------|----------|----------|-----------|
| Schaeberle . . . . . | 22.3     | 1884.0   | 0.35     | 0.96     | 306.1    | 68.6     | 70.3      |
| Glasenapp . . . . .  | 17.5     | 1884.2   | 0.16     | 0.80     | 307.3    | 66.7     | 69.7      |
| See . . . . .        | 24.0     | 1883.8   | 0.39     | 0.89     | 116.3    | 55.6     | 265.4     |
| Burnham . . . . .    | 25.7     | 1883.7   | 0.43     | 0.78     | 123.5    | 49.0     | 261.5     |

The last orbit is shown in the accompanying diagram.

The system has a very large proper motion, and its value is known with extreme accuracy from micrometrical measures of the distant companion.

A comparison of the measures of D of 1878–80 with those of 1897–8 gives 1".30 in 136°.8 for the movement of A. This is a very faint star, and the close agreement with the other results is sufficient to show that C has no proper motion of its own. A similar comparison of the two measures of C by O $\Sigma$  in 1851–2 with the two sets of measures in 1898 gives 1".281 in 139°.2. It is worthy of note that the distances of C at these points, separated by an interval of forty-six years, differ by only one tenth of a second of arc.

[ $\beta$  (x) . . .  $\beta^1$  . . .  $\beta^3$  . . .  $\beta^4$  . . .  $\beta$  (2319, 2334, 2875, 2957, 3048, 3114) . . .  $\beta$  (*Pub. L. O.* II) . . .  $\beta$  (*A. J.* 246) . . . Hall (II) . . . O $\Sigma$  (*Poulkova Obsns.* x, pp. 119, 146) . . . Sp (III) . . . Barnard

(A. J. 447)...Schaeberle (A. J. 185,246,323,391,420)...  
 Doberck (3466)...Lewis (Greenwich Obsns. 1894, 1895)  
 (Mon. Not. LVI, 359; LIX, 400)...Aitken (3466,3585)  
 (Ast. Soc. Pac. VII, 305) (A. J. 429)...Hussey (A. J. 397,  
 427)...Doolittle (A. J. 416)...Aitken ( )...]

The following relate to the distant star C :

[Brunnow (Dunsink Obsns. Part 2) (Viert. der Astron.  
 Gesell. IX, 38)...Argelander (Beob. Sternwarte du Bonn VI)  
 ...Flammarion (Etoiles Doubles et Multiples) (Sid. Mess. III,  
 213) (L'Astronomie III, 176)...Engelhardt (Obsns. Astron. II)  
 ...Bigourdan (Paris Obsns. 1883)...Seagrave (Sid. Mess. II,  
 258)...A (I)...Gore (Mon. Not. XLIX, 361)...Lv (A. J. 382)  
 (Proc. Haverford Coll. Obsy. 1891) Comstock (Pub. Washburn  
 Obsy. X)...Glasenapp (3145)...HΣ ( )...Everett (Mon.  
 Not. LVI, 464)...See (3339) (A. J. 359,378) (Evolution of  
 Binary System)...]

**β 281.** Lalande 47148

R.A. 23<sup>h</sup> 56<sup>m</sup> 38<sup>s</sup> }  
 Decl. + 1° 28' }

A and B

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1877.82 | 217.0 | 1.12 | 7.5...11.0 | 2n | β   |
| 1881.73 | 212.6 | 1.25 | 7.5... 9.2 | 2n | β   |
| 1885.97 | 203.7 | 1.20 | ...        | 1n | HΣ  |
| 1888.89 | 209.0 | 1.35 | 8.0... 9.3 | 1n | Lv  |
| 1891.61 | 208.8 | 1.25 | 7.9...10.2 | 3n | β   |
| 1893.46 | 207.9 | 1.06 | ...        | 6n | Sp  |
| 1897.96 | 203.3 | 1.53 | ...        | 1n | Lew |
| 1898.73 | 203.2 | 1.53 | 7.2...10.0 | 3n | A   |
| 1898.85 | 199.8 | 1.38 | 7.3... 9.8 | 4n | β   |

A and C (= H 998)

|         |       |       |         |    |    |
|---------|-------|-------|---------|----|----|
| 1825    | 330±  | 25±   | 8 ...13 | 1n | H  |
| 1877.82 | 335.8 | 30.44 | ...11.0 | 2n | β  |
| 1881.73 | 336.7 | 30.85 | ...11.2 | 2n | β  |
| 1885.97 | 334.3 | 31.20 | ...     | 1n | HΣ |
| 1891.61 | 334.6 | 31.82 | ...11.9 | 3n | β  |
| 1898.70 | 334.4 | 32.24 | ...12.0 | 2n | A  |
| 1898.86 | 334.4 | 32.63 | ...10.8 | 3n | β  |

Discovered with the 9.4-inch at the Dartmouth  
 College Observatory. The binary character of the  
 close pair is established by the measures. The  
 motion is retrograde, with perhaps a slow increase  
 in the distance. The system has a proper motion  
 of 0.079 in the direction of 154°.1 (Boss). This  
 movement is in a direction opposite the HERSCHEL  
 companion, and the distance of that star is there-  
 fore increasing annually by the proper motion of  
 AB. At one time these stars must have formed a  
 close pair.

[β (v)...β (Mon. Not. xxxv, 31)...β<sup>3</sup>...β<sup>4</sup>...β (3114)...β  
 (Pub. L. O. II)...Sp (III)...Lewis (Mon. Not. LIX, 400)  
 ... Aitken (3585)...HΣ ( )...]

**β 861.** D.M. (68°) 1422

R.A. 23<sup>h</sup> 56<sup>m</sup> 55<sup>s</sup> }  
 Decl. + 69° 2' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.53 | 177.4 | 1.30 | 9.4... 9.7 | 4n | β   |
| 1887.80 | 177.8 | 1.78 | 9.3... 9.5 | 2n | Com |

Discovered with the 15½-inch at the Washburn  
 Observatory.

[β (xii)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...]

**β 862.** W<sup>2</sup> XXIII. 1245

R.A. 23<sup>h</sup> 58<sup>m</sup> 36<sup>s</sup> }  
 Decl. + 37° 30' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.74 | 104.9 | 0.54 | 8.5... 8.8 | 2n | β   |
| 1888.32 | 107.5 | 0.55 | 8.5... 9.0 | 2n | Com |
| 1899.57 | 115.5 | 0.50 | 8.7... 9.1 | 3n | A   |

Discovered with the 15½-inch at the Washburn  
 Observatory. Apparently slow motion in angle.

[β (xii)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...Aitken  
 ( )...]

