November 22, 1910

Draper Class — Yerkes spectrograms.
Independent classification of these plates.
I did not know the object.

1B² 1168
K

K — α Boötis

1B² 1108
more lines seen than in α Boötis
G band ~~area~~ more continuous
absorption feature
4227 wider.
K — Class K2

approaches [illegible]-group. Resembles α Cass in general absorption — 4227 region quite different
ε Pegasi

1B² 952

o Ceti — Md. Hβ, γ, δ, ζ bright.

Nov. 22, 1910

I B² 752 ρ Leonis

Md γ, δ bright
and two in violet.

I B2 1356

K

K₂ (a.p.c.) This is more nearly like ~~α O~~ ε Pegasi than α Bootis
α Arietis

I B² 693

/ I At first thought this to be an
Orion star, with sharp lines

A₀ Div. C. as K is quite clearly seen.

η Leonis. But 4026 is not seen and
line taken for 4471 proves to be
4481, so I class it
A sharp lines.

η Leonis

Nov. 22, 1910

I B2 1280

G, lines sharp

G Div. C ε Leonis.

I B² 1727

B, or 2
wide lines

B κ Cass

I B2 1192

B3
very good

B2 ζ Cass

I B2 1772

B B, or 2
wide lines
κ Cass

Nov. 22, 1910

I B' 108
very narrow & poor

A A
4481 4128-31 seen
~~Camelop.~~ (2 Camelop)

I B' 245

B5 poor at K region

τ Arietis.

I B2 1233

A
2 Camelop.

I B2 1709

F5 ac. F8 - G
nothing pec.
lines not so sharp as in 2 Gemin.

α Persei

Nov. 22, 1910

I B2 1156

K2 absorption marked
Region of shorter λ than Hγ
K is very fnt.

ε Peg.

I B2 1718
B, lines wide & ill. defined
B κ Cass.

I B2 521
A:
Hyd. very wide, metallic lines fnt.
K not seen
14 Comae

I B 464

B5 or 8 4026 strong.
Hyd. very strong
τ Arietis 4481 not quite equal to 4471

Nov. 22, 1910.

I B^1 209

w Can. Maj. B3

Hβ, Hγ bright.

I B^2 691

Sp. almost continuous.

Faintest trace of Hγ and Hβ dark.

May be ζ Puppis but I should never have recognized it had I not already seen it on this plate.

I B^2 667

A good.

A almost no lines seen except hydrogen and K

μ Leporis.

Nov. 22, 1910

I B^2 783

Nothing but hydrogen lines.

ζ Puppis.

I B^5 20

A^2 – A5

K not seen clearly enough to class with certainty.

A3 Metallic lines not very strong

α Cancri.

I B^1 390

B3 good

γ Cass

Nov. 22, 1910

I B² 718

A good

μ Serpentis.

I B² 1178

K, lines sharp.

α Arietis

I B² 2102

Hδ quite strong

Hβ and Hγ not very well

✓ marked

α Persei

I B 472 a

A sharp lines

η Leonis.

Nov. 22, 1910

January 23, 1911 23^L

Independent classification of certain spectra from C plates, in answer to Dr. Albrecht's letter to Prof. Pickering

C 1309 very dense τ Herculis
B3 Sp dense

C 3861 ~~67~~ ~~Herculis~~ Ophiuchi
B5 pec. Lines very well marked
Region of K somewhat peculiar

C 2440 γ Corvi
B8

C 2371 γ Pegasi
B3

C 1638 Too dense γ Pegasi
B3 on this plate. faint lines do not show

C 1030 γ Corvi
B8

C 1492 β Orionis
B8 or possibly A sharp lines
4 Prisms dispersion too great for classification

C 1743 ε Cassiopeiae
B3 Lines hazy

C 1995 very poor plate ι Herculis
Too poor
B3 on this plate Lines hazy

Jan. 23, 1911.

~~C 17~~ ζ
C 1377 ζ Cassiop
B3 on this plate

C 1369 η Lyrae
B3 Lines wide

C 399 β Orionis
B8 Lines narrow

C 2164 ζ Cassiopeiae
B3 Lines little sharp

ζ
C 2635 ζ Draconis
B5 definition very poor.
C 1876
B3 Too poor.

C 1355 ζ Draconis
B5 Too dense

C 753 Too dense ε Cassiopeiae

C 1333 67 Ophiuchi
B5

C 6772 τ Herculis
B5
C 917 ε Cassiop.
B3

Jan 24, 1911

Continuation of preceding

C 6584 β Canis Major
B1 Lines quite sharp

C 2590 very poor β Canis Major
may be B1 or B2

C 6581 η Leonis
A pec Lines sharp

C 6382 β Canis Major.
B1

C 6488 ε Canis Major
Line 4481 seems little stronger

C 6255 ε Can. maj. Line 4481 seems little stronger
B1

C 5489 η Leonis
very poor plate
A

C 2746
Plate too dense, B2 or 3,

C 1386
B3

January 25, 1911

C 10482
B2, Lines near Hδ fainter than in normal B2, but this may be due to denseness of the images

April 4, 1911.

Plates received from Dr. Schlesinger

					28, I
✓ ✓	357,	γ Gemin.	Cracked on edge		VIII a = A0
✓ ✓	916	δ Aquilae			XI a, b, = F0
✓ ✓	968	ι Orionis			I b = Oe5
✓ ✓	976	α Androm.			VIII P = A0p
✓ ✓	1044	28 Tauri	Pleione	Ink? on film.	V b, L. = B5 broad
✓ ✓	1062,	19 Tauri			V a = B5
✓ ✓	1103	18 Tauri		H.R 1144 B8	VI a, b = B8
✓ ✓	1128	21 Tauri			VI a, b = B8
✓ ✓	1186	β Persei			VI a = B8
✓ ✓	1335	θ Aquilae			VII a = B9
✓ ✓	1409	α Virginis			III b = B2
✓ ✓	1458	α Virginis			III b = B2
✓ ✓	1507	ο Androm			V C = B5 Comp.
✓ ✓	1751	α Can. Ven.			VIII ab = A0
✓ ✓	1854	β Aurigae	2 scratches on film		VIII a = A0
✓ ✓	1864	β Aurigae			
✓	1880	β Aurigae			
✓ ✓	2002	ο Persei	Film scratched		III a, b = B1 or 2
✓ ✓	2007	π⁴ Orionis			IV a = B3
✓ ✓	2010	ζ Lyrae			A3, A5
✓ ✓	2045	β Persei			VI a = B8
✓ ✓	2239	ζ Urs. Maj.			A3 pec. F5 super?
✓ ✓	2245	ο Persei	Film scratched		III a, b, = B1 or 2
✓ ✓	2361	α Can. Min	Film scratched		XII a = F5
✓ ✓	2368	α Leonis			VI b = B8
✓ ✓	2463	ω Herculis	Film scratched		IV a, b = B3
✓ ✓	2624	ε Herculis			VII a = A0

			28. I	
✓ ✓	2640	α Lyrae.	VII a =	A0
✓ ✓	2649	57 Cygni		B3
✓ ✓	2660	57 Cygni		"
✓ ✓	2701	β Librae	VI b =	B8
✓ ✓	2799	γ Cass.	L =	B p
✓ ✓ ✓	2837	φ Persei	L. =	B p
✓	2815 A.	β Cassiop.	~~F5~~ XII a, b. =	F5
✓ ✓	2949	π ~~η~~ Androm.		B 3
✓ ✓	2973	η Tauri	V a	B5
✓ ✓	2974	27 Tauri	V a, b	B5
✓ ✓	2994	23 Tauri	V a	B5
✓ ✓	3015	17 Tauri	V a	B5
✓ ✓	3016	20 Tauri	V a	B5
✓	3071	φ Persei	L	B p
✓ ✓	3184	φ Persei	L	B p
✓ ✓	3417	α Can. Maj.	VII a	A0
✓ ✓	4017	α Can. Maj.	"	A0

2 of β ~~α~~ Persei, one strong, one weak.

