

STARS HAVING PECULIAR SPECTRA.¹

ELEVEN NEW VARIABLE STARS.

By M. FLEMING.

AN examination of the photographs of stellar spectra taken at Arequipa, Peru, under the direction of Professor S. I. Bailey, and forming part of the work of the Henry Draper Memorial, has, during the last few months, shown marked peculiarities in the spectra of eleven objects enumerated in Table I, and has resulted in the discovery of eleven new variable stars enumerated in Table II. The first column of Table I gives the designation of the object and is followed by the approximate right ascension and declination for 1900, the catalogue magnitude, and a brief description of the photographic spectrum:

TABLE I.

Designation	R.A. 1900	Dec. 1900	Mag.	Description
<i>Z.C.</i> 3 ^h 1404	3 ^h 46 ^m .7	—43° 50'	8.5	Type IV
<i>S.B.D.</i> —22° 1070	5 14 .5	—22 19	8.7	Peculiar
<i>N.G.C.</i> 2070	5 40 .5	—69 43	..	Bright lines, Gas. Neb.
<i>A.G.C.</i> 8518	6 46 .1	—32 24	4.0	<i>H</i> β bright
<i>A.G.C.</i> 9181	7 10 .2	—26 10	5.4	<i>H</i> β bright
.....	7 19 .5	+ 9 7	..	Bright lines, Gas. Neb.
<i>Cord. D.</i> —31° 5004	7 41 .1	—31 41	9.2	Type V
<i>Z.C.</i> 7 ^h 2999	7 42 .0	—34 8	9.5	Bright lines, Gas. Neb.
.....	16 16 .8	—51 18	..	Type V
.....	16 39 .8	—67 36	..	Type IV
<i>Z.C.</i> 17 ^h 734	17 13 .2	—66 15	8.5	Peculiar

The gaseous nebula whose approximate position for 1900 is in R.A. 7^h 19^m.5, Dec. +9° 7' was found in the examination of the photographs taken with the 8-inch Draper telescope at Cambridge.

¹ Communicated by Edward C. Pickering, Director of the Harvard College Observatory.

The stars contained in Table II have a spectrum of the third type, having also the hydrogen lines bright, and their variability was at once suspected from this peculiarity. Conclusive evidence of their variation, as shown below, was in each case obtained on examination of chart plates of these regions. They are not here announced as suspected variables, but as variable stars, the variation, in each case, having been confirmed independently from an examination of the photographs by Professor Edward C. Pickering. The first column gives the constellation, and the second, the catalogue designation. This is followed by the approximate right ascension and declination for 1900, the number of photographs examined, and the maximum and minimum photographic magnitude as derived from the photographs:

TABLE II.

Constell.	Designation	R.A. 1900	Dec. 1900	No. Plates	Mag.	
					Max.	Min.
Tucana	.....	0 ^h 18 ^m .4	— 62° 14'	15	8.7	< 11.6
Pictor	<i>A.G.C.</i> 5428	4 43 .5	— 49 25	16	8.1	9.5
Lepus	<i>S.B.D.</i> —22° 995	5 0 .6	— 22 2	13	8.2	10.9
Pictor	<i>Z.C.</i> 5 ^h 283	5 8 .3	— 48 38	16	8.6	< 13.3
Scorpius	.....	17 35 .1	— 43 42	37	9.3	12.7
Telescopium	.....	20 7 .6	— 47 18	7	8.4	11.6
Indus	<i>Z.C.</i> 20 ^h 1539	20 49 .0	— 54 42	26	8.4	< 12.4
Octans	.....	20 57 .4	— 82 30	28	9.0	< 12.5
Grus	.....	21 42 .1	— 47 22	25	8.4	< 12.5
Aquarius	.....	22 13 .2	— 21 26	18	8.4	11.6
Phoenix	<i>A.G.C.</i> 32334	23 53 .9	— 57 8	22	7.2	8.7

—Tucanae, R.A. 0^h 18^m.4, Dec. — 62° 14'. The magnitudes of this star as derived from photographs taken on September 11, October 8, November 28, 1889; September 12, September 23, 1890; August 20, September 17, October 4, October 4, October 26, 1891; July 31, September 5, 1892; October 23, 1893; July 6, and July 23, 1894, are <10.9; 10.6, 9.4; 9.4, 9.7; <10.7, <11.3, <11.5, <11.6, 11.3; 8.7, 9.2; <10.3; 8.8 and 9.0 respectively.