**β 997.** Lalande 47215

R.A. 23<sup>h</sup> 58<sup>m</sup> 47<sup>s</sup> }  
 Decl. + 45° 1' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1879.80 | 340.2 | 4.25 | 9 ...10    | 2n | Hl  |
| 1880.73 | 339.7 | 4.02 | 7.9... 8.9 | 4n | β   |
| 1885.76 | 340.8 | 4.08 | ...        | 3n | Hl  |
| 1891.72 | 340.7 | 4.29 | 8 ... 8    | 2n | Hl  |
| 1895.69 | 339.8 | 4.12 | 7.9... 9.1 | 3n | A   |
| 1895.84 | 338.0 | 4.09 | ...        | 1n | Com |
| 1898.75 | 338.9 | 4.22 | ...        | 3n | Hu  |

Discovered with the 18½-inch. Probably no mo-  
 tion. The last measures of HALL are erroneously cred-  
 ited to OΣ 547, which is in the field 8' n and 26<sup>s</sup> f.

[β (xiii)...β<sup>3</sup>...Hall (I, II)...Aitken (Ast. Soc. Pac. VII, 305)  
 ... Comstock (Pub. Washburn Obsy. X)...Hussey  
 ( )...]

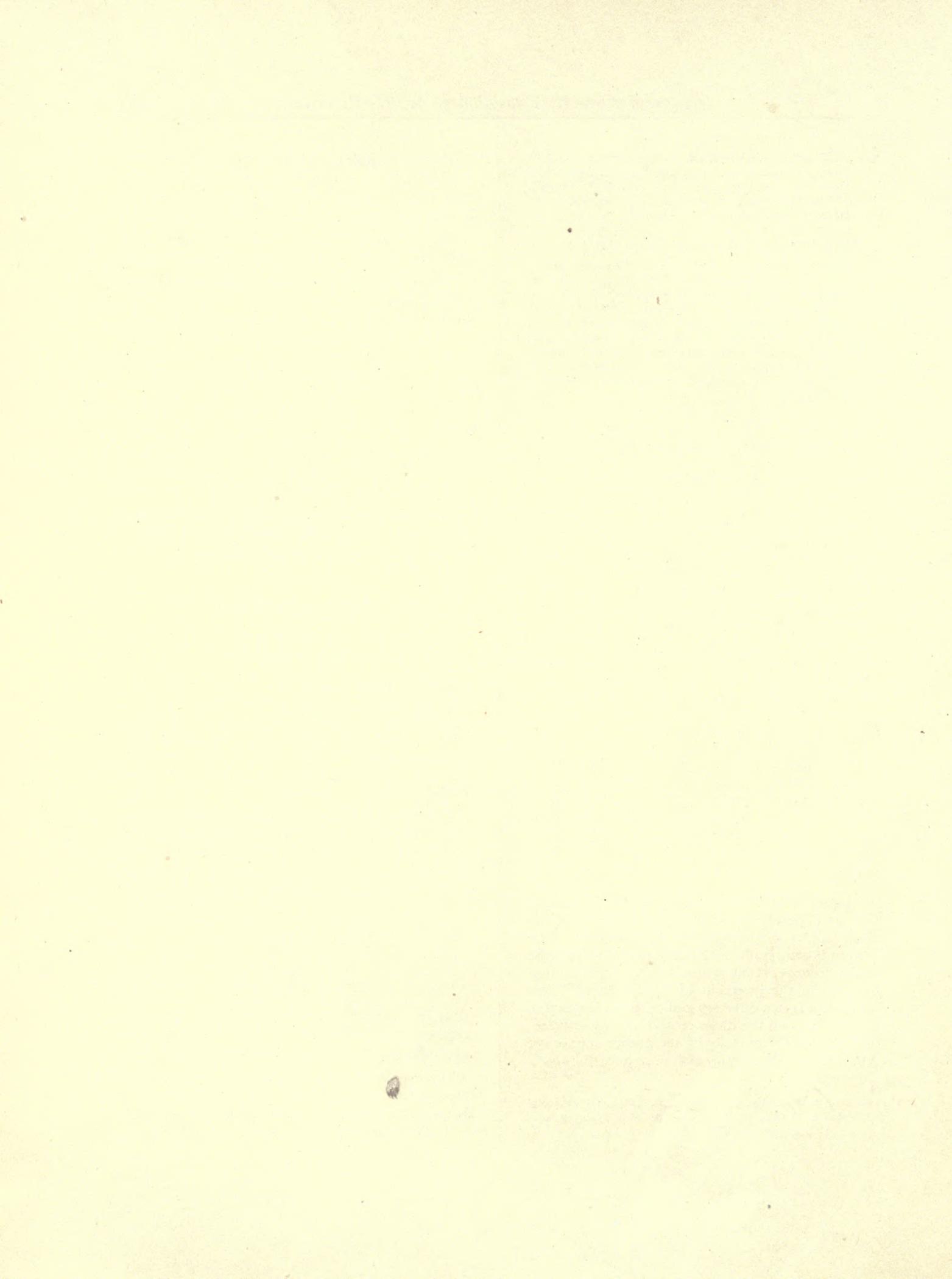
**β 863.** D.M. (72°) 1139

R.A. 23<sup>h</sup> 59<sup>m</sup> 42<sup>s</sup> }  
 Decl. + 72° 55' }

|         |       |      |            |    |     |
|---------|-------|------|------------|----|-----|
| 1881.57 | 123.7 | 1.60 | 9.2...11.0 | 3n | β   |
| 1888.02 | 121.6 | 1.98 | 8.8...10.2 | 4n | Com |
| 1898.68 | 119.3 | 2.03 | 9.0...10.0 | 3n | A   |

Discovered with the 15½-inch at the Washburn  
 Observatory.

[β (xii)...β<sup>4</sup>...Comstock (Pub. Washburn Obsy. vi)...  
 Aitken (3585)...]



