OBSERVATIONS OF VARIABLE STARS,

By S. D. TOWNLEY.

[Communicated by the Director of the Detroit Observatory.]

The following observations of variable stars were made with the 12¼-inch equatorial telescope of the Detroit Observatory of the University of Michigan. On account of electric lights in the neighborhood of the Observatory it is not possible to observe as faint stars as one would expect with a telescope of this size. Both the method by steps, and that by proportions of interval, have been used.

For the comparison-stars I have adopted the magnitudes determined by me at the Washburn Observatory, and an explanation of the notation employed, and the magnitudes of the comparison-stars, may be found in the Publications of the Washburn Observatory, Vol. VI, Part 3.

From the curves of the plotted observations the following phases have been determined.

The first three figures, 241, of the Julian date are omitted. The column O—C is derived from comparison of the observed phase with the elements as given in Chandler's Second Catalogue of Variable Stars (*Astr. Jour.*, no. 300).

Results of Observations.

No.	Star	Phase	Mag.	Date		*E*	O—C	Remarks
				Julian	Calendar			
1222	*R Persei*	Max.	8.0	2801	1893 Dec. 3	56	— 3	
1577	*R Tauri*	Min.	12.4	2799	1893 Dec. 1	35	—23	A theoretical light-curve would place min. 5 or 10 d. later
1582	*S Tauri*	Max.	9.3	2839	1894 Jan. 10	33	— 8	Yendell observed this maximum. See *A.J.* no. 315
1717	*V Tauri*	Max.	8.0	2873	1894 Feb. 13	46	—16	" " " " " " "
1761	*R Orionis*	Min.	11.2	2883	1894 Feb. 23	37	— 9	Uncertain, on account of the small number of obsns.

Individual Observations.

Date	Observation	Resulting Mag.
	243. *U Cassiopeae.*	
1892 Aug. 3	(v), (l), k faint	<13.3 (*f*)
1893 Dec. 20.4	v and f vis. by glimpses	11.3:(*a*)
1894 Jan. 12.4	(v), f and g plain	<12.2
Feb. 22.3	(v), f and g plain	<12.2
28.3	(v), f and g plain	<12.2
Mar. 8.3	(v), f and g plain	<12.2 (*b*)
	1222. *R Persei.*	
1893 Nov. 6.3	e 2 v 2 f	9.3
13.5	b 3 v 2 d 3 e 1 f	8.7
25.2	a 7 v 3 b	8.1(*a*)(*c*)
Dec. 3 2	a 7 v 2 b	8.2
20.2	a 8 v 2 b	8.2 (*a*)
1894 Jan. 12.3	l 4 v 1 e 1 f	9.2
24.3	f 4 v 1 g 2 h 2 k	9.9 (*e*)
Feb. 1.4	g k 2 v	10.5
22.3	k 7 l	11.3
28.4	v l	11.7
Mar. 8.4	l 2 v	11.9 (*d*)
11.4	v l	11.7 (*d*)
29.3	l–v	12 (*b*) (*d*)
Apr. 8.3	l 3–4 v	12.0
	1577. *R Tauri.*	
1893 Nov. 5.4	e 10 v 10 f	11.7
6.4	e 10 v 10 f	11.7
13.4	e 7 f	12.1
Dec. 3.4	e 8 f, v 3 f	12.3 (*b*)
1894 Jan. 12.2	d 3 f, e 7 v	11.3
24.3	d 2 e 3 v	11.0 (*e*)
Feb. 1.3	d e 2 v	10.9
22.3	v 3 e 1 d	10.3(*c*) (*d*)
28.4	c 5 d	10.2
Mar. 8.4	c 3 d, c 3 v	10.2 (*b*)
11.4	c 1 d, c 1 v	10.1
	1582. *S Tauri.*	
1893 Nov. 6.4	(v), h very faint	<13
7.4	(v)	<13
13.4	h 5-6 v	13.5
Dec. 3.4	e 2 f 4 v 5 h	12.4(*b*) (*d*)
20.3	b 2 c 3 v 4 d	9.8 (*a*)
1894 Jan. 12.3	a 8 v 1 b 1 c	9.3
24.3	v b c	9.4
Feb. 1.3	b 1 c v	9.5
22.3	v 3 d, c 7 d	9.9
28.4	v 3 d, c 7 d, b 8 d	10.0
Mar. 8.4	d 1 v	10.3
11.4	d 2 v, d 2 e	10.4
	1717. *V Tauri.*	
1893 Nov. 7.5	v 2 e 5 f	11.0
13.5	e 1 v 5 f	11.2
Dec. 3.4	b 8 v 1 e	10.6(*b*) (*d*)
20.4	v 3 e, b 8 e	10.6