—Pictoris, *A.G.C.* 5428. The magnitudes of this star as

derived from photographs taken on September 26, September 26, October 4, October 8, 1889; September 23, 1890; October 26, 1891; September 28, September 29, December 8, 1892; November 18, 1893; August 21, August 25, September 14, September 19, September 19, and October 19, 1894, are 8.5, 8.3, 8.5, 8.6; 8.8; 8.6; 8.6, 8.6, 9.5; 9.0; 8.1, 8.2, 8.4, 8.5, 8.5, and 8.9 respectively.

—Leporis, *S.B.D.*— $22^{\circ}995$. The magnitudes of this star as derived from photographs taken on November 4, November 17, 1889; February 3, September 19, September 19, December 29, 1890; January 26, 1891; November 18, 1893; September 14, October 24, 1894; March 5, March 9, and March 16, 1895, are 9.2, 8.4; 9.4, 10.5, 10.3, 8.4; 9.4; 8.2; 10.4, 9.0; 10.9, 10.8, and 10.8 respectively.

—Pictoris, *Z.C.* $5^{\text{h}} 283$. The magnitudes of this star as derived from photographs taken on September 26, September 26, October 8, November 6, 1889; September 23, 1890; October 24, November 23, 1891; September 28, October 6, December 8, 1892; September 27, September 27, November 18, 1893; September 14, September 19, and November 5, 1894, are <10.8 , <11.1 , <11.8 , <12.7 ; <13.2 ; <13.3 , <11.4 ; 11.5, 12.0, <13.3 ; 10.6, 10.6, 11.4; 11.3, 11.0, and 8.6 respectively.

—Scorpii. R.A. $17^{\text{h}} 35^{\text{m}}.1$, Dec. $-43^{\circ} 42'$. The magnitudes of this star as derived from photographs taken on July 9, July 9, July 13, July 17, July 19, July 20, July 21, July 22, August 6, August 28, 1889; May 9, June 9, June 9, 1890; May 18, May 18, May 19, May 19, September 8, 1891; April 19, June 6, June 10, 1892; April 27, May 1, May 1, May 8, May 8, June 24, 1893; May 23, June 1, June 1, June 1, June 1, June 14, July 20, July 20, August 14 and September 21, 1894, are 9.9, 9.8, 9.8, 9.6, 9.8, 9.6, 9.5, 9.5, 9.3, 9.6; 11.4, 10.7, 10.8; <11.8 , <10.7 , 12.4, <12.2 , 9.6; <11.1 , 10.8, 10.8; <11.1 , 12.6, <11.6 , 12.7, <12.4 , 11.5; <12.3 , <12.1 , <11.8 , <11.6 , <11.3 , <12.3 , 11.4, 11.2, 10.7 and 9.9 respectively.

—Telescopii. R.A. $20^{\text{h}} 7^{\text{m}}.6$, Dec. $-47^{\circ} 18'$. The magnitudes of this star as derived from photographs taken on July 24, 1893;

July 21, August 21, September 12, September 15, September 15 and September 27, 1894, are 8.7; 11.6, 11.6, 9.0, 9.1, 8.9 and 8.4 respectively.