3 of β Aurigae, of which two strong ones show the double & single lines, and one weak one shows other ~~numerous~~ double lines.

2 of Leonis, one strong and one weak.

2 of ο Persei, showing that the K line is stationary.

2 of 57 Cygni, showing double & single lines.

2 of α Virg. " " " " "

3 of φ Persei showing change in character of spectrum with change of phase. No 2837, time of max. pos velocity. No. 3184, max. neg. velocity. No. 3071 at intermediate phase, showing distinct Helium lines. 2 of ζ Ursæ Maj. β Lyrae. Identical.

April ~~6~~ 5. 1911

Classification of the Allegheny Plates.

✓

VII a = A. 2624 ε Herculis
A0 Hydrogen lines rather broad.

2660 57 Cygni
Hydrogen lines double Fainter component tow'd red.
B8 4471, 4481, 4026 double.

β Aurigae 1854
/ Lines very sharp. ~~H K clearly separated~~
Hydrogen + calcium well separated at the H band. K = Hδ.
~~Sp~~ Faint lines probably burned out.
A5 or F.

VIII ab α Coron. Borealis 1751
Lines broad rather hazy
A2

γ Cassiop 2799
Br. line star. Hβ very bright.
Hγ seems to consist of two bright lines with a dark space between.
No absorption lines clearly seen

π Androm. 2449
B5 Lines rather hazy.

B8 β Persei 2045
B8 May resemble β Orionis. Lines rather sharp

April 6, 1911

✓ α Canis Maj. 3417
Hβ not seen Hγ Hδ Hε broad and hazy.
A0 K sharp.
A0 or A2

μ Herculis 2463
Lines very indistinct.
B3 B2 Helium lines are not well seen.
IV a, b

57 Cygni 2649
B3 B~~3~~5 Helium lines very poorly seen.

β Aurigae 1864
Hβ Hδ Hγ clearly double. K also double.
A2

/ 21 Tauri 1128
Hydrogen lines wide. Other lines very indistinct. Cannot classify. Too poor.

β Persei 1186
✓ B8

17 Tauri 3015
V~~b~~a
Probably B8 very poor of fine lines

April 6, 1911

Harvard Class.

Allegheny Plates.

β Aurigae 1880
Hγ Hδ (and K widely double.
A2

α Canis Min 2361

F5

F. Lines sharp.

ο Persei 2245
B1

B1

VII a
A

θ Aquilae 1335
A0

20 Tauri 3016
V a
Too poor to sub-divide
Some class of B stars.

A

Sirius 4017
Burned out
A0 or A2

18 Tauri 1103
B8? Too poor
Lines wide and hazy.
ο Persei 2002

April 6, 1911

Allegheny Plates.

2010 ζ Lyrae
F5 Line 4077 well marked.

357 γ Gemin.
A2 K line very sharp.

2974 57 Tauri
Faint lines not well seen. Too poor to classify exactly Probably B8 or 9

1507 φ Androm
A0 No lines seen except hydrogen + K line

976 α Androm.
A0, Appears to be somewhat peculiar
Line between Hε and K is well marked
4128, 4131 well marked 4026 seen.

1044 28 Tauri Pleione
Hγ double.
Only hydrogen line seen.
4026 perhaps glimpsed -
Maybe B8 or 9

2239 f Urs. Maj
F5

April 6, 1911

Allegheny Plate.

2973 η Tauri

$H\beta$ appears to be double Spectrum burned out. Nothing seen clearly except hydrogen 4026 perhaps glimpsed. Too dense to classify.

B8.

2368 α Leonis

Lines very wide. Only hydrogen, perhaps 4026 seen Too poor to classify certainly. May be B8

968 ι Orionis

Oe5

2837 ϕ Persei

$H\beta$ bright. consists of two lines

Scratch on film near $H\beta$.

$H\gamma$ sharp dark line superposed on a faint bright band $H\epsilon$ sharp dark line. $H\zeta$ much wider than $H\epsilon$. No other dark lines seen.

~~3071~~ ϕ Persei

$H\beta$ bright. Two bright lines

April 6, 1911

Allegheny Plate.

3071 ϕ Persei

$H\beta$ bright. 4471 dark line well seen $H\gamma$ sharp dark line superposed on faint bright band. $H\delta$ quite a strong dark line on a very faint bright band. $H\epsilon$ rather faint dark line. $H\zeta$ a very strong dark line. Traces of several helium lines seen.

3184 ϕ Persei

Nothing seen except hydrogen. $H\epsilon$ very faint $H\zeta$ well marked.

916 δ Aquilae

H+K equally strong.

F5

✓ 2640 α Lyrae Scratch on film.

A0 or 2 Very few lines seen except hydrogen and the line K.

2815 β Cassiopeiae

F5 to G Lines burned out.

April 11, 1911

Classification of some C plates.

γ Gem — C6474
A2. H band separated into Calc. & hyd.

α Leonis — C6385
B8. Lines broad.

γ Gem — C6344
A0–A2, Probably A1

γ Gem — C2265
A2

ε Herc. — C1887 ~~Op~~
A0. Lines very broad and hazy.

o Andr. — C2916
Composite.
Orion type blended with lines of Class A0 or A2. Lines near λ 4144 strong.

δ Aquilae — C1417
F?
Probably overexposed, for the solar lines are not well seen

Apr. 11, 1911

o Andr. — C2902
Composite. Orion & Class A.

δ Aquilae — C2790
F0

o Andr. Comp. — C2930
Comp. Orion & Class A.

o Andr. — C6074 2 prs.
B9?
very poor. Lines barely seen except hydrogen and 4026

π⁴ Orionis — C2540
B2

π⁴ Orionis — C1650
B2 or 3. Lines burned out.

α Cor. Bor. — C6801
A0. 4481 the only strong line except hyd. and line K.

α Cor. Bor. — C1037 4 prisms.
A0 or A2. Too great dispersion to classify well.

April 11, 1911

C6053 3 prs.

o Androm. B5. Lines wide and a haze of faint lines seen.

C4328.

π^4 Or. B2. Lines fairly sharp and faint lines well seen.

α Cor. Bor. C4135 4 prisms.
A2.

C6622

α Cor. Br. A2 from width of K line

C5956 2 prism

o Androm. B5. Lines very broad.

ζ Aquarii C28~~88~~90 Too poor.
A5?

C2640

ξ Librae B8

C1968.
A0

α Cor. Bor. Probably pec. as 4026 is seen, and K is well marked.

April 11, 1911

C2305

β Cass. F0

C6014 (2 prs.)

θ Aquilae A slightly peculiar.
K narrow + fairly well marked.
4026, 4128, 31 and 4481.
4481 is distinctly double.

C248~~8~~1
Too poor.

o Andr. B3–5 Fine lines not seen

o Persei C1737 (2 prs.)
B1

θ Aquilae C2019
A0 somewhat peculiar 4026 seen

C1569
Too dense

o Persei B1 or 2.

April 11, 1911

C 6309
α Cam. Min. F5. (good)

C 1268
α Leonis Too dense. No lines seen except hydrogens

C 6563
α Bootes K0 (good)

C 1964
μ Herc. B3
Hβ not well seen (too thin)

C 17190
2 sp.
β Lyrae The brighter has Hβ, Hγ and Hδ very wide and hazy, K very sharp,
& Class B3 ?
Fainter Class A5

C 15018
β Lyrae F0
Brighter only is well seen 4077 well marked

April 11, 1911

C 2214
F5
α Cam. Min. erythrosine plate

C 848
Hβ & Hγ bright.
φ Persei Several other bright lines and very faint dark lines.
Resembles γ Cas.
May be γ

C 1594
B0p

C 1615
B0p

April 1$\overset{4}{3}$, 1911

Allegheny Plates

23 Tauri 2994
Hβ double, two indistinct lines
Other hyd. lines wide

4026 seen. Several other helium
lines suspected
Probably B8.