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| I018          | 6 10 7   | 77   | I048    | 5 26 37  | 65   | I080          | 12 22 55  | 120  |
| I019          | 6 11 26  | 77   | I049    | 5 27 3   | 65   | I081          | 12 54 32  | 121  |
| I020          | 6 15 46  | 78   | I050    | 5 30 55  | 66   | I082          | 12 55 35  | 122  |
| I021          | 6 24 8   | 80   | I051    | 5 32 1   | 67   | I083          | 13 0 27   | 123  |
| I022          | 6 53 15  | 84   | I052    | 5 35 39  | 70   | I084          | 13 15 59  | 125  |
| I023          | 7 7 45   | 86   | I053    | 5 45 18  | 72   | I085          | 14 52 37  | 139  |
| I024          | 7 15 33  | 88   | I054    | 5 45 47  | 72   | I086          | 15 1 27   | 140  |
| I025          | 23 1 38  | 255  | I055    | 5 51 32  | 73   | I087          | 16 4 35   | 148  |
| CATALOGUE XIV |  |      | I056    | 5 55 47  | 74   | I088          | 17 2 51   | 155  |
| I026          | 0 5 50   | 2    | I058    | 6 3 13   | 75   | I089          | 17 23 22  | 165  |
| I027          | 0 8 44   | 3    | I059    | 6 15 42  | 78   | I090          | 17 27 43  | 165  |
| I028          | 0 49 28  | 14   | I060    | 6 52 38  | 84   | I091          | 18 8 35   | 174  |
| I029          | 1 7 27   | 18   | I061    | 7 33 54  | 91   | I092          | 22 33 3   | 249  |
| I030          | 3 3 12   | 37   | I062    | 7 41 23  | 92   | CATALOGUE XVI |   |      |
| I031          | 4 29 2   | 49   | I063    | 7 44 15  | 92   | I093          | 0 14 44   | 4    |
| I032          | 5 32 43  | 68   | I064    | 8 5 39   | 97   | I094          | 0 23 29   | 5    |
| I033          | 18 46 56                                       | 184  | I065    | 8 10 0   | 98   | I095          | 0 23 47   | 5    |
| I034          | 20 50 25                                       | 219  | I066    | 8 18 31  | 99   | I096          | 0 29 46   | 8    |
| I035          | 21 17 16                                       | 228  | I067    | 8 20 17  | 99   | I097          | 0 30 30   | 8    |
| I036          | 21 40 59                                       | 237  | I068    | 8 43 2   | 102  | I098          | 0 47 53   | 13   |
| I037          | 22 41 56                                       | 251  | I069    | 8 43 41  | 102  | I099          | 0 49 34   | 14   |
| CATALOGUE XV  |  |      | I070    | 9 18 8   | 105  | I100          | 1 7 9   | 18   |
| I039          | 3 11 0   | 38   | I071    | 9 24 49  | 106  | I101          | 1 17 27   | 19   |
| I040          | 3 28 49  | 40   | I072    | 9 58 20  | 107  | I102          | 1 19 39   | 20   |
| I041          | 3 37 19  | 41   | I073    | 10 26 26                                       | 110  | I103          | 1 35 13   | 23   |
| I042          | 3 52 36  | 44   | I074    | 10 28 20                                       | 110  | I104          | 1 36 2  | 23   |
| I043          | 4 30 28  | 51   | I075    | 10 30 25                                       | 110  | I105          | 3 41 26   | 43   |
| I044          | 4 33 1   | 52   | I076    | 10 40 32                                       | 112  | I106          | 3 42 58   | 43   |
| I045          | 4 50 32  | 56   | I077    | 10 56 19                                       | 112  | I107          | 13 20 37  | 126  |

| $\beta$ | R.A.  | PAGE | $\beta$        | R.A.  | PAGE | $\beta$ | R.A.   | PAGE |
|---------|---|------|----------------|---|------|---------|--|------|
| 1108    | 13 <sup>h</sup> 46 <sup>m</sup> 32 <sup>s</sup> | 130  | 1139           | 20 <sup>h</sup> 58 <sup>m</sup> 39 <sup>s</sup> | 222  | 1169    | 1 <sup>h</sup> 44 <sup>m</sup> 17 <sup>s</sup> | 26   |
| 1109    | 14 3 18   | 131  | 1140           | 21 14 1   | 227  | 1170    | 2 9 39   | 29   |
| 1110    | 14 12 29  | 132  | 1141           | 21 22 6   | 229  | 1171    | 2 12 46  | 29   |
| 1111    | 14 17 29  | 133  | 1142           | 21 25 7   | 230  | 1172    | 2 21 27  | 31   |
| 1112    | 14 26 3   | 135  | 1143           | 21 35 14  | 233  | 1173    | 2 51 38  | 35   |
| 1113    | 14 41 21  | 137  | 1144           | 22 37 23  | 250  | 1174    | 2 57 46  | 36   |
| 1114    | 15 21 42  | 142  | 1145           | 22 42 45  | 251  | 1175    | 2 57 49  | 36   |
| 1115    | 16 18 13  | 150  | 1146           | 22 42 49  | 251  | 1176    | 3 5 9  | 37   |
| 1116    | 16 36 51  | 153  | 1147           | 22 57 5   | 255  | 1177    | 3 12 45  | 38   |
| 1117    | 16 49 34  | 154  | 1148           | 23 22 2   | 261  | 1178    | 3 17 20  | 38   |
| 1118    | 17 3 30   | 158  | 1149           | 23 24 11  | 261  | 1179    | 3 20 47  | 39   |
| 1119    | 17 9 40   | 160  | 1150           | 23 24 46  | 261  | 1180    | 3 22 23  | 39   |
| 1120    | 17 21 14  | 165  | 1151           | 23 25 6   | 262  | 1181    | 3 32 54  | 40   |
| 1121    | 17 31 52  | 165  | 1152           | 23 42 18  | 266  | 1182    | 3 35 30  | 41   |
| 1122    | 17 44 38  | 167  | 1153           | 23 46 45  | 266  | 1183    | 3 37 36  | 42   |
| 1123    | 17 45 20  | 168  | 1154           | 23 53 12  | 267  | 1184    | 3 41 14  | 43   |
| 1124    | 17 54 38  | 169  | CATALOGUE XVII |   |      | 1185    | 4 18 52  | 48   |
| 1125    | 17 55 40  | 170  | 1155           | 0 0 26  | 1    | 1186    | 4 20 51  | 48   |
| 1126    | 17 56 53  | 170  | 1156           | 0 19 58   | 5    | 1187    | 4 45 14  | 55   |
| 1127    | 17 58 59  | 171  | 1157           | 0 22 30   | 5    | 1188    | 5 44 33  | 72   |
| 1128    | 18 23 12  | 179  | 1158           | 0 24 55   | 7    | 1189    | 5 51 18  | 73   |
| 1129    | 19 18 51  | 190  | 1159           | 0 32 28   | 9    | 1190    | 5 51 17  | 73   |
| 1130    | 19 29 19  | 193  | 1160           | 0 43 24   | 12   | 1191    | 6 19 8   | 79   |
| 1131    | 19 33 13  | 195  | 1161           | 0 55 53   | 15   | 1192    | 6 21 50  | 79   |
| 1132    | 19 38 11  | 196  | 1162           | 1 3 52  | 17   | 1193    | 6 44 21  | 82   |
| 1133    | 19 54 56  | 200  | 1163           | 1 18 18   | 20   | 1194    | 7 22 21  | 89   |
| 1134    | 20 19 29  | 208  | 1164           | 1 21 26   | 21   | 1195    | 7 45 35  | 92   |
| 1135    | 20 25 10  | 210  | 1165           | 1 25 4  | 21   | 1196    | 8 8 55   | 98   |
| 1136    | 20 28 6   | 211  | 1166           | 1 31 45   | 22   | 1197    | 13 56 4  | 131  |
| 1137    | 20 52 37  | 219  | 1167           | 1 33 16   | 23   | 1198    | 16 16 8  | 149  |
| 1138    | 20 58 34  | 221  | 1168           | 1 43 48   | 26   | 1199    | 16 37 23                                       | 153  |

