

## HARVARD COLLEGE OBSERVATORY.

CIRCULAR 179.

25 NEW VARIABLE STARS, PRINCIPALLY IN HARVARD  
MAPS 39 AND 45.

THE following description of new variable stars, found usually while examining photographs taken with the 1-inch Cooke Anastigmat, has been prepared by Miss Leavitt.

The plates superposed comprised 5 for Harvard Map 39, centre at R.A. =  $10^h$ , Dec. =  $-30^\circ$ , and 6 for Map 45, centre at R.A. =  $22^h$ , Dec. =  $-30^\circ$ . One more than the customary number was employed for Map 45, because the examination of the earlier plates was less thorough than usual. The principal results are given in Table I, in the same form as Table I in H.C. 130.

TABLE I.

NUMBER AND DISTRIBUTION OF THE VARIABLES.

No.	Region.	New Variables.	Total Found.	Proportion New.	All.	Probable Number.	Proportion Found.	Probable No. Unknown.	Proportion Unknown.
39	$10^h, -30^\circ$	14	22	.64	34	55	.40	21	.38
45	$22^h, -30^\circ$	9	21	.41	37	49	.43	12	.24

The known variables found were *084047*, *084146*, T Antliae, X Hydrae, Y Hydrae, SU Velorum, X Velorum, and U Antliae, in Map 39, and RS Capricorni, *210445*, RX Aquarii, S Microscopii, R Gruis, S Piscis Austrini, R Piscis Austrini, X Aquarii, RT Aquarii, T Gruis, S Gruis, and Y Sculptoris, in Map 45. The variable *210445*, discovered by Miss Leland, as announced in H.C. 152, and re-discovered during this examination, was found to be of special interest, as the period is short, probably about nine-tenths of a day, and the maximum very brief. The range, 1.5 magn., is large for a variable having so short a period.

The new variables are given in Table II. The successive columns contain the designation, Harvard number, constellation, Durchmusterung number, right ascension for 1900, declination for 1900, brightest and faintest magnitudes observed on a provisional scale, and observed range. The number in the fourth column is usually taken from the Cordoba Durchmusterung, but it is taken from the Cape Photographic Durchmusterung for Variable 114760, and from the Bonn Durchmusterung for variables north of the declination  $-23^\circ$ .

TABLE II.  
NEW VARIABLE STARS.

Design.	H. V.	Constellation.	DM.	R. A. 1900.			Dec. 1900.		Bright.	Faint.	Range.
				<i>h.</i>	<i>m.</i>	<i>s.</i>	$^\circ$	$'$			
012629	3347	Triangulum	..	1	26	9	+29	51.5	10.5	11.8	1.3
090031	3348	Pyxis	..	9	0	32	-31	58.7	7.4	14.1	6.7
090843	3349	Vela	-43° 5040	9	8	44	-43	22.1	8.5	9.5	1.0
092234	3350	Pyxis	-34° 5884	9	22	54	-34	28.1	9.8	10.6	0.8
092934	3351	Antlia	-34° 5985	9	29	30	-34	16.4	10.0	10.6	0.6
093320	3352	Hydra	..	9	33	14	-20	12.1	9.4	<12.0	>2.6
094644	3353	Vela	-44° 5914	9	46	12	-44	11.3	9.5	10.7	1.2
094629	3354	Antlia	-29° 7842	9	46	42	-29	25.6	9.2	10.2	1.0
094921	3355	Hydra	-21° 2931	9	49	4	-21	22.6	9.4	10.4	1.0
100229	3356	Antlia	..	10	2	14	-29	35.1	9.3	<12.0	>2.7
100434	3357	Antlia	-34° 6457	10	4	9	-34	41.3	9.1	9.9	0.8
101129	3358	Antlia	-29° 8222	10	11	31	-29	13.3	9.2	10.0	0.8
101645	3359	Vela	-45° 5971	10	16	9	-45	44.0	10.2	<12.0	>1.8
101634	3360	Antlia	..	10	16	41	-34	17.7	7.7	<12.0	>4.3
104134	3361	Antlia	-34° 6961	10	41	22	-34	43.9	9.6	10.6	1.0
114760	3362	Centaurus	-60° 3454	11	47	32	-60	58.1	8.3	8.7	0.4
210034	3363	Microscopium	-34° 14866	21	0	54	-34	40.3	9.6	10.6	1.0
211030	3364	Microscopium	-30° 18489	21	10	21	-30	42.1	11.0	11.8	0.8
214542	3365	Grus	-42° 15664	21	45	39	-42	50.5	9.5	10.0	0.5
215722	3366	Aquarius	-22° 5820	21	57	20	-22	0.1	10.1	10.6	0.5
220233	3367	Piscis Austrinus	-33° 15917	22	2	8	-33	19.9	10.0	<11.5	>1.5
220623	3368	Aquarius	-23° 17297	22	5	59	-23	16.3	10.7	11.3	0.6
223017	3369	Aquarius	-18° 6151	22	30	5	-17	46.5	9.0	9.8	0.8
223544	3370	Grus	-44° 15009	22	35	26	-44	21.7	9.5	10.0	0.5
223721	3371	Aquarius	-21° 6288	22	37	26	-21	42.0	9.2	<11.0	>1.8

REMARKS.