π^4 Orionis Pl. 2067
B2,
Lines very sharp,
✓ Hε is divided into 2 lines, the
one of shorter λ being less intense. This
is probably calcium H

19 Tauri Pl. 1662
Lines thick. Hel. not well seen.
B5 or 8

B8

α Virg. Pl. 1409 B
B2 lines a little wide

α Virg. Pl. 1458
B2 Lines double, especially
towards violet.

April 14, 1911

Pl. 2701 β Librae
✓ Only hydrogen seen. Can not
classify with certainty.

May be B9. or even B8, as 4026
appears to be glimpsed.

Pl. 1103 18 Tauri
B8, lines wide.

Pl. ~~19~~ 21 Tauri
B9

Pl. 3016 C 20 Tauri.
B8 somewhat peculiar.
Lines 4026 strong, H4471 & 4481 as
in B8, but other ft. lines are
more numerous.

May 2, 1911

Lick spectrograms.
4458 B.
η Piscium
Compared with α Bootes on Lick plate;
no important differences seen.
Region of Hγ very faint and foggy on
✓ the Lick plate of η Piscium and
the lines are not sharply defined.

Hβ is perhaps somewhat more intense
than in α Bootes, but I should class
this (η Piscium)
K

4741 B
ν Herc.
✓ Too poor for comparison of lines.

θ Cygni seems to be exactly like α Can. Min.
Hγ and 4337 are equally intense
✓

ι Ceti
K0

May 2, 1911

DC 927 = H.R. 483

Classed F in H.R.

Mapped up with ξ Herculis (class G) and
✓ appears to be very nearly like ξ.
Certainly beyond Class F. Not like α Can
Min.

I A 7024 shows this spectrum
to be Class G, and certainly not F,

π Sag.
Fewer lines than α Can. Min.
✓
Hγ and 4337 equally intense.
F?

May 2, 1911
Leck plates.
ρ 2 Leonis

Too ft. towards violet.
Strong twr. red, & many lines
✓ and bands seen and a
tendency towards Ma's.
K5?

o Ceti 4553 C

✓ F5
Hγ = 4337. Like

ν α Hydrae 4678 A.

K0
✓ Appears blue exactly like α Bootis
except the lines are wider in α H

α Aquarii
Hγ is fainter than 4337
✓ Appears blue exactly like α Bootis.

May 2, 1911

α Cass.
✓
More contrast than in α Bootis.
K2

δ Can. Maj.
Lines much broader than in
α Bootis or α Cass.
✓

6 Vulpec.
Spectrum shows strong contrast
Many lines present.
✓ K5 or Ma

ω2 Scorpii.
Poor twr. violet.
✓
Class K0.

May 2, 1911

10 Urs. Maj.

F5

✓ Appears just like α Can Min

α Leonis

Peculiar strong lines

✓ Probably like α Can Min

Lines narrow + sharp in region

of good focus.

α Orionis

✓ Contrast very strong.

No decided break,

Prob. Class M

δ² Lyrae

✓ Breaks decidedly [illegible]

Certainly Mb

May 2, 1911

+285 D γ Cygni.

very strong lines of great contrast

DC 6880 = H.R. 5589

✓ Class Mb, very marked

By superposing, this is seen to be like δ² Lyrae

6504 C δ Draconis

✓ F5 sharp lines.

α Tauri.

~~430~~ 4937 F.

✓ Ma, Lines very narrow

4505 D γ Eridani.

✓ Appears like α Tauri.

May 2, 1911

5522 C ν Ceti.
✓ Rather poor. K or K5

ι Ceti.
✓ K or K5

7 Ceti
✓ K or Ma
Ma (best)

33 Piscium
✓ Fog poor.
K?

✓ DC 2141 = H.R. 1155
Ma or Mb.
very narrow

✓ 30 Piscium
Mb

May 2, 1911

τ⁴ Erid.
✓ Mb. Like δ² Lyrae

β Androm.
✓ K.

40 Lyncis
✓ K.
Badly scratched. This is my first examination of this plate, and the scratches were found on it

υ Urs. Maj.
Lines very sharp.
✓ Exactly like α Ori

✓ μ Gem.
Ma.

May 2, 1911

ρ Cass.
✓ Too poor.
Lines broad & burned out

36 Com. Ber.
✓ Too poor

δ Virg.
✓ Mb

α Ceti
Too poor

ο Tauri
More lines than in α Can. Min.
Yet alike α in Hγ region and
Hβ is very strong.
F8? or G

✓ ζ Andr.
Too poor.
G – G5

June 8, 1911

α Cancri.
Seeds plate.

Hydrogen lines are wide
All lines a little hazy.
35 lines counted bet. Hβ & Hγ,
some being very faint,
4481 is the strongest of these lines,
but it is not very conspicuous among
the others.

4227 very faint.

Iron line, 4046 is perhaps the
most conspicuous line except the
hydrogen.

The group from 4046 to titanium
4078 all quite well marked.

Region of K not very well seen
but the line appears quite wide.
K = 0.5 H.

June 8, 1911

Comparison of α Cancri & – Coma Ber. shows very slight differences. α Cancri appears to show more lines, but the strong lines are more conspicuous in – Com. Ber. Focus of the latter is poor, so it may be that the faint lines do not show.

I would not put these two spectra in different classes, from these plates.

December 8, 1911

Spectra of long period variables recently photographed.

193449. R Cygni. I 37349.
On edge of plate. Hβ, γ, δ bright. Portion betw. Hγ and Hβ is not like Md, but appears to resemble Class N, not having a wide absorption band which may be 4640 to 4750.

December 8, 1911.

Spectra Md

I 37302 (short) R [illegible] Oct 2, 1911.

Md. Hγ and Hδ bright.
Hδ = 10, Hγ = 9
Dark H & K well marked, no other bright hyd. lines.

December 8, 1911
Sp. Md.
T Cephei:

I 37272 (short) Sept. 16, 1911

$H\delta$ bright. 4227 dark, strong
$H\gamma$ may be faintly bright but
certainly not 1/10 of $H\delta$
Distribution of light nearly cont.
I 37277 (long) Sept 20, 1911

Bright $H\delta$ = 10, $H\gamma$ = 3 $H\zeta$ = 1

4227 dark very wide

? $H\beta$ appears like a Fr. dark line
but am not sure of the ident.

I 37291 (short) Sept. 26, 1911

Same or nearly the same as I 37272

I 37393 (short) Nov. 27, 1911

Bright lines entirely gone.

Dec. 8, 1911

I 37346 long Nov. 2, 1911

R Urs. Maj.:

$H\delta$ = 10 $H\gamma$ = 6

Compare with T Cephei on
I 37277

I 37386

$H\beta$ and $H\gamma$ bright, superposed
nearly upon $H\gamma$ and $H\varepsilon$ of

April 30, 1912

Yerkes plates.

ε Peg. & α Bootis

4227 much wider in ε Pegasi
Line 4275 also stronger in ε Peg

Bet. 4395 & Hγ, several lines much stronger in ε. However, the comp. Sp. of α is denser & lines may be indistinct.

In α Bootis, Hβ and comp. line are clearly sep. Not so on prism plates? They appear nearly equal

R Leonis Apr. 28, 1906.

o Ceti Jan. 5, 1907

Hβ bright in o not seen in R
Absorption greater in R at λ 4757 to Hβ
Line at 4739 stronger in R
Wide absorption on each side of 4617 much stronger in R.

April 30, 1912

Bet. 4550 & Hγ numerous fine dark lines in o, wide absorption spaces in R.

R Leonis has bright lines which are not seen in o Ceti. Strongest is at λ 4202, another at 4378 appears, and two are in the violet, about 3905 & 3890. (Hζ)

May 8, 1912

Yerkes plates

Two stars of Class A,

μ Serpentis & 2 Camelop.

very different in fine lines.
4128,31 strong in 2 Camelop, & not visible in μ Serpentis.