| $\beta$         | R.A.   | PAGE | $\beta$ | R.A.   | PAGE | $\beta$       | R.A.  | PAGE |
|-----------------|--|------|---------|--|------|---------------|---|------|
| I200            | 17 <sup>h</sup> 11 <sup>m</sup> 5 <sup>s</sup> | 162  | I230    | 1 <sup>h</sup> 24 <sup>m</sup> 43 <sup>s</sup> | 21   | I261          | 21 <sup>h</sup> 10 <sup>m</sup> 29 <sup>s</sup> | 226  |
| I201            | 17 26 37                                       | 165  | I231    | 3 32 45  | 40   | I262          | 21 15 40  | 228  |
| I202            | 17 55 33                                       | 169  | I232    | 4 1 26   | 46   | I263          | 21 38 40  | 234  |
| I203            | 18 19 57                                       | 178  | I233    | 4 6 6  | 46   | I264          | 22 24 1   | 246  |
| I204            | 19 6 1   | 188  | I234    | 4 11 56  | 47   | I265          | 22 35 18  | 249  |
| I205            | 20 5 47  | 203  | I235    | 4 17 20  | 48   | I266          | 23 24 29  | 261  |
| I206            | 20 14 36                                       | 206  | I236    | 4 34 27  | 52   | CATALOGUE XIX |   |      |
| I207            | 20 16 25                                       | 206  | I237    | 4 46 28  | 56   | I267          | 5 27 22   | 66   |
| I208            | 20 28 38                                       | 211  | I238    | 4 53 53  | 57   | I268          | 7 9 11  | 86   |
| I209            | 20 34 9  | 214  | I239    | 5 23 28  | 65   | I269          | 10 28 18  | 110  |
| I210            | 20 56 6  | 220  | I240    | 5 30 56  | 66   | I270          | 13 57 46  | 131  |
| I211            | 20 57 15                                       | 221  | I241    | 6 2 27   | 74   | I271          | 14 13 4   | 133  |
| I212            | 21 33 20                                       | 232  | I242    | 6 3 42   | 75   | I272          | 14 13 22  | 133  |
| I213            | 21 48 26                                       | 238  | I243    | 8 7 19   | 97   | I273          | 14 14 2   | 133  |
| I214            | 21 51 23                                       | 239  | I244    | 8 7 31   | 97   | I274          | 18 12 35  | 177  |
| I215            | 22 6 47  | 242  | I245    | 12 14 21                                       | 119  | -----         |   |      |
| I216            | 22 14 42                                       | 243  | I246    | 14 12 12                                       | 132  | I275          | 2 6 21  | 29   |
| I217            | 22 15 33                                       | 243  | I247    | 17 7 3   | 159  | I276          | 3 47 4  | 43   |
| I218            | 22 22 33                                       | 245  | I248    | 17 16 31                                       | 164  | I277          | 3 58 15   | 45   |
| I219            | 22 42 27                                       | 251  | I249    | 17 19 30                                       | 164  | I278          | 4 7 0   | 46   |
| I220            | 23 9 36  | 257  | I250    | 17 20 19                                       | 165  | I279          | 7 4 26  | 85   |
| I221            | 23 22 12                                       | 261  | I251    | 17 36 35                                       | 167  | I280          | 10 19 55  | 109  |
| I222            | 23 22 23                                       | 261  | I252    | 18 15 55                                       | 177  | I281          | 10 21 18  | 110  |
| I223            | 23 39 10                                       | 265  | I253    | 18 28 15                                       | 180  | I282          | 11 7 43   | 113  |
| I224            | 23 50 53                                       | 267  | I254    | 18 38 52                                       | 181  | I283          | 11 8 7  | 114  |
| CATALOGUE XVIII |  |      | I255    | 18 51 37                                       | 185  | I284          | 17 17 38  | 164  |
| I225            | 0 20 55  | 5    | I256    | 19 12 36                                       | 189  | I285          | 18 59 31  | 187  |
| I226            | 0 24 58  | 7    | I257    | 19 30 27                                       | 194  | I286          | 19 21 39  | 191  |
| I227            | 0 25 41  | 7    | I258    | 19 55 26                                       | 200  | I287          | 19 34 5   | 195  |
| I228            | 0 59 30  | 15   | I259    | 20 16 27                                       | 207  | I288          | 19 35 39  | 196  |
| I229            | 1 13 46  | 19   | I260    | 20 16 33                                       | 207  | I289          | 19 56 38  | 201  |
|                 |  |      |         |  |      | I290          | 20 56 50  | 220  |

APPENDIX



# APPENDIX

## CORRECTIONS

- $\beta$  1096 (page 8). For B and C read AB and C.
- $\beta$  309 (page 46). For 3-inch read 6-inch.
- $\beta$  555 (page 59). In the measures of B and C for 1880.82 read 1880-82. The close pair was examined a number of times in those years.
- $\beta$  1281 (page 110). The identity of this pair with O $\Sigma$  218 was overlooked when it was placed in the catalogue. A comparison of the recent measures with those of Madler and O $\Sigma$  show clearly direct motion in angle.
- $\beta$  120 (page 149). In the last measure of AB and C for 326 $^{\circ}$ .4 read 336 $^{\circ}$ .4.
- $\beta$  815 (page 151). The direction of the proper motion, given as 141 $^{\circ}$ .6, is that of the principal star. If the companion is moving, as seems most probable, the direction of its motion would be 321 $^{\circ}$ .6.
- $\beta$  1204 (page 188). Insert the word "than" in the third line, making it read, "four other stars nearer than the Struve companion."
- $\beta$  1092 (page 249). In the measure of AB of 1899.71 for 229 $^{\circ}$ .5 read 209 $^{\circ}$ .5.
- $\beta$  1025 (page 255). In the Right Ascension for 22<sup>h</sup> read 23<sup>h</sup>.

## ADDITIONAL MEASURES

### $\beta$ 1026 (Page 2)

|         |                   |      |    |        |
|---------|-------------------|------|----|--------|
| 1899.89 | 343 $^{\circ}$ .4 | 0.29 | 11 | Aitken |
|---------|-------------------|------|----|--------|

There appears to be a very decided change in the angle since my measures in 1888.

### $\beta$ 1156 (Page 5)

|         |                  |      |    |        |
|---------|------------------|------|----|--------|
| 1899.57 | 31 $^{\circ}$ .0 | 0.54 | 21 | Aitken |
|---------|------------------|------|----|--------|

There seems to be no sensible change.

### $\beta$ 107 (Page 5)

|    |         |       |        |    |           |
|----|---------|-------|--------|----|-----------|
| AB | 1899.82 | 354.8 | 5.78   | 21 | } Barnard |
| AC | 1899.82 | 336.7 | 46.83  | 21 |           |
| AD | 1899.82 | 146.6 | 50.30  | 21 |           |
| AE | 1899.82 | 171.0 | 113.48 | 21 |           |
| AF | 1899.82 | 113.8 | 150.32 | 21 |           |
|    |         |       |        |    |           |

The interval is too short to show change in the distant stars. This will be cleared up by later measures. Change in AB is certain, but it may be due to the proper motion of one of the components.

