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Observations of Double Stars

with the 26 inch equatorial at the U. S. Naval Observatory.

By *Stimson J. Brown.*

In the spring of 1897 I began a series of double star measures with the 26 inch refractor, which were intended as a continuation of the work of Professor Hall with the same instrument. The observing list was purposely limited to those stars which, on account of rapid motion, difficulty or other peculiarities, were considered suitable objects for a telescope of such dimensions. The stars were selected from the catalogues of W. and O. Struve, and included besides several lists of stars furnished by Burnham which needed observations.

The seeing proved unexpectedly bad for double star observations, and it was evident that the greater portion of the list could only be observed at rare intervals. The unfavourable conditions seemed to be partly atmospheric and partly due to the influence of the warm air of the basement underneath the elevating floor.

The elevating platform, 45 feet in diameter, is raised and lowered through a height of 12 feet by hydraulic rams situated in the basement 7 feet below the floor at its lowest point. During very cold weather it is necessary to keep the basement above the freezing temperature, on account of the hydraulic rams for elevating the floor. Generally, during the cold weather of winter the temperature of the basement stands permanently about 10° higher than in the dome above. This is caused by radiation from the massive cement pier and the thick stone walls and cement floor of the basement. The temperature of the ground underneath the cement floor of the basement stands pretty constantly at 57° throughout the year. This warm air escaping from the basement into the dome above through the numerous openings necessary, and escaping thence through the slit, causes an unsteadiness of the images which precludes all difficult double star work in winter. My experience shows that it was only during the spring and fall, when the temperature of the air at night was about the same as that of the ground floor, the basement walls, and the cement pier of the telescope, when difficult double star measurements could be undertaken. At frequent intervals during these months it was possible to measure with certainty stars at and below the theoretical resolving power of the telescope. Except for these favorable occasions, I should have felt that my inability to observe the list of stars, which I had selected for the telescope, was due to some peculiar personal defect. The progress of the work was slow and broken, and therefore generally unsatisfactory.

To fill in such gaps, a number of stars, comparatively easy objects for this telescope, were included in the list as test objects for the seeing, and for the further purpose of furnishing a comparison between my observations and those of Professor Hall with the same instrument.

During the summer of 1899 the walls and floor of the basement and the cement pier were insulated from the basement by a double wall and floor of matched pine, with a heavy sheet of tarred paper between. This also encloses the hydraulic elevating apparatus, so that the basement may now be thoroughly ventilated and its temperature kept more nearly the same as the outside air. Experience during the present winter has shown that the conditions for observing are materially improved by this means, but as the atmospheric conditions have been generally unfavorable during the winter, it would be premature to say that the unfavorable construction of the dome and building of the great equatorial has been permanently remedied.

As the optical parts of the instrument are essentially the same as those described by Prof. Hall in his published observations of double stars,*) there is no need of a special description here.

The illumination of the wires was also the same, by a small hand lamp, which threw a beam of light through a small opening in the end of the micrometer box opposite the micrometer head. This, however, gives an unsymmetrical illumination of the wires, which is not only objectionable on account of its inconvenience, but also its liability to systematic error in measurement between a bright and a faint object. In such a case the bright wire illuminated by the lamp is seen lying alongside the dark wire projected against the bright object, which would not occur with a symmetrical illumination on both sides of the wire. This method of illumination has recently been entirely reconstructed by a small electric light at one end of the micrometer box and a reflector at the other, which has proved not only of great convenience to the observer, but has removed the unsymmetrical illumination described above.

My method of observing has been in one respect different from that pursued by Professor Hall, who, in obtaining the position angle, placed the stars between two

*) Appendix I, 1877, and Appendix I, 1888, Washington Observations.

wires a short distance apart. I have uniformly used a single micrometer wire, and the position angle has been obtained by turning the position circle until the micrometer wire bisects the images of the two stars, and then reading the position circle. In the case of bright wires, the wire is distinctly visible without illumination projected against the star images. If the companion is faint the illuminated wire was necessarily used.

The position angle was measured four times for each observation, turning the circle alternately in opposite directions to avoid systematic error due to direction of rotation in making the bisections.

The zero of the position circle has been obtained by turning the micrometer wire so that an equatorial star near the meridian follows the wire across the field. In measuring the distances the micrometer was turned to a reading 90° different from the reading for the position angle. The measured distance consists of two determinations of the double distance; first the stars are bisected by the wires and the micrometer read, then two readings are taken with the fixed and movable wires reversed, and a final reading as in the first setting. As in the position angle, when the two components are sufficiently bright the dark wires are used, as they could be well seen projected against the bright images of the stars.

The value adopted by Prof. Hall for one revolution of the micrometer screw, 9".936, has been used throughout.

During the spring of 1899 a few measures were carried out conjointly by myself and Dr. See for a comparison of our observations on difficult stars. I am indebted to him for his kindness in preparing the list of stars for publication.

The star places are given for 1880.0.

β 1015.

$\alpha = 0^h 14^m 27^s \quad \delta = +11° 39'$

1897.889	125°3	0".49
1898.015	125.6	0.53
1897.957	125.45	0.51

Power 888 resp. 606. Seeing 3. Slow direct motion.

β 302.

$\alpha = 0^h 51^m 56^s \quad \delta = +20° 45'$

1898.010	99°7	0".60
.015	102.4	0.56
1898.012	101.05	0.58

Power 606. Seeing 3 resp. 4. Slow direct motion.

β 504.

$\alpha = 1^h 11^m 9^s \quad \delta = +1° 13'$

1897.889	281°2	1".82
.941	279.3	1.75
.944	277.4 (1/2)	2.02 (1/2) v. poor
1897.925	279.76	1.832

Power 383 resp. 606 and 383. Seeing 4 resp. 3 and 2.

β 5 = 103 Piscium.

$\alpha = 1^h 32^m 47^s \quad \delta = +16° 1'$

1897.944	292°60	1".49
1898.033	291.10	1.36
.036	288.10	1.30
1898.004	290.60	1.383

Power 606. Seeing 2. No change.

β 509.

$\alpha = 1^h 37^m 25^s \quad \delta = +8° 58'$

1897.941	251°63	0".80

Power 606. Seeing 3. Slow retrograde motion.

β 260.

$\alpha = 1^h 46^m 45^s \quad \delta = +14° 51'$

1897.941	233°48	0".65
1898.021	234.60	0.75
1897.981	234.04	0.70

Power 606. Seeing 2 resp. 3. Very slow motion.

β 10.

$\alpha = 2^h 44^m 23^s \quad \delta = -5° 29'$

1898.010	98°6	2".88

Power 606. Seeing 3.

$O\Sigma$ 65.

$\alpha = 3^h 44^m.3 \quad \delta = +25° 16'$

1898.081	202°6	0".56
.111[1]	206.2	0.67
1898.096	204.40	0.615

[1]) Seeing 2.