μ Serpentis is like Sirius
2 Cam. is like η Leonis having sharp lines of pec. intensity.

2 Cam. resembles τ^9 Erid in intensity of 4128,31 and several other metallic lines, except that one near Hγ, (4233?) is much stronger in 2 Cam.
Hydrogen lines in τ^9 are wide, while they are very narrow in 2 Cam.

η Leonis Yerkes and Harvard compared
A careful comparison shows same lines present but they do not stand out on the Yerkes plates as on the Harvard.
Lines 4173, & 4179 appear stronger on the Harvard than 4128,31, but slightly fainter on the Yerkes. May be due to definition.

~~May 8, 1912~~
Yerkes
o Ceti on I B^2 95-2

Hβ, Hγ, Hδ, Hε and Hζ bright.

Hδ strongest, then Hγ, Hβ, Hζ and Hε very faint.

Line

June 4, 1912

o Tauri
appears like α Bootes, except that
lines are wider

✓ Class K

ε Ceti.
More like α Can. Min.
✓ F85. Lines very broad, & indistinct

η Pisc. & δ α Aquarii alike. Lines wider in
η Pisc.

✓ ξ Herc.
G5

✓ γ Lep F5
nearly like α Gem. Min.
Lines not so sharp

DC 927
K0

June 4, 1912

α Tauri
Resembles α Bootis more than α Orionis
in wid. of lines,

ι Ceti more lines than in α Bootes.
✓ but not like α Orionis.
K5

✓ ο Ceti
F5 lines wide.

φ Capric.
✓ very poor, lines not sharp
F5

η Ceti
✓ Ma, or may resemble α Tauri
Most like ι Ceti

June 4, 1912

33 Piscium
✓ K. Lines wider.

θ Cygni
✓ F5

✓ υ Hydrae
K0 Like α Bootis.

δ Virg.
✓ Mb. Lines very strong, stronger than in α Or.

✓ γ Herc.
Looks F5

✓ π^3 Or.
F5
Like α Can. Mi.

June 4, 1912

ξ Scorpii
A5. Lines wider, but no. &
✓ intensity like α Can. Mi

40 Lyncis
K0 Like α Bootis.
✓

γ Cygni Lines narrow & very sharply defined. Div. c.
Like δ Can. Maj. only lines are narrower.
Line b strong in both.

✓ DC 2141
Ma

✓ ι Leonis
F5, broad.

✓ ρ^2 Leonis
Ma

June 4, 1912.

✓ 30 Pisc.
Mb.

μ ~~α~~ Urs. Maj.
Mb

✓ 6 Vulpec.
Ma

ν Ceti
✓ Prob. like ο Ceti
Line a not like M

γ Erid.
✓ Ma. Exactly like α Or. except
line a which is like ο Ceti

✓ d Drac.
G

✓ π_1 Sag.
F5

June 4, 1912

✓ μ Gem.
Ma

χ¹ Orionis
✓ F5

✓ κ Gem.
K0 like α Boötis.

✓ β And.
Ma. Exactly like α Or.

ω² Scorpii.
✓ G. Like α Aquarii.
Not much diff from α Boötis.

DC 6880
+ Urs. Min.
+ R. 5589 Mb. Breaks strong,

✓ ο Tauri
G0

June 4, 1912

✓ 10 Urs. Maj.
F5

✓ α Cass.
Ko. Like α Bootes.

✓ δ^2 Lyrae
Mb

✓ β Vir.
G

/ 36 Com
Ma

Venus.
Lines sharp.
Compare Class G.

June 25, 1912

Count of lines in α Bootis tech.
Hγ under 4558

1st	266	
2nd	254	Some very faint.

October 25, 1912

Gas. Nebulae

Neb. in Cygnus. Bright lines seen

✓

$H\gamma = 10$
5007 ~~H~~ 30
4959 ~~5005~~ = 6
$H\beta = 8$
$H\delta = 4$
$H\epsilon = 4$
$H\zeta = 1$?
388 3 = 3

Trace of a few br. lines bet. $H\beta$ and $H\gamma$.

Darkening of sp. near 3888 probably due to another star.

√

October 28, 1912

Gas. Neb. 3 58.4 +60 39

Photom. magn. 9.16
I 24404 a good ^chart plate barely shows this object. No sp. of it.

Nova Persei No. 2.
I 32382 Dec. 2, 1904
Too faint. Get plate taken earlier

5 22.8 − 12 46 N.G.C. 418

I 36330 (short)

✓ $H\gamma = 10.$
$H\beta = 7$
$H\delta = 3$
$H\epsilon = 1$
5007 = 1
3724 Line in violet = 4
$H\eta = 1$

Image very hazy around line 3724, which seems to extend beyond the cont. sp.

Incorrectly stated in 56, 175 that $H\beta$ is stronger than $H\gamma$.
$H\gamma$ is ^also stronger on I 32606

Oct. 28, 1912

5 48.9 +46 6
✓ I ~~3516~~1 35137
only lines distinctly seen are
500~~8~~7, $H\beta$ and 3724

$H\beta$ = 1.5 5008
3724 = 1.5 2 $H\beta$

$H\beta$ = 2
✓ 500~~8~~7 = 1
3724 = 3

Cont. sp. seen quite distinctly
with faint absorption and emission
lines.

On I 35161 the sp. is fainter

✓ 6 17.1 −12 56
B 20581
Sp. consists only of bright lines; cont.
sp. not seen
$H\gamma$ = 10 broad & hazy
500~~8~~7 = 40
4959 = 10
$H\beta$ = ~~25~~ 10 narrow
?4686 = 20 narrow

$H\delta$ = 12 narrow
$H\epsilon$ = 20 "
?3889 = 30 "

Oct. 29, 1912

3724 strongest 5 48.9 +46	Neb. having 500~~8~~7 strongest Neb. in Cygnus 6 17.1 −12 56	~~$H\beta$ strongest~~ 5 22.8 −12 40

Oct. 29, 1912

+66°1066
Almost like Neb. in Cygnus
but differs in having line near
✓ Hγ, of ~~short~~ greater λ and ~~Hζ~~ Hε
stronger

−12°1172 5 22.9 −12 46
See also p. 63 Neb. 418

B18649 long dispersion

Hγ = 10
Hβ = 15
✓ 5007 = 2
4959 = 1
Hδ = 5
Hε = 3
Hζ = 1
3724 = 10

B18522
Hγ = 10
Hβ = 8
Hδ 5
Hε = 3
Hζ = 2
3724 = 15

Nov. 6, 1912

−12°1172 5 22.9 −12 48
B18556 long disp.

Hγ = 10
Hβ = 15
✓ 5007 = 1
4959 = ½
Hδ = 3
Hε = 2
Hζ = 2
3724 = 15

Assume Class I = Neb in Cygnus
5007 strongest
6 17.1 −12 56 like I, with 4688 seen
Class II = −12°1172
Hβ, Hγ, 3724 strongest
~~6 17.1 −12 56~~

5 48.9 +46 6 may belong to II, as 3724 is
strongest. Image f.p. Cont. sp. seen

Nov. 8, 1912

Gas Neb. on I 37472.
7^h 27.3 +21° 7 +21° 1609

✓ +21° 1609 is the neb. and it is superposed on +21° 1610, Class A.

I 15764 21 3.3 +41

+41° 4004
Faint.
5007 strongest line

Nov. 9, 1912

Type V in B 35952 (broken & mended on glass.
15 55.0 −62 28 (1900)
Ob Band 4688 strong others faint, but it appears to be like No 77 on I 37891

~~I 15764~~
~~+41~~

Nov. 15, 1912

Nova Gem. No. 2.

Nov. 16, 1912

Nova Sag. ~~[illegible]~~ No. 1

B 21258 Apr. 21, 1898.