### $\beta$ 1226 (Page 7)

|         |                   |      |    |         |
|---------|-------------------|------|----|---------|
| 1899.55 | 187 $^{\circ}$ .3 | 0.34 | 31 | Aitken  |
| 1899.85 | 191.3             | 0.33 | 21 | Barnard |

Probably no material change since the measures of 1891.

### $\beta$ 1096 (Page 8)

|         |                   |       |    |         |          |
|---------|-------------------|-------|----|---------|----------|
| 1899.57 | 266 $^{\circ}$ .7 | 0.19  | 31 | Aitken  | A and B  |
| 1899.76 | 61.6              | 33.78 | 21 | Barnard | AB and C |

### $\beta$ 1097 (Page 8)

|         |                   |      |    |         |
|---------|-------------------|------|----|---------|
| 1899.85 | 251 $^{\circ}$ .4 | 0.40 | 31 | Barnard |
|---------|-------------------|------|----|---------|

### $\beta$ 395 (Page 9)

|         |                   |      |    |        |
|---------|-------------------|------|----|--------|
| 1899.72 | 286 $^{\circ}$ .7 | 0.48 | 31 | Aitken |
|---------|-------------------|------|----|--------|

In two of the measures the components were rated as equal in magnitude.

### $\beta$ 1159 (Page 9)

Examined by AITKEN (1899.89) and elongation suspected in 52 $^{\circ}$  $\pm$ , with distance of 0.2 or less, but conditions not good enough for accurate measurement.

### $\beta$ 301 (Page 11)

|         |                   |      |    |        |
|---------|-------------------|------|----|--------|
| 1899.68 | 319 $^{\circ}$ .2 | 0.86 | 21 | Aitken |
|---------|-------------------|------|----|--------|

No relative motion since 1891.

### $\beta$ 1099 (Page 14)

|         |                   |      |    |        |
|---------|-------------------|------|----|--------|
| 1899.56 | 312 $^{\circ}$ .6 | 0.23 | 31 | Aitken |
|---------|-------------------|------|----|--------|

This mean result includes the single measure previously given of 1899.46.

$\beta$  1162 (Page 17)

|         |                     |      |      |                |         |
|---------|---------------------|------|------|----------------|---------|
| 1899.56 | 139. <sup>o</sup> 2 | "    | 0.33 | 3 <sup>n</sup> | Aitken  |
| 1899.83 | 141.6               | 0.35 |      | 2 <sup>n</sup> | Barnard |

The recent measures show no change since 1890.

 $\beta$  1163 (Page 20)

|         |                     |      |      |                |         |
|---------|---------------------|------|------|----------------|---------|
| 1899.70 | 214. <sup>o</sup> 7 | "    | 0.31 | 3 <sup>n</sup> | Aitken  |
| 1899.79 | 214.3               | 0.25 |      | 2 <sup>n</sup> | Barnard |

A very decided change since my measures in 1890. In nine years the angle has increased more than 20°.

 $\beta$  513. 48 *Cassiopeiae* (Page 27)

|         |                    |   |      |                  |        |
|---------|--------------------|---|------|------------------|--------|
| 1899.72 | 11. <sup>o</sup> 6 | " | 0.42 | 3-2 <sup>n</sup> | Aitken |
|---------|--------------------|---|------|------------------|--------|

 $\beta$  1170 (Page 29)

|         |                     |   |      |                |        |
|---------|---------------------|---|------|----------------|--------|
| 1899.65 | 297. <sup>o</sup> 4 | " | 0.32 | 1 <sup>n</sup> | Aitken |
|---------|---------------------|---|------|----------------|--------|

In 1890 I made the angle 313°3, but it is a very difficult pair, and the apparent change requires confirming.

 $\beta$  1172 (Page 31)

|         |                     |      |      |                |         |
|---------|---------------------|------|------|----------------|---------|
| 1899.65 | 232. <sup>o</sup> 8 | "    | 1.60 | 1 <sup>n</sup> | Aitken  |
| 1899.79 | 238.2               | 1.68 |      | 2 <sup>n</sup> | Barnard |

 $\beta$  524. 20 *Persei* (Page 34)

|         |                    |   |      |                |        |
|---------|--------------------|---|------|----------------|--------|
| 1899.55 | 49. <sup>o</sup> 7 | " | 0.13 | 2 <sup>n</sup> | Aitken |
|---------|--------------------|---|------|----------------|--------|

 $\beta$  1173 (Page 35)

|         |                     |      |      |                |        |          |
|---------|---------------------|------|------|----------------|--------|----------|
| 1899.73 | 338. <sup>o</sup> 2 | "    | 0.20 | 2 <sup>n</sup> | Aitken | A and B  |
| 1899.70 | 283.8               | 4.83 |      | 2 <sup>n</sup> | Aitken | AB and C |

Some change in the close pair is probable.

 $\beta$  1176. 48 *Cephei* (H) (Page 37)

|         |                     |       |      |                |         |    |
|---------|---------------------|-------|------|----------------|---------|----|
| 1899.65 | 268. <sup>o</sup> 1 | "     | 1.22 | 1 <sup>n</sup> | Aitken  | AB |
| 1899.82 | 275.7               | 1.25  |      | 2 <sup>n</sup> | Barnard |    |
| 1899.65 | 232.7               | 10.89 |      | 1 <sup>n</sup> | Aitken  | AC |
| 1899.81 | 232.4               | 11.06 |      | 3 <sup>n</sup> | Barnard |    |

A and B appear to have the same proper motion; and probably form a physical system. The change in C corresponds to the proper motion of A, and the distant companion is therefore not a member of the system.

 $\beta$  1178 (Page 38)

|         |                     |   |      |                |         |
|---------|---------------------|---|------|----------------|---------|
| 1899.84 | 348. <sup>o</sup> 4 | " | 0.51 | 1 <sup>n</sup> | Barnard |
|---------|---------------------|---|------|----------------|---------|

No evidence of change since 1890.

 $\beta$  1177 (Page 38)

|         |                    |   |      |                |        |
|---------|--------------------|---|------|----------------|--------|
| 1899.78 | 12. <sup>o</sup> 0 | " | 0.35 | 3 <sup>n</sup> | Aitken |
|---------|--------------------|---|------|----------------|--------|

A difficult pair, but some change is probable.

 $\beta$  536 (Page 42)

|         |                     |       |      |                |         |    |
|---------|---------------------|-------|------|----------------|---------|----|
| 1899.70 | 301. <sup>o</sup> 6 | "     | 0.15 | 3 <sup>n</sup> | Aitken  | AB |
| 1899.65 | 8.6                 | 18.38 |      | 2 <sup>n</sup> | Barnard | CD |
| 1899.65 | 329.8               | 7.76  |      | 3 <sup>n</sup> | Barnard | CE |

The 16 m star, E, has not been observed before. It is important that the close pair should be watched and measured in the near future.

