HARVARD COLLEGE OBSERVATORY.

CIRCULAR 124.

STARS HAVING PECULIAR SPECTRA. 18 NEW VARIABLE STARS.

EXAMINATIONS of late 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, together with two additional variables found by examination of chart plates, one by Miss Annie J. Cannon and one by Miss L. D. Wells. The constellation and the number in the Durchmusterung 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 catalogue designations and magnitudes are taken from the Bonn Durchmusterung, when the star is north of declination $-23°$, from the Cordoba Durchmusterung, when between declinations $-23°$ and $-52°$, and from the Cape Photographic Durchmusterung, when south of declination $-52°$. 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 independently by another observer. 001828 and 091151 were confirmed by Mrs. Fleming, the remainder were confirmed by Miss L. D. Wells. 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 the Annals, **48**, 93, which gives the approximate position, and also by the designation described in the Annals, **53**, No. 7, 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 approximate galactic longitudes and latitudes of the gaseous nebulae are given in the Remarks following Table I.

TABLE I.

PECULIAR SPECTRA.

Constellation.	DM. No.	R. A. 1900.	Dec. 1900.	Magn.	Spectrum.	Description.
		h. m.	° ′			
Andromeda	+28° 54	0 18.4	+28 51	9.0	..	Variable. H 1305.
Andromeda	..	1 10.4	+41 12	..	Md	Variable. H 1306.
Perseus	+47° 939	4 1.4	+47 28	4.5	B Pec.	Hβ bright.
Camelopardus	+57° 806	4 22.4	+57 11	8.5	Md?	Variable. H 1307.
Cancer	..	9 2.2	+21 58	..	N	Type IV.
Ursa Major	+52 ° 1378	9 11.5	+51 50	9.2	..	Variable. H 1308.
Carina	−64° 1475	10 42.5	−65 5	9.5	N	Variable. H 1309.
Carina	..	10 56.5	−64 42	..	Pec.	Bright lines. Gaseous Nebula.
Crux	−62° 2898	12 36.9	−62 30	6.6	B Pec.	Hβ bright.
Draco	+66° 780	12 52.5	+66 32	7.3	N	Variable. H 1310.
Musca	..	13 2.2	−67 6	..	Pec.	Bright lines. Gaseous Nebula.
Centaurus	..	13 13.2	−60 15	..	Md?	Variable. H 1311.
Centaurus	−62° 3270	13 20.7	−62 8	8.1	B Pec.	Hβ bright.
Virgo.	..	14 22.4	− 0 26	..	..	Variable. H 1312.
Centaurus	−31° 11294	14 28.1	−31 15	9.1	Md	Variable. H 1313.
Bootes	+32 2489	14 29.2	+32 11	9.3	..	Variable. H 1314.
Lupus	..	14 52.3	−54 33	..	Md	Variable. H 1315.
Corona Borealis	+38° 2698	15 43.0	+38 35	9.5	Mc 5 d	Variable. H 1316.
Corona Borealis	..	15 52.2	+29 32	..	Md	Variable. H 1317.
Norma	−60° 6348	15 55.2	−60 13	7.9	Pec.	Hγ, Hβ bright.
Hercules	+12° 2966	16 7.0	+12 20	9.0	Pec.	Bright lines. Gaseous Nebula.
Scorpius	−37° 11206	16 57.2	−37 42	7.1	Pec.	Similar to ζ Puppis.
Apus	−81° 782	16 58.4	−81 26	9.6	Pec.	Dark bands.
Scorpius	−33° 11875	17 8.7	−33 26	..	B Pec.	Hβ bright.
Apus	−81° 787	17 11.0	−81 31	..	Pec.	Dark bands.
Ara	−47° 11484	17 15.8	−47 23	..	B Pec.	Hβ bright.
Ara	−46° 11530	17 20.5	−46 57	..	B Pec.	Hβ bright.
Sagittarius	R	19 10.5	−39 47	R	..	Variable. H 1318.
Aquila	−10° 5057	19 17.7	−10 54	7.0	Pec.	Dark bands.
Aquila	..	19 52.0	− 9 37	..	..	Variable. H 1319.
Delphinus	+15° 4172	20 24.6	+15 56	..	Mc	Variable. H 1320.
Delphinus	..	20 24.6	+15 56	..	..	Variable. H 1321.
Lacerta	R	22 45.4	+40 30	..	Mc 5 d	Variable. H 1322.

REMARKS.

h. m.