Date	Observation	Resulting Mag.
	1717. *V Tauri.* — Cont.	
1894 Jan. 12.3	a 4 v 2 b d 1 c	9.0
24.3	v 2 a	8.4
Feb. 1.3	v 4 a 5 b	8.2
22.3	v 1 a	8.5 (*e*)
28.4	v 3 a 7 c	8.3
Mar. 8.4	v a 5 d	8.6
11.4	a 1 v 3 d	8.8
29.4	d 5 v, d 4 e, b 5 e	9.9
Apr. 8.4	e 2 v, e 1 f	11.1
	1761. *R Orionis.*	
1894 Jan. 12.4	c 3 d, c 2–3 v	10.6
Feb. 1.4	c 7 d, v 3 d	11.1
	1761. *R Orionis.* — Cont.	
1894 Feb. 22.3	c 8 d, v 3 d	11.2
28.4	c 9 d, v 2 d	11.3
Mar. 11.4	c 7 d, v 3-4 d	11.1
	7045. *R Cygni.*	
1893 Nov. 5.4	c d 2 v 3 e	11.1
13.4	d 2 v 2 e	11.1
25.2	c 3 v 3 d	11.0
Dec. 20.3	(v), e very faint	<11.3 (*a*)
1894 Jan. 12.3	(v), e faint	<11.3
Feb. 1.3	(v), f vis. by glimpses	<13.0

Notes. — (*a*) nearly full moon ; (*b*) hazy, or clouds; (*c*) seeing poor ; (*d*) uncertain ; (*e*) difficult on account of contrast of color ; (*f*) with 12-inch equatorial of Lick Observatory ; (*g*) insufficient number of observations.

Ann Arbor, Michigan, 1894 *May* 21.

MAXIMA AND MINIMA OF LONG-PERIOD VARIABLES,

By J. A. PARKHURST.

906. *R Trianguli.*

Twenty-nine observations were made, from 1893 Oct. 9 to 1894 Mar. 31. The light-curve was rather flat near the minimum, but that phase was fairly well indicated for 1894 Jan. 26, at 11^{M}.7. The rise was more rapid than the decline.

1574. *W Tauri.*

My watch on this star began 1893 Nov. 20, when it was about the 10^{M}. From that time the rise was slow, and somewhat irregular. The maximum, 8^{M}.5, was passed about 1894 Feb. 16. It then fell more rapidly, and when last seen, April 21, it was 11^{M}. I have nineteen observations.

1981. *S Camelopardalis.*

This star passed a minimum 1893 Oct. 28, at 10^{M}.3. The rise was then gradual to the maximum mentioned by Mr. Yendell in February. Since that time it has fluctuated between 8^{M}.0 and 8^{M}.7. I have thirty-three observations since 1893 Aug. 1 ; but more are needed to determine the character of the maximum phase.

2100. *U Orionis.*

I have twenty-three observations of this star, from 1893 Dec. 28 to 1894 May 6. During that time it rose rapidly from 10^{M}.5 to a maximum of about 6^{M}.5, 1894 Feb. 22, then fell more slowly to 9^{M} at the last observation.

2815. *U Geminorum.*

This star passed a short maximum in March 1894. On the 16th it was looked for without success by Mr. W. Dearden of Trinidad, Colo., though he saw the comparison-star *l* (Baxendell, 13^{M}.7). I have the following observations, magnitudes on Baxendell's scale :

Gr. M.T.	M
1894 Mar. 17.5	9.7
21.5	10.5
23.5	12.0
26.5	13.6

A maximum is thus indicated near Mar. 18.5.

5157. *S Bootis.*

Twenty-eight observations, from 1893 Oct. 7 to 1894 May 6, give a well-marked minimum, 12^{M}.4, 1894 Jan. 19.

5190. *R Camelopardalis.*

A continuous watch has been kept on this star for a year. Twenty-five observations since the last minimum yield a maximum of 7^{M}.7, 1894 Jan. 13.

5338. *U Bootis.*

Since the minimum, 1893 Dec. 12, reported in no. 313, this star rose rapidly till the middle of January, then more slowly, passing a maximum about 10^{M}, 1894 Mar. 21. Since then the decline has been slow, reaching 11^{M} at the last observation, May 6. I observed the star twenty-six times between the dates mentioned.

5675. *V Coronae.*

A minimum, 12^{M}, is indicated on 1894 Jan. 11 by thirty-four observations between 1893 Sept. 12 and 1894 May 6. The curve is quite flat at this phase, and the minimum may have occurred ten days earlier.