 $\beta$  538 (Page 42)

|         |                     |   |      |                |        |
|---------|---------------------|---|------|----------------|--------|
| 1899.69 | 130. <sup>o</sup> 2 | " | 1.78 | 1 <sup>n</sup> | Aitken |
|---------|---------------------|---|------|----------------|--------|

 $\beta$  1105 (Page 43)

|         |                    |   |      |                |        |
|---------|--------------------|---|------|----------------|--------|
| 1899.70 | 46. <sup>o</sup> 4 | " | 0.32 | 2 <sup>n</sup> | Aitken |
|---------|--------------------|---|------|----------------|--------|

 $\beta$  1106 (Page 43)

|         |                    |   |      |                |        |
|---------|--------------------|---|------|----------------|--------|
| 1899.69 | 19. <sup>o</sup> 6 | " | 0.35 | 1 <sup>n</sup> | Aitken |
|---------|--------------------|---|------|----------------|--------|

This measure is noted as "uncertain," and the apparent change of more than 30° in the past ten years may not be real. It is very difficult object with the largest aperture.

 $\beta$  1185 (Page 48)

|         |                     |   |      |                |        |
|---------|---------------------|---|------|----------------|--------|
| 1899.92 | 352. <sup>o</sup> 0 | " | 0.14 | 2 <sup>n</sup> | Aitken |
|---------|---------------------|---|------|----------------|--------|

Very decided change in the angle.

**$\beta$  550.  $\alpha$  Tauri** (Page 49)

|         |                     |                    |            |         |    |
|---------|---------------------|--------------------|------------|---------|----|
| 1899.64 | 275. <sup>o</sup> 1 | 1. <sup>#</sup> 95 | 2 <i>n</i> | Barnard | CD |
|---------|---------------------|--------------------|------------|---------|----|

 **$\beta$  883** (Page 53)

|         |                    |                    |            |         |
|---------|--------------------|--------------------|------------|---------|
| 1899.75 | 54. <sup>o</sup> 4 | 0. <sup>#</sup> 25 | 7 <i>n</i> | Aitken  |
| 1899.75 | 58.7               | 0.38               | 1 <i>n</i> | See     |
| 1899.78 | 54.0               | 0.22               | 4 <i>n</i> | Barnard |

A recent examination of all the measures of this star leads to the conclusion that the most probable period is about seventeen years. It is certain that the measures of 1891.97 to 1899.78 are properly adjusted as to quadrants, and that the angular motion in 7.8 years is only 110°. These measures are fairly consistent. A different and somewhat smaller value for the period may be found by rejecting the original position of 1879. This is a single observation, but it is substantially correct, unless an error was made in reading the position-circle, and this is very improbable.

 **$\beta$  552** (Page 54)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.75 | 202. <sup>o</sup> 3 | 0. <sup>#</sup> 60 | 1 <i>n</i> | See    |
| 1899.79 | 202.8               | 0.45               | 4 <i>n</i> | Aitken |

 **$\beta$  1238** (Page 57)

|         |                    |                    |            |        |
|---------|--------------------|--------------------|------------|--------|
| 1899.92 | 15. <sup>o</sup> 8 | 1. <sup>#</sup> 48 | 1 <i>n</i> | Aitken |
|---------|--------------------|--------------------|------------|--------|

Probably unchanged.

 **$\beta$  555.  $\beta$  Orionis** (Page 59)

|         |                    |      |            |         |
|---------|--------------------|------|------------|---------|
| 1899.71 | 192 <sup>o</sup> ± | 0.2± | 1 <i>n</i> | Aitken  |
| 1899.72 | 184                | 0.13 | 1 <i>n</i> | "       |
| 1899.82 | 172.7              | 0.1± | 1 <i>n</i> | Barnard |
| 1899.92 | 210.6              | 0.16 | 1 <i>n</i> | Aitken  |

This pair may have a period less than that of any known binary. It is difficult to adjust all the observations, positive and negative. The measures can be represented by a period of about five years, but upon any assumption the elongation should have been seen at some of the times when it was noted as single by apertures large enough to show it. If it is carefully watched with the largest telescopes, as it doubtless will be, the approximate period will be determined within a few years.

 **$\beta$  557** (Page 64)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.73 | 146. <sup>o</sup> 0 | 0. <sup>#</sup> 29 | 1 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

 **$\beta$  1239** (Page 65)

|         |                     |                    |            |        |    |
|---------|---------------------|--------------------|------------|--------|----|
| 1899.92 | 320. <sup>o</sup> 1 | 2. <sup>#</sup> 36 | 2 <i>n</i> | Aitken | BD |
| 1899.92 | 232.1               | 7.75               | 1 <i>n</i> | Aitken | AB |
| 1899.92 | 310.8               | 10.41              | 1 <i>n</i> | Aitken | AC |

 **$\beta$  1240. 26 Aurigæ** (Page 66)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.92 | 330. <sup>o</sup> 8 | 0. <sup>#</sup> 20 | 2 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

 **$\beta$  1032.  $\sigma$  Orionis** (Page 68)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.79 | 329. <sup>o</sup> 0 | 0. <sup>#</sup> 20 | 3 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

The retrograde motion continues, with little or no change in the distance.

 **$\beta$  1007. 126 Tauri** (Page 69)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.54 | 243. <sup>o</sup> 5 | 0. <sup>#</sup> 21 | 3 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

This mean includes the single measure of 1899.17 given on page 69.

 **$\beta$  1055** (Page 73)

|         |                     |                    |            |         |    |
|---------|---------------------|--------------------|------------|---------|----|
| 1899.80 | 333. <sup>o</sup> 6 | 2. <sup>#</sup> 15 | 4 <i>n</i> | Barnard | AB |
| 1899.77 | 327.8               | 33.38              | 3 <i>n</i> | Barnard | AC |

If the proper motion given from KUSTNER is substantially correct, the components of the close pair are moving together, as otherwise, the position angle of B at the date of the above measures would be 20°.5 more than it was in 1888.

 **$\beta$  1241. 4 Geminorum** (Page 74)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.92 | 334. <sup>o</sup> 0 | 0. <sup>#</sup> 50 | 2 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

Change is probable in the close pair.

 **$\beta$  1058. 4 Geminorum** (Page 75)

|         |                     |                    |            |        |
|---------|---------------------|--------------------|------------|--------|
| 1899.92 | 275. <sup>o</sup> 8 | 0. <sup>#</sup> 28 | 2 <i>n</i> | Aitken |
|---------|---------------------|--------------------|------------|--------|

Slow motion in angle is probable.

**$\beta$  1192.** *v Geminorum* (Page 79)1899.92    342.<sup>o</sup>2    "    0.21    1*n*    Aitken **$\beta$  101.** *9 Argus* (Page 92)1899.62    295.<sup>o</sup>4    "    0.54    5*n*    Aitken

This mean includes the two measures of 1899.19 given on page 62. The distance is now about maximum, and the motion in angle is correspondingly slow.