0 18.4. 001828=H 1305. Discovered by Miss A. J. Cannon, from an examination of chart plates taken with the 1-inch Cooke lens. Observations of four hundred and sixty-one plates, taken between November 14, 1889, and November 16, 1906, show a variation of about 1.2 magnitudes. Approximate limits of magnitude 8.7 to 9.9. Period $0^d.49932$.

h. m.

1 10.4. 011041=H 1306. An examination of this star on twelve chart plates, taken between February 19, 1891 and July 21, 1904, shows a variation of about 5.0 magnitudes. Estimates from these plates give the approximate limits 8.0 to <13.

4 1.4. Plate C 16052, taken on October 5, 1905, with the 11-inch Draper Telescope shows the line Hβ bright,

h. m.

and the lines Hγ and Hδ appear to be double, probably due to fine bright lines superposed on them.

4 22.4. 042257=H 1307. An examination of this star on twenty-three chart plates, taken between January 3, 1890, and October 9, 1905, shows a variation of about 1.7 magnitudes. Estimates from these plates give the approximate limits, 7.8 to 9.5. Suspected of variability by Espin. Astron. Nach. **134**, 123, and **145**, 327.

9 2.2. This is a difficult object on Plate I 32758, taken on February 27, 1905 with the 8-inch Draper Telescope. A better photograph may show more detail, and place it in the class of spectra similar to C. DM. −47° 6614, described in Circular 76. On two plates, I 24997, taken April 1, 1900 and I 33005, taken April 22, 1905, the spectrum is too faint to be classified.

9 11.5. 091151=H 1308. Discovered by Miss L. D. Wells. An examination of this star on ten chart plates, taken between March 7, 1892 and March 6 1903, shows a variation of about 0.8 magnitude. Estimates from these plates give the approximate limits 11.1 to 11.9.

10 42.5. *104265*=H 1309. An examination of this star on thirteen chart plates, taken between May 6, 1890 and December 6, 1904, shows a variation of about 1.2 magnitudes. Estimates from these plates give the approximate limits, 8.4 to 9.6.

10 56.5. Galactic longitude, 259°. Galactic latitude, −5°. This object precedes $1^s.3$, and is 63″ north of C. P. D. −64° 1588, magn, 9.5.

12 36.9. On Plate X 11195, taken on May 31, 1906, with the 13-inch Boyden Telescope, Hβ appears as a fine dark line superposed on a broad bright line. The lines Hγ and Hδ are bright on the edge of greater wave length.

12 52.5. 125266=H 1310. An examination of this star on eight chart plates, taken between April 11, 1892 and May 15, 1902, shows a variation of about 2.0 magnitudes. Estimates from these plates give the approximate limits, 8.5 to 10.5.

13 2.2. Galactic longitude, 273°. Galactic latitude, −5°.

13 13.2. *131360*=H 1311. An examination of this star on nine chart plates, taken between June 22, 1893 and June 21, 1904, shows a variation of about 3.0 magnitudes. Estimates from these plates give the approximate limits, 10.5 to 13.5. The variability of this star was discovered independently by Miss H. S. Leavitt, by the method of superposing negatives on a positive plate.

13 20.7. Plate B 35759, taken on April 5, 1905, with the 8-inch Bache Telescope, shows the line Hβ b ight in the spectrum of this star.

14 22.4. *142200*=H 1312. An examination of this star on sixteen plates, taken between March 11, 1897 and May 24, 1906, shows a variation of about 1.4 magnitudes. Qbservations give the approximate limits, 9.1 to <10.5. This variable, which has a period of $0^d.41224$, was discovered from a plate taken at Arequipa with the 1-inch Cooke lens, on May 19, 1906, and having fifteen exposures of 30 minutes each.

14 28.1. *142831*=H 1313. An examination of this star on thirteen plates, taken between July 16, 1894 and May 13, 1904, shows a variation of about 5.0 magnitudes. Estimates from these plates give the approximate limits, 9.0 to 14.0.

14 29.2. 142932=H 1314. Observations of this star on two hundred and seventy-four plates, taken between July 8, 1890 and July 9, 1906, show a variation of about 1.1 magnitudes, the approximate limits being 8.9 to 10.0. This variable, which has a period of $0^d.49931$, was discovered from a plate taken at Arequipa with the 1-inch Cooke lens, on May 24, 1906, and having seventeen exposures of 30 minutes each.

14 52.3. *145254*=H 1315. An examination of this star on eleven plates, taken between May 25, 1891 and August 19, 1905, shows a variation of about 5.0 magnitudes. Estimates from these plates give the approximate limits, 8.5 to 13.5.

15 43.0. 154338=H 1316. An examination of this star on sixteen plates, taken between July 2, 1893 and February 17, 1905, shows a variation of about 2.0 magnitudes. Estimates from these plates give the approximate limits, 8.5 to 10.5.