$O\Sigma$ 531.

$\alpha = 4^h 0^m.2 \quad \delta = +37° 50'$

1898.125	128°0	1".97

Evidently proper motion.

$O\Sigma$ 90.

$\alpha = 4^h 49^m \quad \delta = +8° 26'$

1898.117	341°3	2".00

Very slow motion.

β 314.

$\alpha = 4^h 53^m 39^s \quad \delta = -16° 34'$

1898.114	326°2	0".86

Power 606. Seeing 4. Magnitudes 7 and 10.

$O\Sigma$ 93.

$\alpha = 4^h 55^m.1 \quad \delta = +4° 57'$

1898.188	51°8	0".56

Proper motion?

β 885.

$\alpha = 5^h 4^m 54^s \quad \delta = -1° 55'$

1898.114	194°8	0".69

Power 606. Seeing 3.

β 318.

$\alpha = 5^h 10^m 15^s \quad \delta = -3° 37'$

1898.114	238°5	0".57

Power 888. Seeing 3.

$O\Sigma$ 115.

$\alpha = 5^h 37^m.6 \quad \delta = +15° 2'$

1898.111	118°2	0".76

No motion.

$O\Sigma$ 119.

$\alpha = 5^h 42^m \quad \delta = +7° 58'$

1898.111	320°8	0".69

Slow motion.

$O\Sigma$ 124.

$\alpha = 5^h 53^m \quad \delta = +12° 48'$

1898.188 Single, round. Power 888.

Σ 840.

$\alpha = 6^h 1^m \quad \delta = +10° 48'$

1898.111	171°1	0".80

Very slow motion.

OΣ 132.

$\alpha = 6^h 1^m.2$ $\delta = +38° 0'$

1898.117	319°.9	1".76

Very slow motion.

Σ 919.

$\alpha = 6^h 24^m$ $\delta = -6° 57'$

1898.166	105°.0	2".60	AB
1898.166	311°.55	7".52	AC

Very slow motion.

Σ 3117.

$\alpha = 6^h 35^m$ $\delta = +9° 48'$

1898.185	85°.5	0".90

Very slow motion.

Sirius.

$\alpha = 6^h 41^m$ $\delta = -16° 34'$

1899.21	169°.0	4".78	poor
.818	154.5	—	uncertain
1899.51	161.7	4.78	

OΣ 156.

$\alpha = 6^h 41^m.5$ $\delta = +18° 19'$

1898.202	302°.3	0".64

Slow motion.

Σ 963.

$\alpha = 6^h 44^m.3$ $\delta = +59° 34'$

1899.314	81°.8	0".48
.325	81.0	0.43
1899.320	81.4	0.46

Slow motion, distance decreasing.

OΣ 159.

$\alpha = 6^h 48^m.7$ $\delta = +58° 33'$

1899.314	14°.0	1".02

Quadrant certain. Very slow motion, distance increasing.

β 326.

$\alpha = 6^h 50^m.9$ $\delta = +2° 27'$

1898.185	56°.4	1".33

OΣ 163.

$\alpha = 6^h 55^m$ $\delta = +11° 57'$

1898.182	330°.4	0".52

Very slow motion.

OΣ 170.

$\alpha = 7^h 12^m.3$ $\delta = +9° 29'$

1898.185	109°.7	1".64

Very slow motion.

Σ 1107.

$\alpha = 7^h 31^m.6$ $\delta = +75° 58'$

1899.325	202°.6	1".30

No change.

OΣ 176.

$\alpha = 7^h 33^m$ $\delta = +0° 44'$

1898.166	214°.7	1".52

Motion slow.

Σ 1126.

$\alpha = 7^h 34^m.7$ $\delta = +25° 27'$

1897.244	143°.85	1".07

Slow decrease in distance.

β 101 = 9 Argus.

$\alpha = 7^h 46^m 13^s$ $\delta = -13° 35'$

1898.182	293°.3	0".62
.185	291.8	0.63
1898.183	292.55	0.625

Binary; rapid motion.

Σ 1157.

$\alpha = 7^h 49^m.5$ $\delta = -2° 32'$

1898.185	65°.5	1".22

Motion very slow.

OΣ 185.

$\alpha = 7^h 52^m.2$ $\delta = +1° 24'$

1898.182	22°.3	0".29
1899.303	17°.7	0".37
.308	18.0	0.34
1899.306	17.8	0.35

Observations of this star few and unsatisfactory.

β 581.

$\alpha = 7^h 57^m 44^s$ $\delta = +12° 38'$

1898.177	286°.2	0".57	twilight
.182	279.65	0.58	
.188	280.3	0.63	
1898.182	282.05	0.593	

Power 606 resp. 888 and 888. Seeing 3 resp. 2 and 3.

AB and C.

1898.177	197°.50	4".55

Power 606.

Distance constant. Direct motion of 106° since 1878.

Σ 1175.

$\alpha = 7^h 57^m.2$ $\delta = +4° 27'$

1899.305	225°.0	1".86

No change.

OΣ 186.

$\alpha = 7^h 57^m.3$ $\delta = +26° 34'$

1898.182	73°.4	0".82

Very slow motion.

OΣ 187.

$\alpha = 7^h 57^m.8$ $\delta = +33° 20'$

1899.308	261°.6	0".32	by See
.308	262.4	0.27	
.314	266.0	0.30±	
1899.310	263.33	0.30	

Slow motion in angle; distance decreasing.

Σ 1196 = ζ Cancri.

$\alpha = 8^h 6^m.2$ $\delta = +17° 58'$

AB.

1897.247	14°.72	0".80
.252	15.88	1.12
1897.250	15.30	0.96
1899.207	8°.16	1".10
.210	7.08	1.12
1899.208	7.62	1.11

AC.

1897.252	121°.50	5".38
1899.207	116°.04	5".50
.210	115.48	5.48
1899.208	115.76	5.49

Σ 1291 = σ² Cancri.

$\alpha = 8^h 48^m.2$ $\delta = +30° 58'$

1897.315	327°.52	1".38

Very slow motion.

Σ 1306.

$\alpha = 9^h 1^m.5$ $\delta = +67° 32'$

1897.378	216°.6	1".58	difficult
1899.28	199°.3 (4)	1".33	
.29	203.8 (1)	1.31	
.30	202.0 (1)	1.43	
.31	199.5 (5)	1.33	
.33	204.0 (4)	1.39	very good
.42	—	1.48	very poor
1899.33	201.72	1.38	

The numbers in brackets indicate the number of settings.

$O\Sigma$ 197.

$\alpha = 9^h 4^m.3$ $\delta = +3° 21'$

1897.254	60°.56	1".40
.309	58.20	1.44
1897.288	59.38	1.42

Very slow motion.

