

The Orbit of OΣ 400. By S. W. Burnham.

This close pair of the Pulkowa Catalogue, discovered by Otto Struve something more than half a century ago, was first measured by Mädler in 1843. The measures of OΣ commence in 1844, and continue at intervals down to 1861. It received special attention from Dembowski, who examined it on eleven nights 1865-77, and measured the angle whenever he could do so, but the distance was too small to be measured with his aperture. Since that time very few measures have been made. A large instrument has been necessary in recent years to show any measurable elongation.

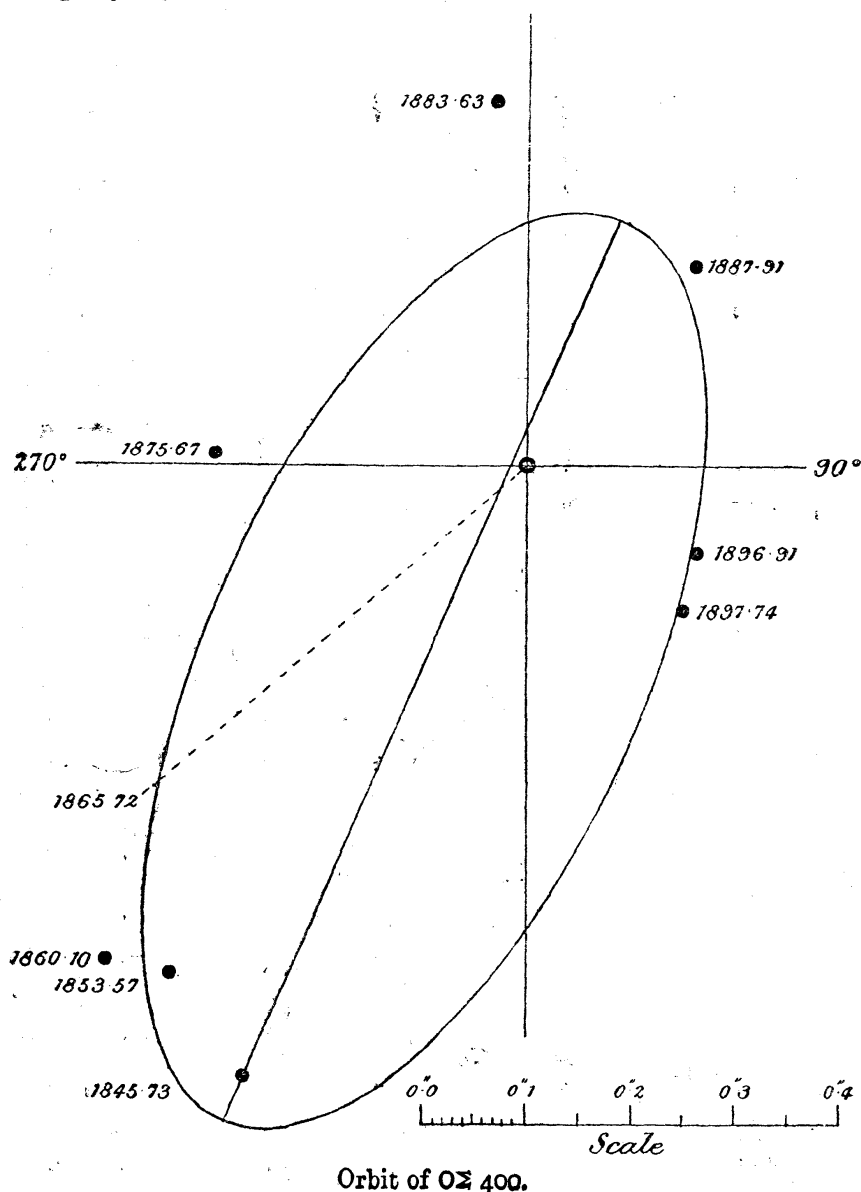
One orbit has been computed of this pair. Gore (*Monthly Notices*, xlvii. 346) from the positions to 1885 found a period of 170^o·37 years.

The following are all the observations of this pair :—

1843·39	326 ^o ·7	0 ^o ·5 ±	2 <i>n</i>	Mädler
*1845·73	334·9	0·64	3 <i>n</i>	O. Struve
*1853·25	324·6	0·59	2 <i>n</i>	O. Struve
1853·89	320·5	0·65 ±	1 <i>n</i>	Dawes
*1860·10	319·3	0·62	2 <i>n</i>	O. Struve
*1865·72	310·7	...	2 <i>n</i>	Dembowski
1868·55	301·6	obl.	1 <i>n</i>	Dembowski
1871·04	301·2	oval	2 <i>n</i>	Dembowski
1872·62	314·9	obl?	1 <i>n</i>	Dembowski
1873·88	94·0?	obl?	2 <i>n</i>	Dembowski
1874·50	107·8	obl?	1 <i>n</i>	Dembowski
*1875·67	267·9	0·3 ±	3 <i>n</i>	Schiaparelli
1877·59		Single	1 <i>n</i>	Dembowski
1878·65		Single	1 <i>n</i>	Burnham
1879·82	150·2	> 0·5 ±	2 <i>n</i>	Seabroke
1880·68		Single?	1 <i>n</i>	Schiaparelli
1881·70		Single	1 <i>n</i>	Bigourdan
1883·62		" not divided "	1 <i>n</i>	Seabroke
*1883·63	185·3	0·35 ±	1 <i>n</i>	Schiaparelli
1885·72	144·5	0·3 ±	2 <i>n</i>	Young
1886·77	122·7	0·3 ±	1 <i>n</i>	Hough
*1887·91	140·1	0·25 ±	1 <i>n</i>	Schiaparelli
1892·79	300 ±	0·2 ±	1 <i>n</i>	Comstock
1895·73	346·8	0·2 ±	2 <i>n</i>	See
1895·76		Single	1 <i>n</i>	Comstock

