

suggest themselves. Where are the principal collections of photographs showing faint stars, and what is their character and extent? Does a photograph exist which is likely to contain the required information? Is this photograph accessible, so that the information desired can be secured from it? Satisfactory answers to these questions can generally be obtained for stars brighter than the thirteenth magnitude but not for fainter stars. Astronomers having collections of photographs showing such faint stars are urged to publish the material required to answer these questions, or to send the information needed to this Observatory. The principal facts desired are given below:

1. A description of the instrument, stating its location; form of lens; maker; aperture; focal length, or scale of photograph, that is, number of seconds of arc to the millimetre; size of plate, or region covered; diameter of circle over which stars as faint as the fourteenth magnitude are shown; kind of plate used; name of observer.

2. A list of photographs, which should include the number designating each plate; the time of the centre of the exposure (found by adding half the duration of the exposure to the time of beginning), expressed either in Julian Days and thousandths following Greenwich Mean Noon, or in calendar days, hours, and minutes; the right ascension

and declination for 1900 of the centre of the plate; the time of exposure in minutes; the quality on a scale of 5, 5 denoting that the images are circular and that no serious defect appears upon the plate, 4 that the images are nearly circular so that their positions can be accurately measured, 3 that faint stars are shown so that the relative brightness can be accurately estimated, even if the images are not circular.

3. A statement whether the owner is willing to examine and if necessary measure his photographs to furnish any desired information; to lend them under suitable restrictions, so that copies may be made; to furnish contact prints at cost.

It is the policy of the Harvard Observatory to make the material it has collected as widely useful as possible. Accordingly, preparations are being made to publish the facts asked for in Nos. 1 and 2. For many years the Observatory has offered to furnish copies of its photographs at cost to whoever might desire them. If this policy is adopted at other observatories, a purchase of large numbers of photographs of faint stars is contemplated here. The Observatory will take charge, temporarily or permanently, of good photographs for which the owners have no further use, and will render them accessible to astronomers by the methods described above.

Harvard College Observatory, 1907 Jan. 19.

Edward C. Pickering.

Zwei neue Veränderliche mit sehr raschen Lichtänderungen

mitgeteilt von M. Jules Baillaud in Comptes Rendus 144 p. 250.

Name	α 1900.0	δ 1900.0	Größe	Dauer d. Beob.
3.1907 Herculis	16 ^h 54 ^m 11 ^s	+21° 42' 0" 0	12.7-14.5	1 ^h 6 ^m
4.1907 Vulpeculae	19 0 8.44	+24 40 15.8	13.6-14.5	1 17

Die Veränderlichkeit ist dadurch entdeckt worden, daß die drei zu den dreieckigen Sternbildern der Himmelskarte gehörenden Aufnahmen Helligkeitsdifferenzen zeigten, die nicht durch die Umstände der Beobachtung erklärt werden konnten. Als Sternbild ist für den zweiten Stern in C. R. irrtümlich Aquila angegeben.

Kr.

Stars having peculiar spectra. 18 new variable stars.

(Harvard College Observatory Circular No. 124).