Σ 3121.

$\alpha = 9^h 11^m.7$ $\delta = +28° 57'$

1897.252	14°.54	0".62
.304	12.94	0.74
.309	14.22	0.61
1897.288	13.90	0.657
1899.27	17°.7	0".82

A rapid binary.

Σ 1331.

$\alpha = 9^h 13^m.2$ $\delta = +61° 45'$

1897.323	152°.70	0".81
.372	151.75	0.81
.378	153.73	0.85
1897.358	152.73	0.823

No motion.

Σ 1334 = 38 Lyncis.

$\alpha = 9^h 14^m.7$ $\delta = +38° 37'$

1897.244	235°.80	3".00

Very slow motion.

Σ 1338.

$\alpha = 9^h 14^m.8$ $\delta = +38° 37'$

1897.315	165°.47	1".57

Very slow motion.

$O\Sigma$ 200.

$\alpha = 9^h 18^m.0$ $\delta = +52° 1'$

1897.328	333°.90	1".47
.378	331.97	1.54
1897.353	332.93	1.505

Very slow motion.

$O\Sigma$ 201.

$\alpha = 9^h 18^m.0$ $\delta = +28° 20'$

1897.315	222°.0	1".35

Very slow motion.

Σ 1348.

$\alpha = 9^h 19^m.0$ $\delta = +6° 44'$

1897.254	324°.4	1".82

Motion slow; distance increasing.

Σ 1355.

$\alpha = 9^h 22^m.2$ $\delta = +6° 43'$

1897.290	333°.8	2".68

Very slow motion.

Σ 1356 = ω Leonis.

$\alpha = 9^h 23^m.1$ $\delta = +9° 30'$

1897.304	106°.75	0".87
.306	112.32	0.83
1897.305	109.54	0.85
1899.207	111°.56	0".85
.210	110.70	0.79
1899.208	111.13	0.82

Σ 1365.

$\alpha = 9^h 26^m.0$ $\delta = +2° 55'$

1899.25	159°.0	3".49

Very slow.

$O\Sigma$ 208 = φ Ursae maj.

$\alpha = 9^h 45^m.3$ $\delta = +54° 33'$

1899.300	286°.1	0".39
.314	281.1	0.39
.325	292.7	0.39
1899.313	286.63	0.39

Power 888. Seeing 4.

Σ 1386.

$\alpha = 9^h 46^m.6$ $\delta = +69° 22'$

1897.353	291°.54	1".94
.378	293.11	1.89
1897.366	292.33	1.915

Very slow motion.

Σ 1389.

$\alpha = 9^h 46^m.6$ $\delta = +27° 28'$

1897.290	312°.36	2".15
.315	311.23	2.36
1897.302	311.80	2.255

Very slow motion.

A. C. 5 = 6 Sextantis.

$\alpha = 9^h 47^m.6$ $\delta = -7° 38'$

1897.30	96°.4	0".25 ±
.31	102.2	0.33 *)
.35	102.1	[0.35] poor
1897.32	99.3	0.29

*) Good observation; separated.

Σ 1406.

$\alpha = 10^h 0^m$ $\delta = +31° 34'$

1899.28	229°.3	1".14

No motion.

$O\Sigma$ 213.

$\alpha = 10^h 7^m$ $\delta = +27° 55'$

1899.28	103°.6	0".81

Very slow motion.

$O\Sigma$ 215.

$\alpha = 10^h 10^m.3$ $\delta = +18° 15'$

1897.309	211°.37	0".88
.315	211.40	0.84
.323	209.40	0.72
1897.315	210.72	0.81
1899.27	209°.1	0".88

Slow motion.

$O\Sigma$ 523.

$\alpha = 10^h 11^m.7$ $\delta = +23° 36'$

1899.28	298°.53	7".30

Distance increasing; large common p. m.

Σ 1423.

$\alpha = 10^h 13^m.8$ $\delta = +21° 4'$

1899.28	58°.1	1".43

Very slow motion.

Σ 1424 = γ Leonis.

$\alpha = 10^h 14^m.4$ $\delta = +20° 21'$

1897.244	115°.24	3".96

Σ 1426.

$\alpha = 10^h 15^m.3$ $\delta = +6° 56'$

AB.

1897.304	280°.16	0".74
.306	280.64	0.93
.309	281.60	0.87
1897.306	280.80	0.837

½ AB and C.

1897.309	8°.42	7".75

Slow motion.

$O\Sigma$ 216.

$\alpha = 10^h 17^m.4$ $\delta = +15° 51'$

1899.29	118°.8	1".38

Slow motion in *p*.

Σ 1429.

$\alpha = 10^h 19^m.5$ $\delta = +25° 6'$

1897.282	72°.81	0".82
.309	72.21	0.93
1897.296	72.51	0.875

Slow motion.

OΣ 217.

$\alpha = 10^h 21^m$ $\delta = +17° 44'$

1899.28	155°9	0″84

Very slow motion.

OΣ 218.

$\alpha = 10^h 22^m.1$ $\delta = +4° 6'$

1899.28	74°8	0″98

Very slow change.

Σ 1439.

$\alpha = 10^h 24^m.6$ $\delta = +21° 19'$

1897.254	114°6	1″90	
.274	114.7	1.81	
.282	115.1	—	Clouds
.309	116.5	2.06	
1897.279	115.23	1.923	

Very slow motion.

Σ 1445.

$\alpha = 10^h 27^m.6$ $\delta = -0° 21'$

1899.305	150°8	2″67

Magnitudes 9 and 12. Very slow change.

Σ 1450 = 49 Leonis.

$\alpha = 10^h 29^m.8$ $\delta = +9° 10'$

1897.290	156°08	2″43

Very slow motion.

Σ 1457.

$\alpha = 10^h 33^m.1$ $\delta = +6° 16'$

1897.282	319°78	1″34
.315	320.37	1.32
1897.298	320.08	1.330

Slow motion.

OΣ 224.

$\alpha = 10^h 34^m.3$ $\delta = +9° 22'$

1899.308	301°5	0″57
.314	306.9	0.51
.341	310.9	0.58
1899.321	306.42	0.553

By Professor See.

1899.308	297°6	0″65
.311	300.0	0.61
1899.310	298.8	0.63

Slow binary.

OΣ 227.

$\alpha = 10^h 34^m.9$ $\delta = +11° 15'$

1897.282	342°10	0″52
.306	349 62	0.63
.347	347.91	0.59
1897.312	346.53	0.580

Very slow motion.

OΣ 228.

$\alpha = 10^h 41^m.8$ $\delta = +23° 6'$

1897.350	190°88	0″39
.383	188.00	0.48
1897.366	189.44	0.435

Very slow motion.

OΣ 229.