Lines seen bright

$H\beta = 9$

? 4633 = 8, wider than β or γ — Same as in Nova Gem. No. 2

$H\gamma = 10$

$H\delta = 6$

$H\epsilon = 3$

$H\zeta = 2$

? $H\eta = 1$

Ft. cont. sp. 3 narrow br. lines near 4633, towards violet

No nebular lines seen on this plate although it is stated in 56 6 that they were present on this date. Perhaps there is another plate.

Nov. 20, 1912

Spectrum of Nova Persei No. 1 (1887)

B 1848 very faint image.

Strongest bright one and the only one which is really distinctly seen appears to correspond with $H\epsilon$, Nebular lines not seen.

Nov. 27, 1912

+ 41° 4004 = I 37878 7027

Lines seen

5007 = 10 Strongest line 100
4959 = 2 20
✓ $H\beta$ = 2 20
4685 = 1 10
$H\gamma$ = 1 10

I 38140 Gas Neb. 23^h 21. +41 59
+41° 4773
5007 strongest line

Lines seen

5007 = 20 50
4959 = 5 12
$H\beta$ = 4 10
4685 = 4 10
✓ 4363 = 1 2
$H\gamma$ 4340 = 4 10
$H\delta$ = 3 8
$H\epsilon$ = 3 8
$H\zeta$ = 1/2 1
3889 = 5 12

Nov. 27, 1912

B40276 −39°6137

Very pec. A bright band approx. 5007 with a well marked cont. spectrum, Hγ, Hδ and Hε dark.

5007 very broad, int. 5 –

Chart plate shows image surrounded by nebulosity, and no other plate shows the dark lines.

This is unlike any sp. so far observed

I38041 Orion Neb.

A large neb. overlapping several stars. Bright bands

Nov. 29, 1912

R S Ophiuchi on B21825

Bands seen

Hβ = 10
4688 = 8
4633 = 5
Hγ = 7
Hδ = 5
Hε 2
Hζ = 3

The relative intensities of bands 4633 and 4688 resemble those in A.G.C. 22763 Class Oe on B4963.

No trace of 5007 or other nebular lines except 4688, which is present in several gaseous nebulae

November 29, 1912

Nova Gem. 1, 063730
Spectrum
First photographed March 25, 1903
before discovery in Oxford.

Other photos on

show no nebular lines.

I 30216 March 25, 1903 (small disp.)
Near edge + focus very poor
Bands seen

$H\beta = 4$
4640 ~~4686~~ = 9
$H\gamma = 10$
$H\delta = 5$
$H\epsilon$ 3
? $H\zeta$ 1

I 30252 (long) Mch. 29, 1903
$H\beta = 10$
4640 ~~4686~~ = 8 broad
$H\gamma = 10$
$H\delta = 9$ very broad
$H\epsilon = 1$

This resembles sp. of Nova Gem. No. 2 in Mch. 29, 1912

November 30, 1912

Nova Gem. No. 1

Found at Oxford. See H.C. 70 for
history of this Nova.
Plate taken Mch. 2, 1903 did not show it.
" " " 6 " Nova 5.08

First spectrum on March 25 19 days
after its appearance on chart plates

I 30250 Mch. 29, 1903

I 30345 Apr. 20, 1903. (small disp.)

$H\gamma = 10$
$H\delta = 12$
4640 = 18
$H\beta = 2$
Dark line seen probably $H\epsilon$.

I 31462 Feb. 11, 1904
Sp. of Nova Gem. 1 not seen
No plates found after this sp. changed into
neb. Sept. 1903, as announced at Lick.

Nova Centauri

Sp. B14151

Chart B14072

Sp. on B14151, is entirely unlike any other Nova than seen. It appears somewhat like a star of Class R. No other plate found so far on which this spectrum appears.

Nova Normae

1893 July 10	B9767	neb. obs. by mistake ~~Hγ=10 5007=.81, Hδ=4, Hε=5 Hζ=2~~ Like Nova Aurigae & η Carinae	1893, July 10
Aug. 5, 1893.	10092	On extreme edge. Too poor.	
	10572	Chart	
Best. Enlarge?	10789	Hγ=10 Hβ 2, 5007,1, 4688,2, Hδ=3. γ very bright. Class Pc	1894, Feb. 28
Too poor	10819		
94, Apr 28	11048	Poor Hγ=10 5007=2, 4959=1 One br. line	
~~Images~~ Lines curved 1894, May 30	11327	Hγ=10 4688=3 5007 wide Hδ=2 Hε=1, Hζ=1	

Nova Sag. 1   188613

ʃ B 21251

B 21258   Enlarge?   No neb. lines.   Sep. 71

~~21329~~

~~22094~~ ?

B 23023   I 22570 n.S.

not cor. I 23263   1899 July 31   I 22594 wgt.

I 23279   I 22960 Chart.

B23042. Sep. 150.   5007 & 4686 seen

June 15, 1899.   Hγ strongest line. 4363 faint;

Hγ=10   5007=6   4686=8   Hδ=2

B23023 June 9, 1899

Hγ=10

Hδ=1

Hε=1

4653 = 3

Hβ very indistinct

5007 not clearly seen, maybe poorer region

Nova Sag. 2

B 41397, May 31, 1910   Sep. 152.

Bright hydrogen lines, with dark edges.

7.8 on March 21, 1910.

~~No other Sp-plate found so far~~ ~~not on~~ off ~~edge of B41501, June 26, 1910.~~

Probably unlike most of the novae as 4686 or 4640 not seen on B41397 two months after appearance, and no neb. lines seen.

Probably like Nova Aquilae, 2.

B 41706 July 25, 1910

Nova Aquilae No. 1 191500

B23253 $\overset{+4363}{H\gamma}$=10, 4688=3 Hβ=2 5007=1 Hδ=3, Hε=1 Hζ=1/2
24086
24449
~~25533~~

July 3, 1899. Best for enlarging. Discovered on B23253. See if an earlier sp. plate can be found, as it was already a neb. on this plate. Class Pe

Sept. 7. 99 B24086. On edge, Hγ and ~~4688~~ 5007 only seen. Probably like sp. of July, except that 5007 is stronger.

Oct. 27. 99 B24449. On edge, but a certain change in the increased intensity of 5007.
Now Hγ+4363 =10, 5007=10, Hδ=1
Others not clearly seen.

Nova Aquilae 2 185604
C15907 sp. fh.
C15938 (Chart)
I33313
I33294

C15907 Aug. 18, 1905
Hγ, Hδ, Hβ br.
Hγ = 10
Hβ = 30
Hδ = 5
Perhaps dark on edge of [illegible].
No neb. lines. fh. object.
Traces of two br. lines betw. Hγ & Hδ.
4472 & 4646 in Bull. 197.

I33313. Sept. 21, 1905.
Very faint 4 br. lines seen which appear to be Hβ, Hγ, Hδ and 4686. Probably like +30° 3639.
No strictly neb. lines seen.
I find no record of this sp. becoming nebular

Nova Arae

B41574.

Image faint, and showing the bright lines

$H\gamma$ = 10 probably overlapping ~~4686~~ 4363
4688 = 2
$H\beta$ = 1
5007 = 1
$H\delta$ = 1

already nebular

B41704 July 25, 1910 short.
$H\gamma$ = 10
4670 ~~4653~~ = 2 Best plate.
$H\beta$ = 2
5007 = 1?
$H\delta$ = 3.
$H\epsilon$ = 1

B41738 Long. sp. ft.
41755

Dec. 10, 1912

Gas. Neb. 7 23.3 + 21 7
See also p. 68.

2392

I37477
✓ superposed on +21°1610
Bright lines seen

$H\gamma$ = 16 Dark lines of +21°1610 also
$H\delta$ = 20 seen. The superposition makes
4686 = 30 the images indistinct.
$H\beta$ = 8
4959 = 10
5007 = 40

Gas. Neb.

From 56, 6 it appears that 103 gas. neb. have been found here independently, and 14 more have been found by looking for those announced elsewhere.