 **$\beta$  1064.** *19 Argus* (Page 97)1899.91    252.<sup>o</sup>9    "    2.24    2*n*    Aitken **$\beta$  208** (Page 101)1899.91    94.<sup>o</sup>4    "    0.25    2*n*    Aitken

This binary appears to be rapidly closing.

 **$\beta$  1069** (Page 102)1899.92    60.<sup>o</sup>0    "    2.08    1*n*    Aitken **$\beta$  608** (Page 124)1898.43    297.<sup>o</sup>2    285.<sup>o</sup>57    2*n*    Glasenapp    AC **$\beta$  800** (Page 125)1899.43    111.<sup>o</sup>5    "    2.52    1*n*    Brown **$\beta$  237** (Page 126)1899.43    203.<sup>o</sup>9    "    2.87    1*n*    Brown **$\beta$  113** (Page 126)1899.43    206.<sup>o</sup>0    "    1.30    1*n*    Brown **$\beta$  953** (Page 153)1899.71    223.<sup>o</sup>2    "    0.10    1*n*    Aitken

The rapid angular motion continues. It is probably a short-period binary.

 **$\beta$  1089** (Page 165)1899.58    352.<sup>o</sup>2    "    0.78    3*n*    Aitken

These measures confirm the retrograde motion in angle.

 **$\beta$  962.** *26 Draconis* (Page 166)1899.71    44.<sup>o</sup>1    "    0.59    1*n*    Aitken

The angular motion is now rapid, and it has become a very difficult pair to measure.

 **$\beta$  131** (Page 174)1899.62    278.<sup>o</sup>5    "    2.85    4*n*    Hussey **$\beta$  1128** (Page 179)1897.73    197.<sup>o</sup>9    "    3.70    2*n*    See

SEE (*A. J.* 431) notes the principal star as a close equal pair,  $265^{\circ} \pm : 0^{\circ}.18 \pm$  (1897.74).

 **$\beta$  971** (Page 183)1899.71    19.<sup>o</sup>8    "    0.36    1*n*    Aitken

This will be an interesting system, but further measures are necessary to show the apparent orbit.

 **$\beta$  651** (Page 192)1899.70    287.<sup>o</sup>0    "    6.69    6*n*    Doolittle **$\beta$  145** (Page 196)

1899.70    266.<sup>o</sup>2    "    0.83    3*n*    Doolittle    AB  
 1899.70    28.8    9.03    3*n*    "    "    AC  
 1899.70    156.2    27.08    3*n*    "    "    AB

 **$\beta$  827** (Page 196)1899.60    262.<sup>o</sup>1    "    0.74    1*n*    Hussey

Slow retrograde motion is probable.

**$\beta$  361** (Page 198)

|         |                      |      |                |           |
|---------|----------------------|------|----------------|-----------|
| 1899.71 | 358. <sup>o</sup> .9 | 3.86 | 3 <sup>n</sup> | Doolittle |
|---------|----------------------|------|----------------|-----------|

 **$\beta$  979** (Page 198)

|         |                      |      |                |           |
|---------|----------------------|------|----------------|-----------|
| 1899.70 | 335. <sup>o</sup> .9 | 2.05 | 4 <sup>n</sup> | Doolittle |
|---------|----------------------|------|----------------|-----------|

 **$\beta$  980.  $\eta$  Cygni** (Page 199)

|         |                      |       |                |           |    |
|---------|----------------------|-------|----------------|-----------|----|
| 1899.71 | 208. <sup>o</sup> .2 | 7.50  | 3 <sup>n</sup> | Doolittle | AB |
| 1899.71 | 326.8                | 46.29 | 3 <sup>n</sup> | "         | AC |
| 1899.71 | 169.2                | 50.08 | 3 <sup>n</sup> | "         | AD |

 **$\beta$  429** (Page 202)

|         |                     |       |                |           |    |
|---------|---------------------|-------|----------------|-----------|----|
| 1899.73 | 60. <sup>o</sup> .2 | 6.56  | 4 <sup>n</sup> | Doolittle | AB |
| 1899.73 | 25.3                | 8.89  | 4 <sup>n</sup> | "         | AC |
| 1899.73 | 300.7               | 11.34 | 4 <sup>n</sup> | "         | AD |
| 1899.73 | 107.1               | 28.28 | 4 <sup>n</sup> | "         | AE |
| 1899.73 | 28.1                | 36.36 | 4 <sup>n</sup> | "         | AF |
| 1899.73 | 109.1               | 9.68  | 4 <sup>n</sup> | "         | FG |
| 1899.73 | 56.6                | 30.08 | 4 <sup>n</sup> | "         | AH |

The faint star, H, has not been measured before.

 **$\beta$  1260** (Page 207)

|         |                      |      |                  |        |
|---------|----------------------|------|------------------|--------|
| 1899.71 | 164. <sup>o</sup> .1 | 0.48 | 3-2 <sup>n</sup> | Aitken |
|---------|----------------------|------|------------------|--------|

A difficult object, but without material change.

 **$\beta$  1136** (Page 211)

|         |                      |      |                |         |
|---------|----------------------|------|----------------|---------|
| 1899.76 | 215. <sup>o</sup> .5 | 0.19 | 1 <sup>n</sup> | Barnard |
| 1899.82 | 200.9                | 0.39 | 1 <sup>n</sup> | Aitken  |

In the last measure the distance is noted as uncertain.

 **$\beta$  68** (Page 220)

|         |                      |      |                |         |
|---------|----------------------|------|----------------|---------|
| 1899.76 | 150. <sup>o</sup> .3 | 1.90 | 3 <sup>n</sup> | Barnard |
|---------|----------------------|------|----------------|---------|

 **$\beta$  151.  $\beta$  Delphini** (Page 211)

|         |                    |      |                |        |
|---------|--------------------|------|----------------|--------|
| 1899.76 | 7. <sup>o</sup> .9 | 0.68 | 2 <sup>n</sup> | See    |
| 1899.76 | 5.5                | 0.58 | 3 <sup>n</sup> | Brown  |
| 1899.68 | 3.8                | 0.60 | 2 <sup>n</sup> | Aitken |

 **$\beta$  271** (Page 226)

|         |                      |       |                |         |    |
|---------|----------------------|-------|----------------|---------|----|
| 1899.75 | 237. <sup>o</sup> .4 | 3.21  | 2 <sup>n</sup> | Barnard | AB |
| 1899.75 | 72.9                 | 75.45 | 4 <sup>n</sup> | Barnard | AC |

The change in the distance of C corresponds to the proper motion of A.

 **$\beta$  686** (Page 232)

|         |                      |      |                |        |
|---------|----------------------|------|----------------|--------|
| 1899.71 | 300. <sup>o</sup> .9 | 0.80 | 1 <sup>n</sup> | Aitken |
|---------|----------------------|------|----------------|--------|

 **$\beta$  1263** (Page 234)

|         |                      |      |                |        |
|---------|----------------------|------|----------------|--------|
| 1899.71 | 243. <sup>o</sup> .4 | 0.49 | 1 <sup>n</sup> | Aitken |
|---------|----------------------|------|----------------|--------|

The measures indicate rapid motion in angle.