$\alpha = 10^h 42^m.3$ $\delta = +41° 38'$

1897.353	324°08	0″84
.378	324.12	0.87
.383	320 44	0.84
1897.375	322.54	0.850

Very slow motion.

Σ 1500.

$\alpha = 10^h 55^m$ $\delta = -2° 56'$

1897.315	315°62	1″23
.323	312.79	1.56
1897.319	314.20	1.395

Motion slow.

Σ 1504.

$\alpha = 10^h 58^m.8$ $\delta = +4° 11'$

1897.315	109°70	1″02
.323	108.26	1.10
1897.319	108.98	1.06

Very slow motion.

Σ 1517.

$\alpha = 11^h 8^m.5$ $\delta = +20° 41'$

1897.350	277°30	0″58
.353	278.07	0.64
.383	278.52	0.58
1897.362	277.96	0.600

Slow motion; magnitudes 9 and 9.5.

OΣ 232.

$\alpha = 11^h 9^m.5$ $\delta = +38° 8'$

1899.30	236°7	0″60

No change.

Σ 1523 = ξ Ursae maj.

$\alpha = 11^h 12^m.8$ $\delta = +32° 7'$

1897.323	163°76	2″25
.353	164.86	1.87
.356	164.64	2.03
.402	164.44	2.03
1897.379	164.42	2.030

A binary with period of 60 years.

OΣ 234.

$\alpha = 11^h 25^m.4$ $\delta = +41° 50'$

1897.383	309°4	0″31
1899.308	317°1	0″33
.328	317.5	0.36
1899.318	317.3	0.345

A binary. Quadrant uncertain.

OΣ 235.

$\alpha = 11^h 26^m.7$ $\delta = +61° 38'$

1897.422	106°03	0″59
1899.325 [1]	118°7	0″59
.341 [2]	109.7	0.60
1899.333	114.2	0.595

[1]) Power 606 [2]) Power 888.

Σ 1555.

$\alpha = 11^h 31^m$ $\delta = +28° 20'$

1899.30	349°0	0″41
.31	349.8	0.37
1899.305	349.4	0.39

Power 888.

OΣ 237.

$\alpha = 11^h 33^m.6$ $\delta = +41° 42'$

1897.372	264°36	1″34
.378	265.11	1.24
.454	264.64	1.29
1897.401	264.70	1.290

Slow motion.

β 794.

$\alpha = 11^h 47^m 2^s$ $\delta = +74° 26'$

1899.324	169°0	0″35
.341	170.8	0.32
1899.333	169.9	0.335

Estimated 0″4. Direct rapid motion.

OΣ 241.

$\alpha = 11^h 51^m.1$ $\delta = +36° 0'$

1899.28	127°3	1″61

OΣ 243.

$\alpha = 11^h 54^m.7$ $\delta = +53° 57'$

1897.477	7°.28	0″.99

Slow motion.

Σ 1606.

$\alpha = 12^h 5^m.8$ $\delta = +40° 27'$

1897.372	335°.98	1″.13
.422	333.00	0.94
.432	336.30	1.13
1897.409	335.10	1.067

Very slow motion.

Σ 1621.

$\alpha = 12^h 10^m.8$ $\delta = +6° 11'$

1897.419	136°.52	2″.64

Slow motion.

β 606.

$\alpha = 12^h 19^m 48^s$ $\delta = -14° 17'$

1899.431	101°.0	1″.19

Very slow direct motion.

By Professor See.

1899.431	100°.9	1″.45

Σ 1639 = 68 Comae Berenices.

$\alpha = 12^h 19^m.4$ $\delta = +26° 8'$

1899.308	4°.8	0″.20 ± good obs.
.325	11.0	0.14 ± *)
1899.316	7.9	0.17

*) Clearly elongated; good observation.

Σ 1641.

$\alpha = 12^h 19^m$ $\delta = +38° 17'$

1897.454	34°.22	9″.56

Rectilinear motion.

Σ 1643.

$\alpha = 12^h 22^m.2$ $\delta = +27° 35'$

1897.402	40°.20	1″.82

Very slow motion.

OΣ 251.

$\alpha = 12^h 24^m.2$ $\delta = +31° 56'$

1899.308 Apparently round; seeing poor. Power 888

1899.333 Cannot see it.

Σ 1647.

$\alpha = 12^h 25^m.5$ $\delta = +10° 16'$

1897.402	220°.90	1″.29

Motion very slow.

β 797.

$\alpha = 12^h 28^m 27^s$ $\delta = +6° 38'$

1899.431	171°.1	0″.73

By Professor See.

1899.431	171°.2	0″.97

Σ 1658.

$\alpha = 12^h 30^m$ $\delta = +8° 0'$

1897.419	356°.8	2″.58

Σ 1661.

$\alpha = 12^h 30^m.9$ $\delta = +11° 57'$

1897.419	236°.7	2″.54

Very slow motion.

Σ 1668.

$\alpha = 12^h 35^m.8$ $\delta = +9° 23'$

1897.419	194°.56	1″.40
.443	193.72	1.67
1897.431	194.14	1.535

Slow motion.

OΣ 256.

$\alpha = 12^h 51^m.2$ $\delta = -0° 24'$

1897.453	252°.46	0″.56

Motion slow.

OΣ 260.

$\alpha = 13^h 3^m.1$ $\delta = +27° 30'$

1899.311	124°.4	0″.98 by See
.369	121.6	0.70
1899.340	123.0	0.84

Σ 1728 = 42 Comae Berenices.

$\alpha = 13^h 5^m.1$ $\delta = +18° 4'$

1899.396	6°.7	0″.30
.399	9.3	0.24
1899.398	8.0	0.27

By Professor See.

1899.399	4°.0	0″.21

OΣ 261.

$\alpha = 13^h 7^m.3$ $\delta = +32° 36'$

1897.473	346°.7	1″.54

Slow motion.

β 800.

$\alpha = 13^h 11^m.8$ $\delta = +17° 34'$

1899.434	111°.5	2″.52

Slow retrograde motion.

β 237.

$\alpha = 13^h 21^m.0$ $\delta = +14° 58'$

1899.434	203°.9	2″.87

β 113.

$\alpha = 13^h 23^m 9^s$ $\delta = +12° 6'$

1899.434	206°.0	1″.30

Slow direct motion. Distance decreasing.

OΣ 267.

$\alpha = 12^h 23^m.6$ $\delta = +76° 30'$

1899.325	327°.2	0″.30 [1]
.333	316.0	0.32 [1]
1899.329	321.6	0.31

[1]) estimated 0″.25.

β 932.

$\alpha = 13^h 28^m 18^s$ $\delta = -12° 36'$

1899.426	273°.9	0″.36
.429	273.5	0.37 poor seeing
1899.428	273.7	0.365

By Professor See.

1899.429	279°.8	0″.29

OΣ 269.