The following Novae are also given as having changed into nebulae

Nova Persei
Nova Aurigae
Nova Gem. 1
Nova Vel.
Nova Normae
Nova Arae
Nova Sag. 1
Nova Aql. 1.

The line 5007 is generally considered the most characteristic nebular line, yet it is not seen in the following nebulae.

No.	Nebs showing 5007	4686	4636	3724	Bech. Pl.
40			0		B22155
1644					

Nova Lacertae

No. ~~3724 3889 Hg~~
40

Formerly Espin.
5.0 mag. on Harvard plate taken Nov. 23, 1910.

I 37015 Jan. 5, 1911

Jan. 23 & 24, $H\gamma$ growing brighter.

I 37047 Jan. 30.
Estimates of bands.

$H\gamma$ = 10
4640 = 5 8
$H\beta$ = 4
5007 = 1
$H\delta$ = 5
$H\epsilon$ = 1
~~4640 = 8~~

I 37000 sep. marked & ident.
I 36992 " " " "

Nova Carinae (RS.)

B 13027 Found Apr. 14, 1895.

$H\gamma$ = 10 accomp. by dark on edge of sh. λ
$H\delta$ = 5 " " " " "
$H\epsilon$ = 1 " " " " "
$H\beta$ = 1 " " " " "

Traces of other bright lines bet. $H\gamma$ & $H\beta$.

B 13772 June 15, 1895
Very faint and plate badly scratched.
Appears to consist of 2 bright lines, $H\gamma$ and 4686 with traces of other fainter ones.
No trace of 5007.

Plates 15042 & 15132 show no trace of lines, so probably too faint to see after June.

Evidently we have no plate showing this object a gaseous nebula.

See also p. 187.

No.		3724	3869	Hζ 3889	H? 3968	Hε 3970	4026	Hδ 4101	Hγ 4340	4363	4471	4686	Hβ 4861	4959	5007	
40	very fnt. on long plates.	12		..	..	..		9	10	..	..	15	6	..	..	I 32399 I 35068
1644	Ft. on short.		Disp. too small to be sure whether this is 3869 or Hζ.	1		2		5	10	Perhaps superposed on Hγ.		..	..	?	2?	B 22155. Sep. 94.
651	Too fnt.								n.s						5?	
1747	Too fnt.								n.s						10?	
1535			3			2		~~8~~ 3	10					Part. unknown in 5007	100	I 33065
2105																
1700																
1714																
2111																
1743																
2114																
1763																
2115																
2116																
2117																
2126																
2127																
418		15		2	..	2	..	3	10	..	..	~~15~~ ..	15	0.5	1	
1976																
2029																
2022													..		50	
2070 (30 Dor.)			5	..		3		8	10				..		40	
2077			?	..		6		5	10							
2079																
2081																
2145																
2149																

No.	3724	3869	Hζ 3889	3968	Hε 3970	4026	Hδ 4101	Hγ 4340	4363	4471	4686	Hβ 4861	4959	5007	
2165		30 ~~or~~	30?		20		12	10	..	..	16	16	10	40	B20581
2159															
2392							20	10			30	8	10	40	
2438															
2440															
2448															
2792															
2867															
2501															
3132															
2553															
3211															
3242															
2621															
.. 11^{h} 240 −52 23															
3918															
4361															
.. 12 30.4 +83															
4191															
4274															
.. 13 44.6 −50															
5315															
4406															

Dec. 11, 1912

Gas neb. 1644   1 62 −73 44

✓ Faint. Seen quite clearly on B 22155. A faint wide brightening is ~~perhaps~~ probably 5007 + 4959 combined.

Gas neb. 40.   0 7.6 +71 32

✓ On I 32399, a wide hazy portion of the sp. appears to be at pos. of neb. line 3724.
It is uncertain whether this is a neb. or a Type I.

Gas. neb. 1535   4 9.6 −13.6

Pl. 33605

Dec. 11, 1912

Gas. neb. 651.

Pl. B 1047. very ft., One bright band,
✓ may be 5007, but not good enough to make a study of.

Gas. neb. 1747
I 32414 see note on cover as to identif.

One bright ~~band~~ seen, not certain which it is.

Gas. neb. 2070   30 Doradus
✓ B 24210
Line 5007 seems to extend beyond the cont. spectrum. The effect is that of a cluster with a neb. superposed. Lines seen as in Table.

Dec. 13, 1912

I38041 Gas neb. Neb. of Orion

✓ $H\gamma = 10$
$H\beta = 5$
$5007 = 25$
$H\delta = 8$
$H\epsilon$?
$H\zeta$?
$3724 = 20$

I30345 Nova Gem. I on Apr. 20, 03

December 17, 1912

B24594 Gas. neb. ~~2438~~ 2440
Short.
— 17°2105 —

$H\gamma = 10$
$H\beta = 2$
~~4186~~
$4186 = 4$
$5007 = 100$ prob. comb. w. 4959
$H\delta = 2$
$H\epsilon = 3$
$3869 = 6$
$3724 = 2$

Get long disp.

B24594 Gas. neb. 2438

Very fnt. One band. This looks to me more like Class Oa

December 18, 1912

Neb.

2448 on B21452.

3869 = 12
Hε = 6
Hδ = 2
✓ Hγ = 10
4686 = 3
Hβ = 2
5007 = 80

Neb. 2792 on B38418
Too ft. Only 1 ft. line
✓

Neb. 2867 on B38748
9 18.6 -57 53

✓ Hγ = 10
Hβ = 12
4959 = ~~40~~50
5007 = 100
Hδ = 1
Hε = 11
~~3889~~ 3869 = 40

Dec. 18, 1912

Neb. ~~2867~~ 2501 ~~on~~ B38748 9 35.9 -59 38.

✓ Only one line seen, may be 5007, but am not sure.

B9374 Neb. 2501
Better than B38748.
Lines seen.

Hγ = 10 & sharp.
✓ Hβ = 1
5007
4959 = 1~~0~~5
Hδ 1
Hε 1
3869 1

on B31795 — only 1 line seen of Neb. 2501,

Dec. 20, 1912

Neb. 3132 on B40276

Wide bright band at 5007,
Hβ not clearly seen
$H\gamma$ = 10 dark & narrow
✓ $H\delta$ = 15
$H\epsilon$ = 8

✓ Violet end not clearly seen, but there appears blue wide band of absorption.

Nothing else, so far seen is anything like this.

Same appearance on B19157, but not so good.

Dec. 20, 1912

B34089 Neb. 2553

✓
Hβ very ft.	1
4959	8
5007	15

Get B12901

✓ Neb. 3211 on B31795, B9115
Nothing seen on B31795 except 4959 and 5007. Look up all short disp.
not so good on B9115 short.

Neb. 3242 on B11308, B13136

✓ B13136 short disp.

$H\gamma$	=10	Hβ	1
$H\delta$	4	4686	2
$H\epsilon$	7	4959	100
3869	12	5007	

Dec. 24, 1912

Neb. 2621   10 56.5 −66 42

on B 36119 (long disp.)

2 ft. bright lines.
probably 5007, + 4959

Ge B 13037, short.

n.s.

✓

Dec. 26, 1912

B 4951   N. G. C. 3918

Lines narrow.

Hγ = 10
5007 = 60
4959 = 20
Hβ = 1
4685 = 1
? = 1   Line bet. 4685 + Hγ
Hδ = 2
Hε = 6
3869 = 20   Hζ may he!
3726 = 1

✓

B 4981   Neb. 6891
short disp.

Hγ = 10
5007 = 70
4686 n. s.
Like 6828

✓

Dec. 26, 1912

Neb. 6818 on B9807
Poor. 5007 strongest
3869, 4685 seen
May be like D16047.

Neb. 6741 on B12038
✓ fbr. Only one bright band
Can not be sure whether it
is 5007 or 4686

Neb. 6790 on B10125
✓ Same as Neb. 6741
One br. band

Neb. 1297 on B9560
✓ Same as Neb. 6741

Dec. 26, 1912

Neb. 4846 on B23042
5007 strongest
Hγ also seen
Prob. Cygnus type

~~ob~~ Neb. 4816 Nova Sag. 1.
on B23042 June 15, 1899
Hβ, 4640, Hγ bright.