—Indi. *Z.C.* 20^h 1539. The magnitudes of this star as derived from photographs taken on June 20, July 5, July 19, July 21, July 22, August 22, October 26, 1889; May 21, May 22, June 2, June 10, June 10, July 16, 1891; September 8, September 8, September 8, 1892; June 27, July 31, July 31, September 23, September 23, 1893; May 21, July 13, July 25, August 11 and August 11, 1894, are 10.3?, <11.3, <12.3, <11.9, <11.6, <12.4, <9.9; 11.3, 11.7, <12.1, <10.4, 12.0, <10.2; <11.1, <12.2, <12.2; 10.2, 11.3, 11.4, <12.2, <12.3; 8.4, 9.3, 9.7, 10.1 and 10.1 respectively.

—Octantis. *R.A.* 20^h 57^m.4, Dec. $-82^{\circ} 30'$. The magnitudes of this star as derived from photographs taken on June 17, June 18, June 20, August 8, September 4, September 16, September 27, October 1, 1889; June 9, June 13, June 14, August 5, September 5, 1890; June 11, June 11, June 11, June 14, June 19, October 19, October 19, 1891; May 3, June 23; 1893; July 16, July 16, August 2, August 13, August 14 and September 10, 1894, are 12.4, 11.8, <11.7, <10.8, <10.4, <10.3, <12.3, <11.8; 9.8, 9.5, 9.5, 10.3, 12.0; <11.2, <10.4, <12.5, <10.9, <12.5, 10.6, 10.6; <12.5, 9.8; 11.3, 11.2, 9.0, 9.1, 9.0 and 9.1 respectively.

—Gruis. *R.A.* 21^h 42^m.1, Dec. $-47^{\circ} 22'$. The magnitudes of this star as derived from photographs taken on June 20, June 20, July 13, July 13, July 13, July 18, July 18, July 22, September 11, September 28, October 8, 1889; June 12, 1890; May 20, June 8, June 8, June 8, June 13, July 16, 1891; October 6, October 6, 1892; July 24, July 24, August 21, August 21, 1893; May 21 and August 31, 1894, are <10.5, <10.5, <11.1, <11.5, <11.7, <12.4, <12.5, <12.3; <11.6, <10.5, <11.7; 11.9; <11.8, <10.5, <11.8, <10.1, <10.8, <12.2; 8.8, 8.8; 11.8, 11.7, 10.2, 10.6; <11.6 and 8.4 respectively. The magnitude 10.2 on August 21, 1893, may be somewhat in error since the image of the variable is near the edge of the plate, thus rendering the comparison difficult.

—Aquarii. R.A. $22^{\text{h}} 13^{\text{m}}.2$, Dec. $-21^{\circ} 26'$. The magnitudes of this star as derived from photographs taken on August 28, September 3, September 25, September 27, September 30, September 30, October 24, 1889; July 7, July 10, 1890; June 14, June 16, 1891; July 3, 1892; September 20, September 20, October 25, October 25, 1893; August 10 and August 11, 1894, are 10.0, 10.0, <10.6 , 10.6, 10.8, 10.8, 11.6; 10.0, 9.9; 10.9, <10.6 ; <10.4 ; 9.4, 9.4, 9.3, 9.3; 8.5 and 8.4 respectively.

—Phoenicis. *A.G.C.* 32334. The magnitudes of this star as derived from photographs taken on July 17, August 20, September 11, October 8, October 8, 1889; June 30, August 20, August 20, August 21, September 17, 1891; May 16, May 16, August 16, September 5, 1892; July 24, July 27, August 21, September 20, September 27, October 23, November 17, 1893; and July 24, 1894, are 8.2, 8.4, 8.4, 7.2, 7.5; 8.7, 7.8, 7.7, 8.2, 8.3; 8.2, 8.2, 8.4, 8.4; 8.4, 8.2, 8.2, 8.1, 8.3, 8.2, 8.6; and 8.0 respectively.

The magnitudes given above for the new variable star in Aquarius were derived from the mean of two or more measures made independently on two different dates, and using a different set of comparison stars when the variable was faint. The average difference of these measures is $\pm .09$.

HARVARD COLLEGE OBSERVATORY,
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