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 with the designation of the editor of the A. N. for the variables, 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 designation of the editor of the A. N. 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.	α 1900	δ 1900	Mgn.	Spectr.	Description
5.1907 Andromedae	+28°54	0 ^h 18 ^m .4	+28° 51'	9.0	—	Variable. H 1305
6.1907 Andromedae	—	1 10.4	+41 12	—	Md	Variable. H 1306
Perseus	+47 939	4 1.4	+47 28	4.5	B Pec.	$H\beta$ bright
7.1907 Camelopardalis	+57 806	4 22.4	+57 11	8.5	Md?	Variable. H 1307
Cancer	—	9 2.2	+21 58	—	N	Type IV
8.1907 Ursae Majoris	+52 1378	9 11.5	+51 50	9.2	—	Variable. H 1308
9.1907 Carinae	—64 1475	10 42.5	—65 5	9.5	N	Variable. H 1309
Carina	—	10 56.5	—64 42	—	Pec.	Bright lines. Gaseous Nebula
Cruz	—62 2898	12 36.9	—62 30	6.6	B Pec.	$H\beta$ bright
10.1907 Draconis	+66 780	12 52.5	+66 32	7.3	N	Variable. H 1310
Musca	—	13 2.2	—67 6	—	Pec.	Bright lines. Gaseous Nebula
11.1907 Centauri	—	13 13.2	—60 15	—	Md?	Variable. H 1311
Centaurus	—62 3270	13 20.7	—62 8	8.1	B Pec.	$H\beta$ bright
12.1907 Virginis	—	14 22.4	— 0 26	—	—	Variable. H 1312
13.1907 Centauri	—31 11294	14 28.1	—31 15	9.1	Md	Variable. H 1313
14.1907 Bootis	+32 2489	14 29.2	+32 11	9.3	—	Variable. H 1314
15.1907 Lupi	—	14 52.3	—54 33	—	Md	Variable. H 1315
16.1907 Cor. bor.	+38 2698	15 43.0	+38 35	9.5	Mc 5 d	Variable. H 1316
17.1907 Cor. bor.	—	15 52.2	+29 32	—	Md	Variable. H 1317
Triang. Austr. 1)	—60 6348	15 55.2	—60 13	7.9	Pec.	$H\gamma$, $H\beta$ 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.	$H\beta$ bright
Apus	—81 787	17 11.0	—81 31	—	Pec.	Dark bands
Ara	—47 11484	17 15.8	—47 23	—	B Pec.	$H\beta$ bright
Ara	—46 11530	17 20.5	—46 57	—	B Pec.	$H\beta$ bright
18.1907 Cor. austr. 2)	R	19 10.5	—39 47	R	—	Variable. H 1318
Aquila	—10 5057	19 17.7	—10 54	7.0	Pec.	Dark bands
19.1907 Aquilae	—	19 52.0	— 9 37	—	—	Variable. H 1319
20.1907 Delphini	+15 4172	20 24.6	+15 56	—	Mc	Variable. H 1320
21.1907 Delphini	—	20 24.6	+15 56	—	—	Variable. H 1321
22.1907 Lacertae	R	22 45.4	+40 30	—	Mc 5 d	Variable. H 1322

Remarks.

5.1907 Androm. 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.

6.1907 Androm. 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^h1^m.4. Plate C 16052, taken on October 5, 1905, with the 11-inch Draper Telescope shows the line $H\beta$ bright, and the lines $H\gamma$ and $H\delta$ appear to be double, probably due to fine bright lines superposed on them.

7.1907 Camelop. 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. Astr. Nachr. 134.123, and 145.327.

9^h2^m.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°66'14, described in Circular 76, A. N. 165.187. On two plates, I 24997, taken April 1, 1900 and I 33005, taken April 22, 1905, the spectrum is too faint to be classified.

8.1907 Urs. maj. 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.

9.1907 Carinae. 104265₂ = 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^h56^m.5. Galactic longitude, 259°. Galactic latitude, —5°. This object precedes ι^3 , and is 63' north of C. P. D. —64°15'88, magn. 9.5.

12^h36^m.9. On Plate X 11195, taken on May 31, 1906, with the 13-inch Boyden Telescope, $H\beta$ appears as a fine dark line superposed on a broad bright line. The lines $H\gamma$ and $H\delta$ are bright on the edge of greater wave length.

10.1907 Drac. 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. ³⁾

1) Im Zirkular steht irrthümlich Norma. Kr. 2) Als Sternbild ist im Zirkular irrthümlich Sagittarius angegeben. Kr.

3) Vergl. den nachfolgenden Artikel der Herren Müller und Kempf. Kr.

13^h2^m2. Galactic longitude, 273°. Galactic latitude, -5°.

11.1907 Centauri. 131360_n = 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^h20^m7. Plate B 35759, taken on April 5, 1905, with the 8-inch Bache Telescope, shows the line $H\beta$ bright in the spectrum of this star.

12.1907 Virg. 142200_n = 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. Observations 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.