Neb. .. 19 0.5 −6
on B37580. see
2 br. lines may be 5007 or
4686.

Neb. 6790 on same plate.
5007 strongest.
Probably like Cygnus

Dec. 26, 1912

Neb. 6818 in B 40586

✓ Like D I 6047
4686 present
5007 strongest

Hγ	10	5007	}80
Hδ	3	4959	}
Hε	3	Hβ	1
Hζ + 3869 =	9	4686	.5

✓ Neb. 6572 in I 35416

5007 strongest

Neb. 4776 in B 20243

Like Cygnus

Dec. 27, 1912

B 37580, neb at 19 0.5 − 8 8′
Not ~~known~~ in N.G.C.

Two bright bands which may be 5007 & 4686. Map up.

Jan. 13, 1913

I 35416

Gas. Nebs 6572 18 7.2

+6° 3649

Rather ft. & near edge.

$H\gamma = 10$
$H\beta = 25$
5007 } = 60
4959 }

✓

$H\delta = 1$
$H\epsilon = 1$
$H\zeta = 2$ 3869 may be superposed

I 32499 Neb. 6543

$H\gamma = 10$
$H\beta$ 5
5007 30 4959 probably superposed
$H\delta$ 7
$H\epsilon$ 6
$H\zeta$ 4 wide, 3869 prob. enhanced

✓

Get long disp.

Jan. 15, 1913

B 9767 Nova Normae

small disp.
ft

$H\gamma = 10$
$H\delta = 7$
$H\epsilon = 8$
$H\zeta$ or 3869 = 6

5007 = 40

Prob. neb. on plate obs. by mistake.

B 11308 Neb. 3242

$H\gamma = 10$
$H\delta$ 5
$H\epsilon$ 8
3869 20
$H\beta$ 2
4868 1
4959 } 100
5007 }

✓

Jan. 15, 1913

I 10734 Neb. 2189 7 19.5 +9

1 br. line ~~[illegible]~~ sp. on edge of plate

I 37428 see Bk. 56, no. 109.

Neb. 2149

✓

Hγ 10
Hδ 1
Hβ 8
4959 3
5007 10

On I $_{32859}$ (short) near edge & poor.

Jan. 15, 1913

B 41745 Neb. 5882.

Like Cygnus.

✓

Hγ	10	Hβ	1~~2~~
Hδ	5	4959	20
Hε	9	5007	60
Hζ	~~12~~ 15		

4686 n. s.

Jan. 22, 1913

B 9398 9 50 −56.7

Several br. line objects on plate.

object 3002 = 618 on B 31795 / mg.

10h 13.5 − 57 25

One rather strong br. line

✓ Supposition shows this to be 4686

Therefore this must be Oa or possibly Pb, but as no other lines

---

Jan 24, 1913

B 15241 Neb. 2022

~~Fl.~~ wrongly ident.

✓ ~~Hγ 10~~
~~4686 H 9~~
~~Hδ 2~~

5007 15
4686 18
Hγ 10
Hδ 1

Others lines n. s.

B 40305

✓ 1 br. line Fl. object.

See also B 38548. Ch. 27290

Jan 24, 1913

B19892

Obs. 390 = -61° 3826

Too ft. Does not look like Type V. Pec. no br. lines, probably hydrogen.

Obj. 391 = -61° 3791

13 26.8

2 br. lines & Hδ barely seen br.

✓ Probably Oc

Neb 4191

very ft. on B19892
✓ Stronger on B35759. only 1 line seen

Obj. 389
Oa.

Jan. 24, 1913

Neb 5315 ~~B37575~~
B21696

5007 =	40	
4959	9	
Hβ	20	
✓ 4686	5	
Hγ	10	wide
Hδ	3	wide
Hε	8	
Hζ	1	Other lines narrow
3869	10	
3727	2?	wide.

Neb 4274

✓ very ft. May be 5007

B 37575 Neb. 4274

✓ Wides. Remark sugg. a group of 3 gas. neb. in line.

Hγ = 10
5007 = 100 4686 = 3
Hβ = 3

Jan. 24, 1913

✓ B19872
Neb. 6326
very faint 1 faint line

Jan. 29, 1913

Type V −58° 28′45″

✓ 10 48.7 −58 51

"New on 21154"
on B21379 Oa 1 br. line
fr. object.

−58° 2566 10 37 −58 15

✓ Oa on B21379
37574

Nova Vel. on B 37574
Lines seen Sl. 30–34

very narrow.
Resembles Nova Gem
in Nov. 1913

Hγ	10
4363	100
4640	20
4686	20
Hβ	5
4959	10
5007	25
Hδ	20

✓

Nova also on B37600
but not ~~so~~ good

Jan. 29, 1913

B37600

Neb. 11 24.0 −52 23

✓ 1 rather wide band

Near edge. Difficult to distinguish bet. gas. neb. or type V.

Probably uncertain whatsoever.

Jan. 30, 1913

B31795 long.

Obj. 617 9 51.6

Oc, Bands 4633 & 4688 seen

but whereas in Lyr. stars 4688 is stronger, in 9 51.6, 4633 appears a little stronger.

Obj. 632 10 40.1 −59 36

Oc. A.G.C. 14684

Obj. 631. Neb. 2501

Better on B9374 short. Obj. 2968 Sep.

Jan. 30, 1913

B 36119
Type E pec. in line 3869
11 2.3 −64 58

Neb. 2621   10 56.5 −64 42

Two lines like 4959 & 5007.

✓

I883   N.G.C. 6210

Hγ 10
Hδ 8
Hε 15
Hζ & 3869 {25
✓ 5007 {100
4959
Hβ 1
4686 1

Jan. 30, 1913

B 9435   Neb. 5882

Not so good as B 11048.

✓

B 11048   Neb. 5882

Hγ 10
Hβ 5
{5007
{4959 100

See p. ~~11~~ 111

Nova Norma.
One br. line seen

B39201   Neb. 5873

✓

		B21793
Hγ	10	10
Hδ	5	8 2
Hε	7	9
Hζ 3869	8	15
N Hβ	1	3
4686	1	3
5007	{70 wide	50
4959		30

Jan. 30, 1913

B 36137
✓ Neb. ~~6629~~ 6644
Two lines apparently 4959 & 5007

B 40317

N.G.C. 6523
Too diffuse

N.G.C. 6514
Trifid
Too diffuse

N.G.C. 6629 = ~~C~~ − 23° 14358
✓ 18 19.6 − 23
~~Two pt. lines like 4959 & 5007~~
Hβ and 4959, 5007 only lines seen

✓ ~~N.G.C.~~ − 21° 4864 Oa

✓ − 19° 4854 ~~Oa? Ob~~ Ob
neb. 6567
Two lines 5007, 4959 ?

Best on B24169,
Certainly like H.P. 1311

Jan. 31, 1913

B 42414
Neb. 17 56.0 − 24 24
Best on this plate,
Resembles Orion neb,
Wide band extends from Hβ to 5007,

3727 present
Hγ 10
✓ Hβ − 5007 10
Hδ 3
3727 12

Estimates very uncertain due to width of bands.

B 24169 neb. 6567
18 7.8 − 19 6
Gas. neb. obj. 672

✓ Hγ 10
Hβ 10
{4959 5007 100

Jan. 31, 1913

B23042 obj: 13353

Neb. 4846

Feb. 4, 1913

B18289 obj: 9545

CDM. −41° 3911 8, 9.9 −41 19.5 (1875)

Pec. bright lines. Marked on com as resembling η Carinae, but I do not see it.

Lines seen.

Hγ	10
Hδ	0.5
Hε	3
Hζ	0.2
3869	5
Hβ	3.
~~48~~ 4686	3

~~4636~~ 4363 superposed on Hγ, as plate B8897, large dispersion, shows.

