



und rechts in der Mitte nicht genügend scharf. Mittlere zwei dunkle Flecke oft gut sichtbar. Nordpolar-Calotte, rechts einen hellen weissen Fleck enthaltend, etwas grünlich.

Aug. 15 7^h 45^m - 8^h 20^m M. E. Z. Saturn zeigt reine Scheibe und ist scharf begrenzt. Encke'sche Trennung längere Zeit deutlich. Aequatorealband sehr ausgeprägt; links zwei dunkle Flecke auffallend rein. In der Mitte zwei und rechts unten ein dunkler Fleck ziemlich deutlich. Rechts oben ein heller Fleck scharf aufblitzend. Polarfleck sehr gut sichtbar. Ueber dem Aequator zarter Streifen.

Die dunklen Flecke wurden auch von Herrn B. Geiza von Podmaniczky auf den ersten Blick, ohne meine Zeichnung zu sehen, beobachtet, und die Position nach Augenmaass richtig entsprechend bestimmt.

Kis-Kartal, 1896 Aug. 26.

A. Anton Wonszek.

Stars having peculiar spectra. New variable Stars in Crux and Cygnus.

By *Edward C. Pickering.*

A list of stars having peculiar spectra and found by Mrs. Fleming in her regular examination of the Draper Memorial photographs are given in the annexed table. The successive columns give the designation of the star, the

approximate right ascension and declination for 1900, the catalogue magnitude, and a brief description of the character of the spectrum, followed by additional remarks when required.

Designation	RA 1900	Decl. 1900	Mag.	Description
-39°3939	8 ^h 0 ^m 1	-39° 43'	2.5	Peculiar. ζ Puppis
ZC. 11 ^h 742	11 11.2	-57 23	9	Type IV
GC. 15946	11 35.0	-72 0	8.5	Type IV
—	12 26.9	-57 1	—	Type III. Hydrogen lines bright. Variable
-36°11341	17 7.0	-37 0	9.1	Gaseous Nebula. Gal. long. 317° 12', lat. -0° 15'
GC. 22812	16 47.0	-42 12	5.8	Hβ bright. ζ ¹ Scorpii
GC. 23694	17 24.1	-49 47	2.9	Hβ bright. α Arae
+44°3649	20 54.4	+44 24	7.9	Peculiar
+44°3679	20 58.9	+44 25	6.8	Peculiar

The spectrum of the first of these stars is very remarkable and unlike any other as yet obtained. The continuous spectrum is traversed by three systems of lines. First, the hydrogen lines and the line *K*, which are dark, as in stars of the first type. Second, two bright bands or lines whose approximate wave lengths are 4652 and 4698, which may be identical with the adjacent lines in spectra of the fifth type. Third, a series of lines whose approximate wave lengths are 3814, 3857, 3923, 4028, 4203, and 4505, the last line being very faint. These six lines form a rhythmical series like that of hydrogen and apparently are due to some element not yet found in other stars or on the earth. The formula of Balmer will not represent this series, but if we add a constant term and write

$$\lambda = 4650 \frac{m^2}{m^2 - 4} - 1032,$$

we obtain for *m* equal to 10, 9, 8, 7, 6, and 5, the wave lengths 3812, 3858, 3928, 4031, 4199, and 4504. The deviations from the observed wave lengths have an average

value of three tenmillionths of a millimetre, are systematic rather than accidental, and although small appear to be rather larger than might be expected from the errors of observation. A line of wave length 5168 is indicated for *m* = 4, and, if present, could be observed visually, or photographed on a plate stained with erythrosin. The only other line found in the spectrum of this star has the wave length 4620, and apparently does not belong to this series.

The fourth star in the table is a new variable in the constellation Crux. A comparison with eight adjacent catalogue stars gives its position for 1875, RA. = 12^h 25^m 27^s.5, Decl. = -56° 53' 25". The period is about a year. The photographic magnitude, as derived from 57 plates, is 10.3 at maximum, and fainter than 13.2 at minimum.

The fifth of these objects is NGC. 6302, whose spectrum, on a photograph taken on July 9, 1896, is shown to contain the bright lines characteristic of gaseous nebulae.

The presence of the bright hydrogen line in the sixth of these objects was found independently by Miss A. J. Cannon.

The last two objects in the table have similar spectra, containing two bright bands resembling, and perhaps identical with, those in the spectrum of ζ Puppis.

In addition to the above objects a star in the constellation Cygnus, whose approximate position for 1900 is RA. = $21^h 38^m 8$, Decl. = $+43^\circ 8'$ has been found to be

Harvard College Observatory, 1896 Nov. 2.

variable by Miss Louisa D. Wells. Its period appears to be about 40 days and its photographic brightness varies from 7.2 to fainter than 11.2, an unusually large range for a variable having so short a period. Its position for 1900, as determined visually by Mr. O. C. Wendell, is RA. = $21^h 38^m 46^s 21$, Decl. = $+43^\circ 7' 34'' 8$.