$\alpha = 13^h 28^m.3$ $\delta = +35° 46'$

1899.311	51°.4	0″.35 ± *)
.328	42.7	0.39 †)
1899.320	46.05	0.37

*) To poor to measure. †) Good observation.

1899.311	42°.8	0″.36 by See

β 933.

$\alpha = 13^h 29^m 7^s$ $\delta = +33° 45'$

1899.434	29°.1	2″.23	AB
1899.434	17°.7	33″.93	AC

Σ 1768 = 25 Can. venat.

$\alpha = 13^h 33^m$ $\delta = +36° 48'$

1899.311	128°.6	1″.44

By Professor See.

1899.311	128°.7	1″.41

β 612.

$\alpha = 13^h 34^m.6$ $\delta = +11° 15'$

1899.341	220°.3	0″.35
.369	225.0	0.32
1899.355	222.65	0.335

By Professor See.

1899.369	232°.9	0″.29 *)

*) Unsteady and difficult.

Binary; rapid motion.

Σ 1781.
$\alpha = 13^h 41^m.1$ $\delta = +5° 37'$

1897.465	271°0	1″01
1899.369	275°2	1″08 good meas.
.388	272.9	1.06
1899.378	274.05	1.07
1899.369	268°1	1″43 by See

Σ 1785.
$\alpha = 13^h 44^m.5$ $\delta = +27° 29'$

1897.465	266°34	1″45

In orbital motion.

OΣ 273.
$\alpha = 13^h 51^m.3$ $\delta = +5° 47'$

1897.473	109°20	0″92

Very slow motion.

β 939.
$\alpha = 14^h 7^m 48^s$ $\delta = -7° 58'$

1899.429	320°5	0″56 *)

*) Very poor seeing.

By Professor See.

1899.429	316°0	0″58

OΣ 278.
$\alpha = 14^h 8^m.2$ $\delta = +44° 40'$

1899.328	274°8	0″32

Σ 1820.
$\alpha = 14^h 9^m.7$ $\delta = +55° 47'$

1897.476	74°52	2″21

Σ 1819.
$\alpha = 14^h 10^m.3$ $\delta = +3° 36'$

1897.473	1°44	1″36

Very slow motion.

OΣ 281.
$\alpha = 14^h 15^m.3$ $\delta = +9° 2'$

1897.454	159°94	1″57
.465	157.59	1.61
1897.460	158.81	1.595

Σ 1834.
$\alpha = 14^h 16^m.7$ $\delta = +48° 58'$

1899.396	270°±	0″20±

Σ 1837.
$\alpha = 14^h 19^m.3$ $\delta = -11° 13'$

1897.454	308°9	1″50

Very slow motion.

Σ 1842.
$\alpha = 14^h 22^m$ $\delta = +4° 8'$

1897.520	15°06	2″82

Motion very slow.

β 117.
$\alpha = 14^h 25^m.1$ $\delta = -15° 30'$

1899.328	92°3	2″51

Σ 1865 = ζ Bootis.
$\alpha = 14^h 36^m.4$ $\delta = +14° 9'$

1899.399	160°6	0″22± by See
1899.426	166°	elong. by Brown

Σ 1866.
$\alpha = 14^h 36^m.8$ $\delta = +9° 57'$

1897.498	23°01	0″80

Very slow motion.

Σ 1871.
$\alpha = 14^h 38^m.2$ $\delta = +51° 49'$

1897.476	292°4	1″84

Slow motion.

Σ 1876.
$\alpha = 14^h 41^m.1$ $\delta = -6° 58'$

1897.520	74°45	1″45

OΣ 285.
$\alpha = 14^h 41^m.7$ $\delta = +42° 48'$

1899.396	137°5	0″36
.399	135.8	0.27
1899.398	136.65	0.315

Σ 1883.
$\alpha = 14^h 43^m.9$ $\delta = +6° 22'$

1897.515	63°6	0″58

Very slow motion.

Σ 1884.
$\alpha = 14^h 43^m.9$ $\delta = +24° 47'$

1897.589	55°2	1″69

Motion very slow.

Σ 1888 = ξ Bootis.
$\alpha = 14^h 46^m.8$ $\delta = +19° 31'$

1897.465	218°70	2″95
.473	219.32	2.91
1897.469	219.01	2.93
1899.412	208°7	2″57
.420	208.6	2.74*)
.423	208.3	2.74
.429	208.5	2.91
1899.421	208.52	2.74

By Professor See.

1899.429	205°2	3″02
.431	210.1	2.93*)
.431	208.9	3.03
1899.430	206.06	2.993

*) Companion reddish.

OΣ 287.
$\alpha = 14^h 47^m.9$ $\delta = +45° 20'$

1897.476	318°7	0″68

Magnitudes 8 and 9.

OΣ 288.
$\alpha = 14^h 48^m.7$ $\delta = +16° 7'$

1897.498	189°56	1″64

Very slow motion.

β 348 = 2 Serpentis.
$\alpha = 14^h 56^m.7$ $\delta = +0° 15'$

1899.300	119°2	0″59
.388	122.3	0.75
1899.344	120.75	0.67

Slow motion in p.

Σ 1908.
$\alpha = 15^h 0^m.7$ $\delta = +34° 51'$

1897.520	148°80	1″41

Slow motion.

OΣ 294.
$\alpha = 15^h 10^m$ $\delta = +56° 26'$

1897.520	246°4	3″65

Motion slow.

Σ 1932.
$\alpha = 15^h 13^m.9$ $\delta = +27° 13'$

1897.558	326°8	0″91
.580	327.7	0.84
1897.569	327.25	0.875

Motion.

Σ 1937 = η Corona borealis.
$\alpha = 15^h 19^m.1$ $\delta = +30° 39'$

1897.580	336°50	0″48
.618	337.60	0.50
1897.599	337.05	0.49

A binary.

Σ 1938 = μ^2 Bootis.

$\alpha = 15^h 20^m.7$ $\delta = +37° 43'$

1897.498	81°.50	0″.78
.588	82.15	0.83
1897.543	81.82	0.805

Σ 1944.

$\alpha = 15^h 22^m.8$ $\delta = +6° 28'$

1897.520	330°.14	1″.15

Slow motion.

$O\Sigma$ 299.

$\alpha = 15^h 32^m.4$ $\delta = +64° 14'$

1897.520	20°.46	3″.53

Very slow motion.

$O\Sigma$ 298.

$\alpha = 15^h 32^m.4$ $\delta = +40° 9'$.

1897.589	176°.90	1″.07
.599	177.52	1.05
1897.594	177.21	1.06

A rapid binary.

Σ 1967 = γ Coronae borealis.