 **$\beta$  989.  $\kappa$  Pegasi** (Page 234)

|         |                      |      |                |       |
|---------|----------------------|------|----------------|-------|
| 1899.81 | 281. <sup>o</sup> .4 | 0.20 | 2 <sup>n</sup> | See   |
| 1899.81 | 282.2                | 0.24 | 2 <sup>n</sup> | Brown |

 **$\beta$  689** (Page 234)

|         |                      |      |                |        |
|---------|----------------------|------|----------------|--------|
| 1899.74 | 239. <sup>o</sup> .0 | 1.91 | 2 <sup>n</sup> | Aitken |
|---------|----------------------|------|----------------|--------|

The components appear to be fixed.

 **$\beta$  691** (Page 237)

|         |                      |      |                |         |
|---------|----------------------|------|----------------|---------|
| 1899.76 | 316. <sup>o</sup> .1 | 0.76 | 1 <sup>n</sup> | Barnard |
|---------|----------------------|------|----------------|---------|

Change in angle is probable.

 **$\beta$  1213** (Page 238)

|         |                      |      |                |        |
|---------|----------------------|------|----------------|--------|
| 1899.78 | 306. <sup>o</sup> .0 | 0.84 | 2 <sup>n</sup> | Aitken |
|---------|----------------------|------|----------------|--------|

There may be some change in the angle.

 **$\beta$  1265** (Page 249)

|         |                      |      |                |        |
|---------|----------------------|------|----------------|--------|
| 1899.73 | 250. <sup>o</sup> .0 | 0.55 | 1 <sup>n</sup> | Aitken |
|---------|----------------------|------|----------------|--------|

 **$\beta$  848** (Page 253)

|         |                    |      |                |        |
|---------|--------------------|------|----------------|--------|
| 1899.73 | 2. <sup>o</sup> .1 | 2.34 | 1 <sup>n</sup> | Aitken |
|---------|--------------------|------|----------------|--------|

$\beta$  78 (Page 255)

|         |                    |                    |            |           |    |
|---------|--------------------|--------------------|------------|-----------|----|
| 1898.51 | 54. <sup>o</sup> 7 | 18.29 <sup>"</sup> | 2 <i>n</i> | Doolittle | AB |
| 1898.51 | 61.9               | 48.36              | 2 <i>n</i> | Doolittle | AC |

 $\beta$  180 (Page 256)

|         |                     |                   |            |           |  |
|---------|---------------------|-------------------|------------|-----------|--|
| 1898.49 | 172. <sup>o</sup> 8 | 0.82 <sup>"</sup> | 2 <i>n</i> | Doolittle |  |
| 1898.49 | 106.6               | 34.84             | 2 <i>n</i> | Doolittle |  |

No material change.

 $\beta$  853 (Page 258)

|         |                     |                   |            |        |    |
|---------|---------------------|-------------------|------------|--------|----|
| 1899.73 | 223. <sup>o</sup> 4 | 0.75 <sup>"</sup> | 1 <i>n</i> | Aitken | AB |
| 1899.73 | 69.8                | 7.03              | 1 <i>n</i> | Aitken | AC |

No material change.

 $\beta$  718. 64 *Pegasi* (Page 260)

|         |                    |                   |            |        |  |
|---------|--------------------|-------------------|------------|--------|--|
| 1899.92 | 88. <sup>o</sup> 1 | 0.46 <sup>"</sup> | 1 <i>n</i> | Aitken |  |
|---------|--------------------|-------------------|------------|--------|--|

Noted as "difficult and uncertain." The relative motion is obviously slow.

 $\beta$  720. 72 *Pegasi* (Page 262)

|         |                     |                   |            |     |  |
|---------|---------------------|-------------------|------------|-----|--|
| 1899.81 | 167. <sup>o</sup> 8 | 0.35 <sup>"</sup> | 1 <i>n</i> | See |  |
|---------|---------------------|-------------------|------------|-----|--|

 $\beta$  721 (Page 263)

|         |                     |                   |            |     |  |
|---------|---------------------|-------------------|------------|-----|--|
| 1899.81 | 127. <sup>o</sup> 0 | 0.30 <sup>"</sup> | 1 <i>n</i> | See |  |
|---------|---------------------|-------------------|------------|-----|--|

 $\beta$  733. 85 *Pegasi* (Page 268)

|         |                     |                   |            |        |  |
|---------|---------------------|-------------------|------------|--------|--|
| 1899.80 | 234. <sup>o</sup> 6 | 0.83 <sup>"</sup> | 2 <i>n</i> | Brown  |  |
| 1899.81 | 237.5               | 0.82              | 1 <i>n</i> | See    |  |
| 1899.92 | 234.8               | 0.81              | 1 <i>n</i> | Aitken |  |

## NEW NEBULAE

In looking over my old observing books used at the Lick Observatory, I find a good many nebulae noted from time to time which were not found in DREYER'S *General Catalogue*. These were accidentally picked up in the course of the double star work, and seen because they were in the field with some bright star. A few of these were measured from the star, and the places given in *Publications of the Lick Observatory*, Vol. II, pp. 155, 181. Many others were never reexamined at that time. Three of these I have looked up with the 40-inch, and measured their places from the adjacent stars. In each case the position given below is that of the star (1880).

## Lalande 26702 and nebula

R.A. 14<sup>h</sup> 33<sup>m</sup> 29<sup>s</sup> }  
Decl. - 15° 41' }

|          |                     |                     |                 |
|----------|---------------------|---------------------|-----------------|
| 1899.285 | 236. <sup>o</sup> 7 | 284.46 <sup>"</sup> | Single distance |
|----------|---------------------|---------------------|-----------------|

This star is the preceding of two, about 7 m.

## D.M. (34°) 2815 and nebula

R.A. 16<sup>h</sup> 56<sup>m</sup> 57<sup>s</sup> }  
Decl. + 33° 42' }

|          |                     |                     |                 |
|----------|---------------------|---------------------|-----------------|
| 1899.285 | 314. <sup>o</sup> 0 | 153.88 <sup>"</sup> | Single distance |
|----------|---------------------|---------------------|-----------------|

The comparison star is 13<sup>s</sup>.6 preceding and 5'.2 south of 59 *Herculis*.

## Piazzì XVIII. 203 and nebula

R.A. 18<sup>h</sup> 43<sup>m</sup> 39<sup>s</sup> }  
Decl. + 19° 11' 43" }

|          |                    |                     |                 |
|----------|--------------------|---------------------|-----------------|
| 1899.249 | 86. <sup>o</sup> 8 | 112.99 <sup>"</sup> | Single distance |
|----------|--------------------|---------------------|-----------------|

The comparison star is 6 m. Lalande 35032.





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