1896.66	°	Single	1 <i>n</i>	Comstock
1896.90	67.8	0.18	2-1 <i>n</i>	Hussey
*1896.92	63.5	0.18	3 <i>n</i>	Aitken
*1897.74	47.3	0.20	3 <i>n</i>	Aitken

It is evident that little use can be made of most of this material in investigating the character of the relative motion. Some of the positions are obviously erroneous or uncertain. With the recent measures made with the 36-in. at Mt. Hamilton we have a total arc of nearly 290° , which should give data for determining the elements of the orbit with substantial accuracy. The observations in the foregoing list marked (*) are shown on the accompanying diagram.



From these positions the following elements are obtained :—

$$\begin{aligned}
 P &= 81.04 \text{ years} \\
 T &= 1888.23 \text{ ,,} \\
 e &= 0.46 \text{ ,,} \\
 a &= 0''.47 \text{ ,,} \\
 i &= 59^\circ.9 \text{ ,,} \\
 \varpi &= 157^\circ.1 \text{ ,,} \\
 \lambda &= 7^\circ.0 \text{ ,,}
 \end{aligned}$$

Apparent orbit :—

Length of major axis...	...	0''.93
Length of minor axis...	...	0''.42
Angle of major axis	155°.9
Angle of periastron	153°.5
Distance of star from centre...		0''.21

The observed positions require the following corrections :—

1845.73	+ 0.2	+ 0.04	3 ⁿ	O. Struve
1853.57	+ 2.8	+ 0.06	2 ⁿ	O. Struve
1860.10	0.0	- 0.05	2 ⁿ	O. Struve
1865.72	+ 0.1	...	2 ⁿ	Dembowski
1875.67	+ 2.1	- 0.06	3 ⁿ	Schiaparelli
1883.63	+ 2.8	- 0.13	1 ⁿ	Schiaparelli
1887.91	+ 15.5	0.00	1 ⁿ	Schiaparelli
1896.91	- 5.2	0.00	3 ⁿ	Aitken
1897.74	0.0	0.00	3 ⁿ	Aitken

It will be noticed that most of these errors are insensible quantities in measures of a close pair of this kind. The distance is now slowly increasing, and in a few years it can be measured with a moderate aperture.

The magnitudes of the components, according to O. Struve, are 7.2 and 8.2. The principal star is Lalande 38758, and its place (1875) from the Bonn Catalogue is—

R. A.	20 ^h	6 ^m	5 ^s
Decl.	43°	34'	23''

It does not appear to have any sensible proper motion.

Yerkes Observatory :
December 23.

The Ternary System, Lac 7215=*h* 4935. By R. T. A. Innes.

As a wide pair this was observed by Sir John Herschel at the Cape in 1837, and the chief star was noted as double at Melbourne in 1867, but it was first measured as a double star some years later as β 416 and Russell 298. The chief star turned out to be a rapid binary pair with a period of 33 years according to the orbit computed by Professor See. Of Herschel's companion, which is C Z 17^h 719, I find the following measures :—

1837.4	130° ±	...	<i>h</i>	1 night.
1875.5	130° 5	29.44	Cord. Zone Catalogue.	1 "
1876.5	130 ±	...	β	1 "
1877.6	132.4	...	Russell	1 "
1889.4	128.6	31.03	β	3 "
1891.5	128.8	30.52	do.	3 "
1892.4	129.4	30.55	do.	2 "

The chief star, which is yellow in colour, is *Lac 7215* (R.A. 17^h 12^m 8^s, Dec. 34° 52' 7", 1900), and has a large proper motion which is well known. The latest determination, that of Professor Porter, gives

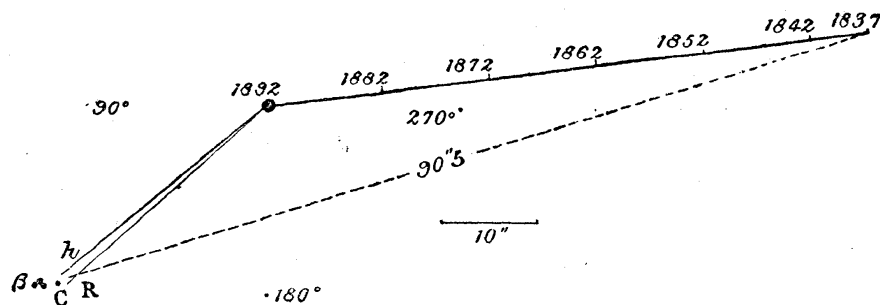
$$\delta \text{ R.A.} = +0''.0924.$$

$$\delta \text{ Dec.} = -0''.161$$

or

$$1''.15 \text{ towards } 98^\circ.1.$$

The consideration of this proper motion shows that the Herschel companion travels with the binary pair.



The diagram will, perhaps, make the matter clearer. If both stars are animated by the same proper motion the position marked 1892 will be that of the chief star in relation to the measures of the companion, which are marked *h*, C, R, and β . The agreement is satisfactory.

If, however, the companion does not share in the proper