$\alpha = 15^h 38^m.5$ $\delta = +26° 36'$

1897.616	120°.30	0″.64	
.618	120.50	0.62	
1897.617	120.40	0.63	
1899.470*)	125°.0	0″.69	by Hussey
.470*)	115.8	0.45	by Brown
1899.470	120.4	0.57	

*) Seeing very poor.

Σ 1969.

$\alpha = 15^h 39^m.4$ $\delta = +60° 22'$

1899.401	234°.3	0″.63*)

*) Very poor seeing.

β 810.

$\alpha = 15^h 47^m.6$ $\delta = +42° 46'$

1899.401	82°.8	0″.97
.426	87.8	0.88
1899.413	85.3	0.925

$O\Sigma$ 303.

$\alpha = 15^h 56^m.3$ $\delta = +13° 33'$

1897.515	143°.33	0″.91

Slow motion.

Σ 1998 = ξ Scorpii.

$\alpha = 15^h 58^m.9$ $\delta = -11° 5'$

1897.589	221°.10	0″.74
.599	218.55	0.84
1897.594	219.82	0.79

A binary.

Σ 2027.

$\alpha = 16^h 10^m.3$ $\delta = +4° 32'$

1897.558	75°.60	1″.95

Very slow.

Σ 2032 = σ Coronae borealis.

$\alpha = 16^h 11^m$ $\delta = +34° 7'$

1897.558	210°.80	4″.30

A binary of long period.

Σ 2026.

$\alpha = 16^h 11^m.3$ $\delta = +7° 38'$

1897.600	260°.40	0″.39
.619	252.60	0.53
.648	254.50	0.49
1897.622	255.80	0.470

$O\Sigma$ 309.

$\alpha = 16^h 16^m$ $\delta = +41° 54'$

1897.600	245°.85	0″.58

Little change since the earliest measures.

Σ 2041.

$\alpha = 16^h 17^m.5$ $\delta = +1° 26'$

1897.575	359°.0	2″.68

Slow change.

Σ 2049.

$\alpha = 16^h 23^m.8$ $\delta = +26° 12'$

1896.567	208°.8	1″.24

Motion slow.

Σ 2052.

$\alpha = 16^h 24^m.5$ $\delta = +18° 37'$

1897.558	95°.30	1″.82
.575	92.63	2.00
1897.566	93.96	1.91

Very slow motion.

Σ 2055.

$\alpha = 16^h 25^m.9$ $\delta = +2° 12'$

1896.570	50°.0	1″.47

Slow motion.

$O\Sigma$ 313.

$\alpha = 16^h 29^m.3$ $\delta = +4° 19'$

1897.591	330°.0	0″.87

Motion slow.

$O\Sigma$ 314.

$\alpha = 16^h 34^m.3$ $\delta = +20° 40'$

1897.654	236°.9	3″.54

Slow change.

Σ 2084 = ζ Herculis.

$\alpha = 16^h 36^m.8$ $\delta = +31° 49'$

1899.437	274°.0	0″.50 ± doubtful!

By Professor See.

1899.859	258°.3	0″.33	poor seeing
.862	272.3	0.37	» »
1899.861	265.3	0.35	

Σ 2091.

$\alpha = 16^h 38^m.8$ $\delta = +41° 23'$

1897.668	303°.2	0″.99
.670	303.7	0.99
1897.669	303.45	0.99

Slow motion.

Δ near Σ 2091.

$\alpha = 16^h 41^m.7$ $\delta = +43° 40'$

1899.396	325°.7	0″.55
.396	321.4	0.58
1899.396	323.55	0.565

β 43.

$\alpha = 16^h 42^m 18^s$ $\delta = +2° 57'$

1898.645	242°.85	1″.15

Power 606. Slow retrograde motion.

Σ 2107.

$\alpha = 16^h 47^m.9$ $\delta = +28° 50'$

1899.396	319°.4	0″.33

$O\Sigma$ 319.

$\alpha = 16^h 53^m.5$ $\delta = +15° 17'$

1897.600	64°.3	0″.68

Slow motion in distance.

$O\Sigma$ 322.

$\alpha = 16^h 56^m.4$ $\delta = +37° 5$

1897.613	202°.7	1″.61

Slow motion.

β 1118 = η Ophiuchi.

$\alpha = 17^h 3^m 30^s$ $\delta = -15° 34'$

1899.437	257°7	0″42

Slow retrograde motion.

$O\Sigma$ 324.

$\alpha = 17^h 4^m 3$ $\delta = +31° 21'$

1897.690	220°6	3″90

No motion.

$O\Sigma$ 325.

$\alpha = 17^h 8^m 4$ $\delta = +7° 52'$

1897.613	210°6	1″36

Slow motion.

$O\Sigma$ 328 = u Herculis.

$\alpha = 17^h 13^m 5$ $\delta = +33° 13'$

1897.691	57°2	4″42

Magnitudes 5 and 11; motion slow.

β 628.

$\alpha = 17^h 13^m 55^s$ $\delta = +32° 47'$

1898.711	354°20	0″46

Power 888. Very slow retrograde.

β 959.

$\alpha = 17^h 16^m 8^s$ $\delta = +5° 7'$

1898.634	254°90	3″43
.643	257.10	3.62
1898.638	256.00	3.52

Power 383. Seeing 3. Slow; distance increasing.

β 242.

$\alpha = 17^h 17^m 21^s$ $\delta = -11° 35'$

1898.634	73°40	0″83	AB
1898.634	62°50	9″63	AC
1898.634	63°59	47″92	AD

β 46.

$\alpha = 17^h 18^m 7^s$ $\delta = +13° 31'$

1898.629	204°65	2″00
.667	206.10	1.95
1898.648	205.38	1.98

Power 383. Seeing 2.

β 1249.

$\alpha = 17^h 19^m 30^s$ $\delta = +53° 58'$

1898.711	82°17	0″49	AB
1898.711	74°61	63″66	AC

Power 606. Seeing 3. Motion uncertain.

Σ 2171.

$\alpha = 17^h 23^m 6$ $\delta = -9° 55'$

1897.654	246°4	1″56

Very slow motion.

Σ 2173.

$\alpha = 17^h 25^m 3$ $\delta = -0° 59'$

1897.613	334°72	1″28
.616	332.05	1.08
1897.614	333.38	1.18

Binary.

$O\Sigma$ 331.

$\alpha = 17^h 27^m 0$ $\delta = +2° 54'$

1897.674	337°4	0″93
.676	335.4	0.96
1897.675	336.4	0.945

β 960.

$\alpha = 17^h 32^m 2^s$ $\delta = -1° 5'$

1898.629	293°75	3″57
.645	294.70	3.51
1898.637	294.22	3.54

Power 383. Seeing 3 resp. 2. Slow retrograde motion in p; distance increasing.

β 1251.

$\alpha = 17^h 36^m 55^s$ $\delta = +16° 2'$

1898.675	69°10	1″41

Power 606. Seeing 2. Moderate retrograde motion.