13.1907 Centauri. 142831_n = 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.

14.1907 Bootis. 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.

15.1907 Lupi. 145254_n = 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.

16.1907 Cor. bor. 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.

17.1907 Cor. bor. 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^h55^m2. 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 $H\beta$ and $H\gamma$ bright in the spectrum of this star. There is also a trace of a bright $H\delta$ line.

16^h7^m0. 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.

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 RA. = 9^h38^m1, Decl. = -79°58'. The class of spectrum is similar to that of the Sun, and the manitude is about 9.5. If this object

16^h57^m2. 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, Astr. Nachr. 123.95.

16^h58^m4. This spectrum is similar to that of C.DM. -47°66'14, described in Circular 76, A. N. 165.187.

17^h8^m7. 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 $H\beta$ bright in the spectrum of this star.

17^h11^m0. This spectrum is similar to that of C.DM. -47°66'14 described in Circular 76, A. N. 165.187.

17^h15^m8. Plate X 11235, taken at Arequipa on June 25, 1906, with the 13-inch Boyden Telescope, shows the line $H\beta$ bright in the spectrum of this star. $H\gamma$ appears as a fine narrow bright line superposed on a broad dark line.

17^h20^m5. Plate X 11235, taken at Arequipa on June 25, 1906, with the 13-inch Boyden Telescope, shows the line $H\beta$ bright in the spectrum of this star.

18.1907 Cor. austr. 191039_n = 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°13'207, magn. 9.5, represents an observation of the variable, the nebula, or the combined light of both.

19^h17^m7. This spectrum is similar to that of C.DM. -47°66'14, described in Circular 76, A. N. 165.187¹⁾.

19.1907 Aquilae. 195209_n = H 1319. This variable was found from chart plates, while searching for Iris. An examination of this star on nine chart plates, taken between Nov. 16, 1894 and Sept. 18, 1906, shows a variation of about 1.9 magnitudes. Estimates from these plates give the approximate limits, 9.6 to <11.5.

20.1907 Delphini. 202415_a = H 1320. Observations of this star on two hundred and twenty-one plates, taken between July 31, 1890, and Nov. 9, 1905, show a variation of about 0.9 magnitudes, the approximate limits being 8.9 to 9.8²⁾.

21.1907 Delphini. 202415_b = H 1321. A faint star about 20" distant, following and south of 20.1907 Delphini. Observations of this star on seventy-four plates, taken between July 21, 1890 and Nov. 9, 1905, show a variation of about 1.0 magnitude, the approximate limits being 11.8 to <12.8.

22.1907 Lacertae. 224540 = H 1322. The preceding and southern of a pair of stars, about 40" apart, either of which might be identified as +40°49'20, magn. 9.1. An examination of this star on thirteen chart plates, taken between Nov. 20, 1891 and Nov. 2, 1902, shows a variation of about 1.5 magnitudes. Estimates from these plates give the approximate limits, 8.2 to 9.7³⁾.

is an asteroid it is of great interest owing to its southern declination.

Since Circular 111 (A. N. 171.139) was published, the spectra of the known variable stars, 132262 RR Ursae maj., 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.

Harvard College Observatory, Cambridge, Mass., 1907 Jan. 26.

Edward C. Pickering.

¹⁾ Mrs. Fleming hat den Stern schon 1890 und 1891 angezeigt; vgl. A. N. 126.163 und 128.122. Kr.

²⁾ Der Stern befindet sich in der Liste der suspected variable stars von Espin in A. N. 145.327; vgl. auch Birm.-Esp. 672 und Krüger, Katalog der farbigen Sterne 1751. Kr.

³⁾ Der Stern BD. +40°49'20 ist Espin, Stars with remark. spectra Nr. 429; vgl. A. N. 124.179. Kr.

Über den veränderlichen Stern 10.1907 Draconis.

In Zirkular 124 des Harvard College Observatory ist unter 18 neu entdeckten Variabeln auch der Stern +66°78'0 = 10.1907 Draconis aufgeführt. Die Veränderlichkeit dieses

Sterns haben wir bereits in Band 16 der Potsdamer Publikationen S. 255 angezeigt, und er ist auch als »var.« in unseren Generalkatalog (Band 17) übernommen. Wir haben