15 52.2. 155229=H 1317. An examination of this star on ten chart plates, taken between May 25, 1891 and May 8, 1905, shows a variation of about 3.0 magnitudes. Estimates from these plates give the approximate limits 8.0 to <11.0.

15 55.2. Plates X 1205 and X 11221, taken at Arequipa on June 9, 1906 and June 13, 1906, respectively, with the 13-inch Boyden Telescope, show the lines Hβ and Hγ bright in the spectrum of this star. There is also a trace of a bright Hδ line.

16 7.0. Galactic longitude, 353°. Galactic latitude +40°. An examination of this object on twenty-seven chart plates, taken between July 18, 1890 and June 22, 1905, shows a distinct change of about 0.4 magnitude which may be due to the photographs. The change is most noticeable on the sixteen plates taken with the 1-inch Cooke lense. This small change in magnitude has been confirmed independently by Miss Wells.

16 57.2. The spectrum of this star on Plate X 11191, taken at Arequipa on May 29, 1906, with the 13-inch Boyden Telescope, shows the bright lines at wave lengths 4652 and 4698, and the additional dark lines, 4027, 4202, and 4544, characteristic of the spectrum of ζ Puppis. Announced as a star of the fifth type, Astron. Nach. **123**, 95.

16 58.4. This spectrum is similar to that of C. DM. −47° 6614, described in Circular 76.

17 8.7. Plates X 11001 and X 11007, taken at Arequipa on July 1, 1905 and July 3, 1905, with the 13-inch Boyden Telescope, show the line Hβ bright in the spectrum of this star.

h. m.

17 11.0. This spectrum is similar to that of C. DM. −47° 6614 described in Circular 76.

17 15.8. Plate X 11235, taken at Arequipa on June 25, 1906, with the 13-inch Boyden Telescope, shows the line Hβ bright in the spectrum of this star. Hγ appears as a fine narrow bright line superposed on a broad dark line.

17 20.5. Plate X 11235, taken at Arequipa on June 25, 1906, with the 13-inch Boyden Telescope, shows the line Hβ bright in the spectrum of this star.

19 10.5. *191039*=H 1318. Observations of this star on one hundred and sixty-six plates, taken between July 5, 1889 and July 1, 1904, show a variation of about 2.6 magnitudes. Estimates from these plates give the approximate limits, 9.8 to 12.4. Photographic observations of this star were exceedingly difficult, as it is involved in a nebula whose centre is in the same right ascension, and is 14″ south of it. It is uncertain whether C.DM.−39° 13207, magn. 9.5, represents an observation of the variable, the nebula, or the combined light of both.

19 17.7. This spectrum is similar to that of C.DM.−47° 6614, described in Circular 76.

19 52.0. *195209*=H 1319. This variable was found from chart plates, while searching for Iris. An examination of this star on nine chart plates, taken between November 16, 1894 and September 18, 1906, shows a variation of about 1.9 magnitudes. Estimates from these plates give the approximate limits, 9.6 to <11.5.

20 24.6a. 202415a=H 1320. Observations of this star on two hundred and twenty-one plates, taken between July 31, 1890, and November 9, 1905, show a variation of about 0.9 magnitudes, the approximate limits being 8.9 to 9.8.

20 24.6b. 202415b=H 1321. A faint star about 20″ distant, following and south of 20^h 24^m.6a. Observations of this star on seventy-four plates, taken between July 21, 1890 and November 9, 1905, show a variation of about 1.0 magnitude, the approximate limits being 11.8 to <12.8.

22 45.4. 224540=H 1322. The preceding and southern of a pair of stars, about 40″ apart, either of which might be identified as +40° 4920, magn. 9.1. An examination of this star on thirteen chart plates, taken between November 20, 1891 and November 2, 1902, shows a variation of about 1.5 magnitudes. Estimates from these plates give the approximate limits, 8.2 to 9.7.

Plate A 7588, taken at Arequipa with the 24-inch Bruce Telescope on January 30, 1906, and having an exposure of 64^m, shows the spectrum of a moving object, whose approximate position for 1875 is in R. A. = 9^h 38^m.1, Dec. = −79° 58′. The class of spectrum is similar to that of the Sun, and the magnitude is about 9.5. If this object is an asteroid it is of great interest owing to its southern declination.

Since Circular 111 was published, the spectra of the known variable stars, 132262 RR Ursae Majoris, 170627 RT Herculis, and 215934 RT Pegasi, have been photographed, and give the classes of spectra of these objects as Md?, Md 4, and Md?, respectively.

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