HARVARD COLLEGE OBSERVATORY.

CIRCULAR 132.

STARS HAVING PECULIAR SPECTRA. 15 NEW VARIABLE STARS.

AN examination of the photographs of the Henry Draper Memorial, by Mrs. Fleming, has led to the discovery of a number of variable stars and other objects having peculiar spectra. A list of these is given in Table I. The constellation and Durchmusterung number are given in the first two columns. The approximate right ascension and declination for 1900 and the catalogue magnitude are given in the third, fourth, and fifth columns. The designations for stars north of declination $-23°$ are taken from the Bonn Durchmusterung. For stars between $-23°$ and $-52°$ the Cordoba Durchmusterung, and for stars south of declination $-52°$ the Cape Photographic Durchmusterung is used. The class of spectrum and a brief description of the object are given in the sixth and seventh columns. Each of the new variables has been confirmed by Miss L. D. Wells, unless otherwise specified. Additional information regarding these objects is given in the Remarks following the table. In the case of new variable stars, the right ascension is followed by the designation, described in H. A. **48**, 93, which gives the approximate position, and also the designation described in H. A. **53**, 147, which indicates the number in the series of variables found at Harvard. This last number is also given in the table, for convenience of future reference.

The star $+66°$ 780 is given by Dunér and by Krüger as of the fourth type. It was announced as a variable star in H. C. 124. The spectrum appears to change on the photographs available for examination. On Plate I 3247, taken on March 5, 1891, the spectrum is faint but clearly shown and contains no bright line. On Plate I 12509, taken on March 14, 1895, the object is near the edge of the plate. No part of the continuous spectrum is visible, but the bright line Hβ is well defined and easily seen. On Plate I 12724, taken on April 19, 1895, the line Hβ appears as a strong bright line, and the portion of the continuous spectrum shown is of shorter wave length than Hβ and does not extend beyond Hγ. On Plate I 33878, taken on February 22, 1906, the line Hβ appears as a strong bright line, and the brightest and best defined portion of the spectrum is of greater wave length than Hβ, but the portion between Hβ and Hγ is also well shown, although about half a magnitude fainter than the part of greater wave length

TABLE I.

PECULIAR SPECTRA.

Constellation.	DM.	R. A. 1900.	Dec. 1900.	Magn.	Spectrum.	Description.
		h. m.	° ′			
Aries	+11° 305	2 9.6	+11 46	8.9	Pec.	Variable?
Auriga	+45° 1324	6 28.2	+45 43	8.7	Mc	Variable. H 2992.
Monoceros	− 4° 1708	6 48.3	− 4 27	9.0	Na	Variable. H 2993.
Canis Major	−22° 1850	7 19.4	−22 47	9.1	Na	Variable. H 2994.
Cancer	+15° 1808	8 16.8	+15 19	8.6	Mc 5 d	Variable. H 2995.
Ursa Major	. .	9 44.4	+53 7	. .	Pec.	Dark bands.
Vela	−49° 5234	10 21.0	−49 54	9.6	Pec.	Dark bands.
Carina	−72° 1048	10 48.7	−72 14	9.8	Mb 5 c	Variable. H 2996.
Musca	R	11 35.0	−72 0	8.5	Na	Variable. H 2997.
Virgo	. .	12 0.0	+12 56	. .	Md	Variable. H 2998.
Musca	R	12 17.4	−74 57	9.5	Na	Variable. H 2999.
Corvus	−16° 3503	12 32.3	−16 43	9.6	Mc 5 d	Variable. H 3000.
Centaurus	−63° 2720	13 15.5	−63 42	9.5	Na	Variable. H 3001.
Centaurus	−56° 5891	13 36.4	−56 16	6.8	Pec.	Class A, peculiar.
Circinus	−67° 2622	14 30.9	−67 46	7.0	Pec.	Hβ bright.
Corona Borealis	+39° 2901	15 37.8	+38 53	7.0	Mc 5 d	Variable. H 3002.
Draco	+57° 1786	17 35.4	+57 48	9.3	Mc 5 d	Variable. H 3003.
Ophiuchus	+ 6° 3898	18 37.1	+ 6 43	9.0	Pec.	Dark bands.
Aquila	. .	20 7.1	+11 35	. .	Pec.	Bright line. Type V.
Draco	+74° 861	20 25.9	+74 56	9.3	Mc 5 d	Variable. H 3004.
Cygnus	+32° 3850	20 27.6	+32 14	9.1	Na	Variable. H 3005.
Pegasus	+34° 4597	22 1.4	+34 52	8.5	Mc 5 d	Variable. H 3006.
Aquarius	−21° 6376	23 6.3	−21 32	9.0	Pec.	Dark bands.

REMARKS.

h. m.

2 9.6. An examination of twenty-four chart plates, taken between January 13, 1890 and September 6, 1905, shows a small but distinct variation in the light of this star. On several plates it is about 0.2 magnitude fainter than +11°303, magn. 9.5, (assumed photographic magnitude 8.6), while on others it is about 0.3 to 0.4 magnitude brighter than that star. Estimates from these plates gave the approximate limiting magnitudes, 8.2 to 8.8.

6 28.2. 062845 = H. V. 2992. An examination of this star on twenty-one chart plates, taken between March 3, 1890 and March 11, 1905, shows a variation of about 0.9 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.5 to 9.4.