012629. This star was one of a sequence measured on two plates for Kapteyn Region 45, and was discovered to be variable through the discordance of the resulting magnitudes. It is of the Algol type, having

been found faint on only 17 out of nearly 300 plates examined.

090031. This star was bright during the spring of 1902, and for some time after its discovery was supposed

to be a Nova. After it had been looked for on more than 400 photographs, however, it was again found very bright on a photograph taken with the 8-inch Bache Telescope on May 28, 1890. A star of about the fourteenth magnitude appears in the same position on all photographs, about 30 in number, which show objects of that degree of faintness. Its light appears to vary slightly with a range of not more than two or three tenths of a magnitude. The dates and estimated magnitudes on plates nearest the time of the appearance in 1890, and on all plates taken between March 19 and July 3, 1902, are as follows:— May 2, 1890, 14.0; May 5, 1890, 14.0; May 28, 1890, 7.5; April 22, 1892, 14.2; March 19, 1902, not seen on a plate showing stars of the magnitude 10.5; April 2, 1902, 9.00; April 7, 8.00; April 29, 7.55; May 2, 7.45; May 27, 8.20; May 28, 8.00; May 29, 8.05; May 31, 8.00; June 9, 8.15; June 10, 8.30; June 19, 8.20; July 3, 9.10. No more photographs of this region were taken until September 26, when the star was not seen on a photograph showing stars of the magnitude 11.5. On October 9 it was not seen on a plate showing stars of the magnitude 12.5. It has not appeared brighter than the fourteenth magnitude on any of 268 plates taken since October 9, 1902. Unfortunately, its image has not been found on any spectrum plate. The form of the light curve is clearly that of a Nova. It may be necessary to revise the definition of such stars to cover the possibility of there being more than one appearance. Twelve years elapsed between the two observed appearances, and if the outbursts are periodic it should be seen again in 1914.

*100434.* This variable is of the Algol type. Observations of 7 minima between January 3, 1903 and May 26, 1909 give the approximate formula, J.D. 2,410,002.96 + 3<sup>d</sup>.0519 E.

*101129.* Period short, and maximum evidently very brief.

*101645.* This variable is of the Algol type. Eighteen minima are satisfied by the formula J.D. 2,410,001.57 + 2<sup>d</sup>.10838 E.

*114760.* This variable was discovered during the examination of Harvard Map 50, but was not announced in Circular 122 on account of its small range. It is of the type of  $\beta$  Lyrae, and the times of minima are well represented by the formula, J.D. 2,410,001.7 + 2<sup>d</sup>.4645 E.

*210030.* This variable is perhaps of the Algol or  $\beta$  Lyrae type. The brightness appears to be nearly constant on 20 out of 24 plates examined.

*214542.* This variable is of the Algol or  $\beta$  Lyrae type. The period is one of the shortest known, and is closely represented by the formula, J.D. 2,410,000.13 + 0<sup>d</sup>.20547. The object is fainter than the normal brightness during more than one-third of the entire period.

*215722.* The variability of this star is well established, notwithstanding its small range, as good comparison stars are near.

*220233.* This variable is of the Algol type. The times of minima are approximately represented by the formula J.D. 2,410,001.8 + 8<sup>d</sup>.18 E.

*223544.* This variable is of the Algol type. The times of minima are approximately represented by the formula J.D. 2,410,001.60 + 1<sup>d</sup>.47603 E.

The variable *090843* was originally discovered in July, 1908 by Mrs. Fleming, who recorded its spectrum as "Mc 5d var?" on Plate B 38415, taken February 5, 1908. Announcement was withheld on account of the small range. It was again found by Miss Cannon in January, 1910, while comparing chart plates in Harvard Map 49. The photographs on which it was found by Miss Leavitt show the variable near the edge. This independent discovery of the same variable by three people, notwithstanding its small range, is of interest as an illustration of the thoroughness with which the heavens may be studied on plates belonging to the Harvard collection. Of the new variables, those designated *090843*, *092234*, *093320*, *094644*, *100229*, *101634*, *104134*, *210034*, and *223721*, probably have long periods, while the periods are probably short for *094629*, *094921*, *101129*, *220623*, and *223017*, as well as for the Algol variables mentioned below. The variable *090031* seems to have all the characteristics of a Nova, excepting that two appearances have been observed, the first in 1890, the second in 1902. Further

information concerning it is given in the Remarks. The variables 012629, 100434, 101645, 114760, 214542, 220233, and 223544 are of the Algol or  $\beta$  Lyrae type, and the periods of all but the first-mentioned are given in the Remarks which follow the Table. Of these, 114760 has been observed on a large number of plates, and a full ledger prepared. The others will be more fully observed later, and the periods are subject to correction.

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