Edward C. Pickering.

Zusatz. Für den von Miss Wells entdeckten neuen Veränderlichen in Cygnus theilt Prof. *F. Deichmüller* d. d. 22. Nov. aus den Bonner AG.- und BD -Beobachtungen die folgenden Daten mit:

1) AG. Zone T. 88 1869 Nov. 12. Tiele. Wolkig. BD. $+42^\circ 41' 90$ ist als $8^m 6$ beobachtet und dabei ist bemerkt $8^m 6$ praec. $25^s 8'' 5$ Bor. Hiernach ist der Ort dieses in BD. fehlenden Sterns:

$8^m 6$ $21^h 38^m 48^s$: $+43^\circ 7' 40'' 5$ (1900.0)

Das ist unzweifelhaft eine ältere Beobachtung des Well'schen Sterns.

Z. 608 1878 Aug. 5. Deichmüller. Klar, unruhig. BD.

$+42^\circ 41' 90$ ist nur an den beiden letzten Fäden beobachtet und dabei kein praec. notirt.

Z. 615 1878 Sept. 14. Deichmüller. BD. $+42^\circ 41' 90$ ist als letzter Zonenstern beobachtet, als sich der Himmel mit Wolken überzog. Es ist kein praec. notirt.

2) BD. Zone 1054 1856 Oct. 20. Schönfeld. Sehr klare Luft. Der Stern fehlt.

Z. 1060 1856 Oct. 21. Krueger. Luft etwas neblig und feucht; der Stern fehlt.

Z. 1073 1856 Oct. 25. Krueger. Luft anfangs recht gut, später etwas neblig. (Anfang $21^h 0^m$, Ende $22^h 8^m$). Der Stern fehlt.

Kr.

Two brilliant meteors.

By *W. F. Denning.*

On Sept. 10, 1896 the sky was beautifully clear in England and two fireballs made their appearance.

The first became visible at $9^h 3^m$ p. m. and moved swiftly leaving behind it a luminous streak for a period of 30 seconds. The second burst into view at $10^h 26^m$ p. m. and moved slowly leaving a slight train and emitting, as it fell, a vivid bluish light which quite illuminated the sky and landscape. At Bristol I observed the second meteor as it descended almost vertically amongst the stars of Ursa Minor and Ursa Major, its apparent path being from $203^\circ + 88^\circ$ to $154^\circ + 69^\circ$.

From a comparison of the various observations I have worked out the following real paths:

	I	II
G. M. T. of visibility	$9^h 3^m$	$10^h 26^m$
Height at beginning	82 miles	71 miles
Place	{ 12 miles E of Isle of Man	Bromfield Hereford
Geographical position	{ Lat. $54^\circ 14' N$ Long. $4 3 W$	Lat. $52^\circ 21' N$ Long. $2 41 W$
Height at ending	65 miles	30 miles
Place	{ 20 miles W of Isle of Anglesey	Hope Hereford
Geographical position	{ Lat. $53^\circ 24' N$ Long. $5 13 W$	Lat. $52^\circ 9' N$ Long. $2 42 W$
Position of Earth point	{ Lat. $49^\circ 0' N$ Long. $10 0 W$	Lat. $52^\circ 1' N$ Long. $2 43 W$

Bristol 1896 Oct. 3.

	I	II
Length of visible flight	78 miles	44 miles
Velocity per second	31 miles	15 miles
Appar. astr. Radiant point	$72^\circ + 42^\circ$	$33^\circ + 71^\circ$
Approximate star	α Aurigae	β Cephei
Incl. of meteor's descent	$12\frac{1}{2}^\circ$	71°
Direction of flight from	NE by N	N
Apparent brilliancy	$> \varnothing$	$5 \times \varnothing$
Number of observations	7	15

The great difference in the radiant points proves the two bodies to have belonged to widely distinct systems.

The parent or derivative meteor showers from which they came agree with the following radiants in my catalogue published in the Monthly Notices of the Royal Astronomical Society for May 1890:

I			
No. 520	1885	Sept. 12-15	$73^\circ + 43^\circ$
No. 549	1879	Sept. 15-16	$72 + 41$
} Swift meteors with streaks			
II			
No. 518	1885	Sept. 4-9	$335 + 71$ slow, bright

Fireballs are generally numerous during the period Sept. 5 to 15 but they often belong to a rich shower from the point $61^\circ + 36^\circ$ near ϵ Persei. — It is fortunate therefore to have recorded two fine meteors from other systems.

W. F. Denning.