

# Measures with the 36 inch refractor of the Lick Observatory of the binary stars 48 Cassiopeiae, 99 Herculis, $\tau$ Cygni and $\mu$ Herculis.

By *S. W. Burnham.*

During the present year I have made the following measures of these binary systems with the great telescope:

## 48 Cassiopeiae ( $\beta$ 513).

### A and B.

1891.597	314.2	0.51	5, 7
.600	312.8	0.58	5, 7.5
.633	314.6	0.58	—, —
.626	312.5	0.65	5, 8.5
1891.61	313.5	0.58	5, 7.7

### A and C.

1891.600	51.4	23.64	—, 13.5
.633	51.3	23.80	—, 13.5
.626	50.9	23.56	—, 13.7
1891.62	51.2	23.67	—, 13.6

This will prove to be one of the most interesting of the binaries. The angular motion since I discovered it in 1878 is about  $50^\circ$ . The distance is slowly decreasing. The observations already made indicate a period of less than 40 years. The measures of the next few years will furnish data for a fairly accurate determination of the orbit. It is an easy object to measure with the large refractor.

The only other measures of the distant star are:

1878.80     $49^\circ 4'$      $23^\circ 98'$      $\beta$  1 n.

Lick Observatory, Mt. Hamilton, Cal., 1891 Sept. 1.

## 99 Herculis.

1891.540	299.2	0.70	6, 11.5
.559	293.1	0.77	—, 11.5
.578	290.9	0.68	—, 12
1891.56	294.4	0.72	—, 11.7

This pair is always extremely difficult even with the 36 inch under the best conditions. The angular motion since last year, according to my measures, is about  $9^\circ$ . Gore has computed an orbit, using the measures of 1890, (Mon. Not. L.I. 45) and finds a period of 53.55 years.

## $\tau$ Cygni.

1891.419	12.2	0.64	—, —
.504	11.8	0.58	—, —
.540	13.1	0.61	—, —
1891.49	12.4	0.61	—, —

According to my measures the angular motion in the last two years has been about  $24^\circ$ . The closeness of the components, and their very unequal magnitudes, make this now difficult to measure. The change in position angle since 1875 is about  $160^\circ$ .

## $\mu$ Herculis. B and C.

1891.331	18.7	0.71	—, —
.392	18.8	0.80	—, —
.419	18.0	0.65	—, —
1891.38	18.5	0.72	—, —

The angular motion in the last two years, as shown by my measures, has been about  $20^\circ$ .

*S. W. Burnham.*

## Observations of Occultations of Stars by the Moon

made at the Hong-Kong Observatory.

Day	Phenomenon	Pow.	H. K. M. T.	Remarks
1890				
Sep. 30	Disapp. $\xi$ Arietis	240	$10^h 35^m 57^s$	Bad.
Oct. 26	» 26 Ceti	240	6 42 34	Bad.
26	» 29 Ceti	240	9 22 20.7	Good.
26	» 33 Ceti	240	11 18 44.4	Rather good.
26	» f Piscium	240	16 5 32.3	Perh. $4^m 32^s 3$
31	» 132 Tauri	240	16 33 9	Rather bad.
Nov. 1	» $\epsilon$ Geminor.	416	15 50 53.9	Very good.
1891				
Jan. 16	» 33 Ceti	118	6 36 15.6	Very good.
16	» Ll. 2089	118	6 37 41.2	Very good.

Day	Phenomenon	Pow.	H. K. M. T.	Remarks
1891				
Jan. 21	Disapp. 121 Tauri	157	$8^h 43^m 31^s$	Bad.
23	» A Geminor.	157	7 41 18.8	Very good.
Feb. 14	» 31 Arietis	157	6 46 44.6	Very good.
14	Reapp. 31 Arietis	157	8 7 21	Very bad.
15	Disapp. BAC. 1096	157	10 3 3.2	Good.
15	Reapp. BAC. 1096	157	10 59 50	Very bad.
16	Disapp. BAC. 1373	66	10 25 10.9	Good.
Aug. 20	Reapp. $\tau^1$ Aquarii	157	8 4 50	First time seen.
20	Disapp. $\tau^2$ Aquarii	157	8 17 21.0	Good.

Instrument: Lee Equatoreal (175 feet West of the transit-instrument). Aperture: 6 inches.

*W. Doberck.*