6 48.3. 020911 = H. V. 2993. The spectrum of this star is already known as Type IV. An examination of sixteen chart plates of this object, taken between February 22, 1891 and November 11, 1904, shows a variation of about 1.2 magn. Estimates from these plates gave the approximate limiting magnitudes, 9.2 to 10.4.

7 19.4. *071922* = H. V. 2994. An examination of this star on twenty-one chart plates, taken between April 17, 1894 and November 30, 1904, shows a decided although small variation of 0.9 magn. Estimates from these plates gave the approximate limiting magnitudes, 11.0 to 11.9.

8 16.8. 081615 = H. V. 2995. An examination of this star on eighteen chart plates, taken between February 14, 1899 and January 30, 1906, shows a variation of about 0.9 magn. Estimates from these plates gave the approximate limiting magnitudes, 9.4 to 10.3.

9 44.4. This spectrum is faint, but is apparently of the same type as C.DM. −47° 6614, described in H.C. 76.

10 21.0. This spectrum is of the same type as C.DM. −47° 6614, described in H.C. 76.

10 48.7. *104872* = H.V. 2996. An examination of this star on eighteen chart plates, taken between April 1,

h. m.
1890 and May 12, 1905, shows a variation of about 1.7 magn. Estimates from these plates gave the approximate limiting magnitudes, 9.8 to 11.5.

11 35.0. *113572* = H.V. 2997. This star is A.G.C. 15946 and is known to have a spectrum of Type IV. An examination of eighteen chart plates of this object, taken between April 1, 1890 and May 12, 1905, shows a variation of about 1.6 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.6 to 10.2.

12 0.0. 120012 = H.V. 2998. An examination of this star on fourteen chart plates, taken between April 25, 1891 and May 9, 1905, shows a variation of about 4.0 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.5 to 12.5.

12 17.4. *121774* = H.V. 2999. This star is A.G.C. 16865. An examination of sixteen chart plates of this object, taken between May 2, 1893 and March 29, 1905, shows a variation of about 1.8 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.8 to 10.6.

12 32.3. *123216* = H.V. 3000. An examination of this star on twenty chart plates, taken between April 1, 1890 and May 12, 1905, shows a variation of about 1.7 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.8 to 10.5.

13 15.5. *131563* = H.V. 3001. The spectrum of this star is already known as Type IV. An examination of eighteen chart plates of this object, taken between May 24, 1889 and January 30, 1901, shows a variation of about 1.5 magn. Estimates from these plates gave the approximate limiting magnitudes, 9.0 to 10.5.

13 36.4. On Plate B 5271, taken on May 25, 1890, the hydrogen lines are very faint and narrow in the spectrum of this star. On Plate B 36285, taken on June 24, 1905, the lines Hβ and Hγ are bright on the edge of greater wavelength, while Hδ, Hε, and Hζ appear as broad dark bands with narrow bright lines superposed towards the edge of shorter wave length. These give the spectrum on this plate the appearance of being that of a spectroscopic binary.

14 30.9. On Plate B 36127, taken on May 27, 1905, Hβ appears as a faint bright line.

15 37.8. 153738 = H.V. 3002. An examination of this star on twenty-eight chart plates, taken between June 2, 1892 and February 11, 1907, shows a variation of about 1.3 magn. Estimates from these plates gave the approximate limiting magnitudes, 7.0 to 8.3.

17 35.4. 173557 = H.V. 3003. Variability suspected by Espin. A. N. **145**, 327. An examination of this star on twenty-one chart plates, taken between August 17, 1892 and October 10, 1902, shows a variation of about 1.7 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.0 to 9.7.

18 37.1. This spectrum is of the same type as C.DM.—47° 6614, described in H.C. 76.

20 7.1. Galactic longitude, 20° 45′. Galactic latitude, −13° 6′. In Heis' Atlas, Plate VII, in Aquila, in Plate XII, near border of Delphinus.

20 25.9. 202574 = H.V. 3004. An examination of this star on nine chart plates, taken between October 18, 1894 and October 28, 1903, shows a variation of about 2.2 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.3 to 10.5.

20 27.6. 202732 = H.V. 3005. An examination of this star on ten chart plates, taken between August 4, 1890 and November 9, 1905, shows a variation of about 1.0 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.5 to 9.5.

22 1.4. 220134 = H.V. 3006. An examination of this star on twenty chart plates, taken between December 22, 1890 and September 27, 1905, shows a variation of about 1.0 magn. Estimates from these plates gave the approximate limiting magnitudes, 8.2 to 9.2. This object was found to be variable by Mrs. Fleming on November 26, 1904, but since the change was slight, about half a magnitude, on the plates examined, publication was withheld until the star was rediscovered independently by Miss Leavitt in her examination of the Harvard Maps of the Sky. She found a change of about 0.7 magn.

23 6.3. This star is announced as of Type IV in Astronomy and Astrophysics, **12**, 546. On Plate A 8155, taken with the 24-inch Bruce Telescope, on October 11, 1906, a good image of the spectrum of this star shows that it is of the same type as C. DM. −47° 6614, described in H. C. 76.

than Hβ. On Plate I 34569, taken on March 7, 1907, the line Hβ appears as a faint bright line, while the continuous spectrum is well shown and is similar to that on Plate I 33878. The object is difficult to describe on these plates, since all were taken with the 8-inch Draper Telescope using a small prism, and the portion visible on the individual plates amounts to 1.8, 0.1, 0.7, 1.6, and 1.8 millimetres, respectively. Plate I 10978, taken with the same telescope, using an 8° prism, shows a very faint spectrum which is similar to that on Plates I 33878 and I 34569.

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