β 824.

$\alpha = 17^h 42^m 39^s$ $\delta = -1° 45'$

1898.670	351°30	0″63

Power 888. Seeing 3.

A.C. 7 = Σ 2220 BC.

$\alpha = 17^h 42^m 6$ $\delta = +27° 47'$

1897.618	50°02	1″42
.648	52.60	1.51
.654	52.70	1.45
1897.630	51.77	1.463

β 358.

$\alpha = 17^h 43^m 10^s$ $\delta = +34° 32'$

1898.643	160°25	5″98 poor

Power 383. Evidently β 632.

$O\Sigma$ 338.

$\alpha = 17^h 47^m 6$ $\delta = +15° 21'$

1898.596	19°0	0″66

Power 888. No motion.

A.C. 9.

$\alpha = 17^h 49^m 51^s$ $\delta = +29° 50'$

1899.325	148°5	1″33

β 417.

$\alpha = 17^h 52^m 13^s$ $\delta = +39° 27'$

1898.643	274°30	1″52
.670	272.00	1.57
1898.656	273.15	1.545

Power 606. Seeing 2.

Σ 2244.

$\alpha = 17^h 52^m 0$ $\delta = +0° 6'$

1897.616	95°55	1″12

Quadrant?

β 635.

$\alpha = 17^h 56^m 40^s$ $\delta = +1° 35'$

1898.629	116°60	1″45	AB
.667	116.75	1.53	
1898.648	116.67	1.49	
1898.629	122°03	69″25	AC
.667	122.10	69.15	
1898.648	122.06	69.20	

Power 606. Seeing 2. Slow motion.

Σ 2262 = τ Ophiuchi.

$\alpha = 17^h 57^m 6$ $\delta = -8° 11'$

1896.513	255°92	1″99
.515	256.17	1.96
1896.514	256.05	1.975

Σ 2275.

$\alpha = 18^h 0^m 3$ $\delta = +39° 21'$

1897.649	315°8	0″75

Quadrant?

Σ 2272 = 70 Ophiuchi.

$\alpha = 18^h 0^m 4$ $\delta = +2° 33'$

1896.513	293°20	2″32
.515	290.39	2.28
1896.514	291.80	2.300
1899.412	263°3	1″77
.420	262.4	1.80
.426	261.3	1.79
1899.419	262.33	1.787

AC.

1899.426	209°72	51″95

By Professor See.

1899.429	260°2	1″98
.434	261.3	1.97
.703	263.6	2.07
1899.522	261.7	2.01

BC.

1899.429	207°45	50″81
.434	208.95	50.81
1899.431	208.20	50.81

β 636.

$\alpha = 18^h 2^m 4^s$ $\delta = +2° 12'$

1898.675 | 126°00 | 4″66

Power 606. Seeing 2.

β 638.

$\alpha = 18^h 4^m 19^s$ $\delta = +2° 34'$

1898.670 | 6°34 | 1″75 | BC

1898.670 | 151°80 | 22″40 | AC

Power 606. Seeing 2.

Σ 2283.

$\alpha = 18^h 4^m.6$ $\delta = +6° 8'$

1897.616	86°02	1″07
.619	88.90	0.93
.632	82.70	1.03
1897.622	85.83	1.010

Motion very slow.

$O\Sigma$ 345.

$\alpha = 18^h 8^m.0$ $\delta = +5° 47'$

1897.619 | 62°9 | 1″18

Slow motion.

Σ 2303.

$\alpha = 18^h 14^m.7$ $\delta = -8° 3'$

1897.676 | 226°9 | 2″47

Motion slow.

Σ 2312.

$\alpha = 18^h 17^m.3$ $\delta = +28° 17'$

1897.654 | 338°9 | 1″43

Slow decrease in distance.

$O\Sigma$ 350.

$\alpha = 18^h 22^m.0$ $\delta = +6° 21'$

1897.690 | 167°2 | 1″81

No motion.

$O\Sigma$ 359.

$\alpha = 18^h 31^m.4$ $\delta = +23° 31'$

1897.690 | 341°5 | 0″39

Slow change in distance.

$O\Sigma$ 360.

$\alpha = 18^h 33^m.9$ $\delta = +4° 46'$

1897.619 | 293°5 | 1″67

Slow increase in distance.

Σ 2369.

$\alpha = 18^h 38^m.9$ $\delta = +2° 31'$

1897.671 | 91°8 | 1″08

Slow motion in distance.

$O\Sigma$ 363.

$\alpha = 18^h 42^m.4$ $\delta = +77° 35'$

1897.788 | 26°4 | 0″40±

Motion slow.

Σ 2409.

$\alpha = 18^h 47^m.0$ $\delta = +13° 24'$

1897.690 | 39°1 | 0″98

Motion very slow.

β 648.

$\alpha = 18^h 52^m 30^s$ $\delta = +32° 45'$

1897.690	234°8	1″48
.786	236.2	1.32
1897.738	235.5	1.40

Rapid retrograde motion.

Σ 2434.

$\alpha = 18^h 57^m.6$ $\delta = -0° 51'$

1898.714 | 53°90 | 1″57

Power 606. Seeing 2.

Σ 2464.

$\alpha = 19^h 4^m.5$ $\delta = +11° 42'$

1898.700 | 24°1 | 1″30

No change.

$O\Sigma$ 369.

$\alpha = 19^h 8^m.3$ $\delta = +71° 54'$

1897.788 | 35°9 | 0″85

Motion?

Σ 2525 = B Cygni.

$\alpha = 19^h 22^m.5$ $\delta = +27° 7'$

1898.722 | 320°17 | 0″44

Power 888. Seeing 3.

1899.815 | 320°0 | 0″40

By Professor See.

1899.815 | 323°0 | 0″53

$O\Sigma$ 384.

$\alpha = 19^h 40^m.3$ $\delta = +38° 5'$

1897.788 | 189°2 | 1″00

Very slow motion.

β 1205.

$\alpha = 20^h 5^m 46^s$ $\delta = -8° 27'$

1897.791 | 48°20 | 0″59

Power 606. Seeing 2. Slow motion.

$O\Sigma$ 400.

$\alpha = 20^h 6^m.9$ $\delta = +43° 39'$

1899.815 | 23°2 | 0″22

By Professor See.

1899.755	23°5	0″33
.815	26.8	0.20*)
1899.785	25.15	0.265

*) Closer than $\varkappa$ Pegasi.

β 1206. (8, 11).

$\alpha = 20^h 14^m.6$ $\delta = +36° 23'$

1897.791 | 5°60 | 2″14

Slow motion.

β 432.

$\alpha = 20^h 20^m 12^s$ $\delta = +35° 23'$

1897.791 | 192°70 | 1″35

Power 606. Seeing 2.

β 63 = 1 Delphini.

$\alpha = 20^h 24^m 33^s$ $\delta = +10° 30'$

1897.799	345°2	1″23 very poor
.843	347.9	0.99 » »
1897.821	346.5	1.11

Power 606. Seeing 2.

β 670.

$\alpha = 20^h 27^m 16^s$ $\delta = +13° 32'$

1897.843	47°2	0″45
.848	50.8 (½)	— *)
1897.845	48.4	0.45

*) Too poor for distance.

β 1208.

$\alpha = 20^h 28^m 38^s$ $\delta = +6° 28'$

1897.799 | 333°0 | 3″12 very poor.

Power 606. Seeing 2. Slow motion.

β 151 = β Delphini.

$\alpha = 20^h 32^m.9$ $\delta = +14° 15'$

1897.900 | 359°5 | 0″63

Power 888. Seeing 3.

1898.722	2°92	0″60
.725	3.12	0.50
1898.723	3.02	0.55

Power 888. Seeing 2.

1899.755	8°.0	0″.65
.760	4.1	0.53
.760	4.3	0.56
1899.758	5.37	0.58

By Professor See.

1899.755	8°.1	0″.72
.760	7.7	0.65
1899.758	7.9	0.685

OΣ 410.

$\alpha = 20^h 35^m.9$ $\delta = +40° 13'$

1897.788 | 15°.65 | 0″.69

Very slow motion.

β 64.

$\alpha = 20^h 39^m 18^s$ $\delta = +12° 17'$

1897.832 | 186°.9 | 0″.55

Power 606. Seeing 3. Slow motion.

β 152.

$\alpha = 20^h 39^m 18^s$ $\delta = +56° 57'$

1897.900 | 106°.8 | 0″.50

Power 888. Seeing 3.

β 65 = 13 Delphini.

$\alpha = 20^h 41^m 52^s$ $\delta = +5° 34'$

1897.843	188°.5	1″.56
.846	188.3	1.41
1897.844	188.4	1.485

β 67.

$\alpha = 20^h 45^m 37^s$ $\delta = +30° 28'$

1897.791 | 288°.1 | 1″.62

Power 606. Seeing 3.

β 155.

$\alpha = 20^h 47^m 25^s$ $\delta = +50° 58'$

1897.900 | 28°.36 | 0″.75

Power 888. Seeing 3.

OΣ 417.

$\alpha = 20^h 48^m.7$ $\delta = +28° 46'$

1897.786 | 29°.5 | 0″.71

Very slow motion.

β 367.

$\alpha = 20^h 49^m 53^s$ $\delta = +27° 38'$

1897.832 | 137°.1 | 0″.42

Power 888. Seeing 3. Slow motion.

OΣ 419.

$\alpha = 20^h 50^m.8$ $\delta = +36° 41'$

1897.786 | 34°.5 | 1″.61

No change since *OΣ*.

β 678.

$\alpha = 20^h 54^m 20^s$ $\delta = -8° 49'$

1897.846 | 201°.4 | 2″.49

Power 606. Seeing 3.

β 681.

$\alpha = 21^h 7^m 40^s$ $\delta = +16° 27'$

1897.846 | 240°.6 | 3″.10

Power 606. Seeing 3.

A. G. C. 13 = τ Cygni.

$\alpha = 21^h 10^m$ $\delta = +37° 32'$

1899.760	312°.4	0″.86
.774	308.8	0.82
.812	315.6	0.86
1899.782	312.3	0.85

By Professor See.

1899.760	312°.0	0″.96
.774	313.4	0.88
.812	314.4	0.83
1899.782	313.3	0.89

Σ 2783.

$\alpha = 21^h 11^m.4$ $\delta = +57° 53'$

1899.812 | 30°.2 | 1″.04 Brown

1899.812 | 28°.8 | 1″.26 See

β 838. (8, 11).

$\alpha = 21^h 14^m 51^s$ $\delta = +2° 37'$

1897.848 | 100°.9 | 1″.65

Power 606. Seeing 2. Slow motion; distance increasing.

β 684.

$\alpha = 21^h 23^m 53^s$ $\delta = -5° 57'$

1897.848 | 30°± | 2″.0±

Evidently β 72.

β 1212.

$\alpha = 21^h 33^m 20^s$ $\delta = -0° 36'$

1897.889 | 267°.4 | 0″.73 | AB

Power 606.

1897.889 | 143°.38 | 43″.13 | AC

β 989 = $\varkappa$ Pegasi.

$\alpha = 21^h 40^m.1$ $\delta = +25° 11'$

1899.812	279°.4	0″.25
.815	285.0	0.24
1899.813	282.2	0.245

By Professor See.

1899.812	276°.9	0″.23
.815	286.0	0.17
1899.813	281.5	0.20

β 843.

$\alpha = 22^h 18^m 43^s$ $\delta = +2° 3'$

1897.941 | 234°.4 | 3″.57

Power 606. Seeing 2. Companion very faint.

β 701.

$\alpha = 22^h 22^m 9^s$ $\delta = +11° 42'$

1897.889 | 268°.0 | 1″.42

Power 606. Seeing 3.

Σ 2912 = 37 Pegasi.

$\alpha = 22^h 25^m.0$ $\delta = +3° 55'$

1899.760	285°.2	0″.31
.774	297.8	0.28
.812	295.6	0.38
1899.782	292.9	0.32

By Professor See.

1899.760	285°.3	0″.42
.774	297.8	0.32
.812	297.7	0.45
1899.782	293.6	0.399

β 711.

$\alpha = 22^h 39^m 29^s$ $\delta = +10° 34'$

1897.832 | 46°.6 | 0″.96

Power 606. Seeing 3. 10th and 11th magnitude. Slow retrograde motion.

β 79.

$\alpha = 23^h 11^m 24^s$ $\delta = -2° 10'$

1897.884 | 85°.3 | 1″.08 Clouds

Power 606. Seeing 3.

β 719.

$\alpha = 23^h 18^m 22^s$ $\delta = +13° 49'$

1897.832 | 358°.8 | 1″.47

Power 606. Seeing 3. Slow retrograde motion.

β 81.

$\alpha = 23^h 28^m 59^s$ $\delta = -12° 14'$

1897.941 | 14°.6 | 2″.01

Power 383. Seeing 3.

β 733 = 85 Pegasi.

$\alpha = 23^h 56^m.9$ $\delta = +26° 34'$

1899.785	235°.8	0″.80
.815	233.4	0.87
1899.800	234.6	0.835

1899.815 | 237°.5 | 0″.82 by See.

U. S. Naval Observatory, Washington, D. C., 1899 Dec. 19.*)

S. J. Brown.

*) Eingegangen bei der Redaction 1900 April 8. *Kr.*