Slight darkening may be 5007.

This pec. object ~~does not~~ appears in Vol. 56. 61, as Pec, and resembling η Carinae

Feb. 4, 1913

Nova Sag. 1 on B21258
Apr. 21, 1898

Hγ 10
Hδ 9
✓ Hε 3
Hζ 2

Hβ 10
4640 12 wider than Hβ or Hγ

No neb. lines.

Feb. 5, 1913

B8897 −41.0 3911 ~~3991~~ very flt.

Hγ 10
4363 13
Hβ 5
Hδ 3
3869

Feb. 7, 1913

B13757
Type V. Obj. 7277

One bright band. Could not classify from this.

Obj. 7280. Bright line bands seen. May be defect, as I see no trace of it on 24169 a better plate.

✓ B9415 Neb. 6153
One band.

✓ B42478 Neb. 6153
One band. may be 5007.

Feb. 17, 1913

Ring Neb. of Lyra.

I 34172 poor.

Lines seen.
5007, Hβ? & a wide band about Hγ. Get better plate.

March 4, 1913

B13027

Obj. 6510

R.S Carinae Nova

$H\gamma$ br. = 10

$H\delta$ 7

$H\epsilon$ 1

$H\beta$ 1

4640 1

No neb. lines seen

Best phot. on June 15, 1895

I10734 ~~Obj~~ Neb. 2189.

Probably a defect in I10734, since other plates such as I32497, much better, do not show it.

Also I10733, taken on same date, does not show it.

March 10, 1913

I34011

Neb. +83°357 no number in N.G.C. or Index

$H\gamma$ 10

$H\beta$ 1

✓ {5007 / 4959} 100

$H\delta$ 3

$H\epsilon$ 5

$H\zeta$ / 3869 } 10

Cont. sp. = 2

B40091 Neb. 4361 Herschel's Gas. Neb.

March 10, 1913

β 20243

Neb. 4776

Hγ = 10
4363 12
Hβ 15
4959 10
5007 70
Hδ 10 double?
Hε 15
Hζ ?
3869 40

Lines very narrow
Cont. sp = 0

March 10, 1913

I 34917

N.G.C. 6891

southern
Hγ 10
Hβ 1
5007
4959 60
Hδ 1
Hε 2
Hζ
3869 1

Cont = 0

northern

Neb. 4997

March 12, 1913

Neb. 4361   B 40091
Herschel's Gas. neb.
Faint
Hγ = 10
λ686 = 12

Not very nebulous looking on chart pl. B18457.

Too ft. mtf. pl. B40448.

March 13, 1913

B13846
Obj. 7743
Too ft.
This is N.G.C. 6445 found visually by Prof. Pickering

Pos. 17 43.3 −19 59

See if there is a better plate.
No idea of the class can be formed from the image on B13846.

B38104
40715 5007 seen wide
39280 5007 seen "
21786
17091
39488 not seen.

March 13, 1913

B39344 Neb. 16 29.6 −55 28

✓ Ann. in H.C. 158.

Image entirely v. ft. and as this plate shows ft. objects

B42468 not seen
B42463 not seen
B37595
41597 not seen

Neb 15 39.3 −60 53

B37619
Ft.
Hγ ~~10~~ not seen
Hβ 5
{4595
{5067 15

March 14, 1913

B35964 long f. Neb. 4364

One band out of focus, near edge.

B22853
Obj: 12962

Neb. 12962 = −36° 11341

Hγ 10
Hδ 1
Hε 3
{3869 10
3727 2
Hβ 0.5
{4007
{4959 60
4686 3

Neb. 4637.
Too ft. One ft. band may be 5007.
Omit in discussion if not seen on better plate.

March 19, 1913

B 22853

Type V

Obj. 12961
Oa? One br. band, near edge.

Obj. 12962 Neb.
See prec. page.

12963

12967 Neb.
Too fnt. Exist. other plate.

12968

12970 One br. band near edge.
Oa?

12971

March 19, 1913

B 22853

16 ~~35~~ 57.2 − 37 × 2

Obj. 12963
Oe.

B 11078 (long) shows this sp. to be
Oe or perhaps Od. Resembles
ζ Puppis in some respects.

March 21, 1913

η Carinae

X 6592
Br. lines conspicuous
Dark lines not clearly seen, merely spaces bet. br. bands.

X 6358
Too poor. Near edge.

X 10713
Br. lines only seen. Very poor.

X 6480 broken
Br. lines have strong dark bands on edge of shorter λ.

X 10705
Too poor

X 4044
Too poor

X 10658
Too poor

X 10703
Too poor

March 21, 1913

X 10667
Br. lines as in 10855

X 10649
Br. lines as in 10855

X 10644
X 10513
X 10505
X 10482
X 10494

March 21, 1913

B 37619

Gas neb 15 39.3 -60 53

Faint, Hγ perhaps glimpsed but not ~~surely~~ clearly seen.

Assuming it 10,

then 4686 = 30

{5007 = 100
{4959

Chart plate B2 used to identify.

March 22, 1913

I 34060 . Neb. 4593

Long {I 22297
{I 23148
{I 23015 not seen, or too faint.

I 34060 4593

✓

Hγ 10

5007 10

Hβ 1

4686 0

Hδ 3

Hε 2

{Hζ 2
{3869

March 22, 1913

B22852 Neb. 4642

obj 956.

Hγ	10	
5007	12	
Hβ	x3	
4686	13	
✓ Hδ	1	
Hε	—	n.s
Hζ	—	n.s

obj 948

Too poor to est.

B23828. obj: 299 neb. 6326

obj: 299 17 12.9 -51

✓ Hγ	10
5007 4959	100
Hβ	1
4686	..
Hδ	5
Hε	10
Hζ 3869	20

March 22, 1913

B21893

obj 12627 17 38.2 -413

Br. hyd. lines.

Probably like 2 stars near η Carinae

✓

~~Hβ~~ Hγ	10
~~H~~ Hβ	7
Hδ	6
Hε	2

See list having Pec. Sp. $\tilde{56}$ 223

~~Rx~~ with Rem. "Perhaps resembling η Car."

March 22, 1913

B 22862 obj. 12995 neb. 4663
17 36.3 - 44 50

Much better than on B 21873

Hγ 10
5007 40
Hβ 4868 n.s. 15
Hδ 6
Hε 10
Hζ 3869 18

Cont. = 0

✓

March 24, 1913

neb. 4699

B 22862
obj. 13000
18 9.3 - 46 1
(1875)

✓

Hγ 10
~~5007~~
{5007 {4959 ~~100~~ 150
Hβ ^ 4686 n.s.
Hδ 10
Hε 15
{Hζ {3869 50
Cont. = 0.

obj. 12990.

very Pec. Like Nova Lac.
✓ on card Called Nd & given name
Z Cor Aust
Hβ, 4686, γ and other bright lines
br. Probably like R S Oph.

March 26, 1913

B40627 Searle's Neb. 6369

One br. band, barely seen

Looked up on B38104 better

✓ sp. but still only 1 band seen

By superposition on chart plate, this appears to be 5007

I 37580

Obj: 14054 Neb. 6790 (Pickering)

✓ Hγ 10

{5007
{4959 100

Hβ 1

Hδ 1

Hε 8

Hζ
3869 25

March 26, 1913

Neb. 6439

B40623 N. S. very fa. line seen
B39488 N. S. can not subdivide

✓ Ch. pl. B27627 shows object + 30039 shows no neb.
also B28476 shows object. L. D. W's card

Neb. 4634 on B39353

Hγ 10

Hγ 1

{5007
{4959 70

✓ Hδ 1

Hε 5

Hζ
3869 25

Mch. 26, 1913

B13761

Obj. 7296   9 51.6 −57
O~~A~~c?   See B9374

Obj. 7302
Oa   1 line

B23042

Obj. 13353   Neb. ~~4861~~ 4846

Hγ 10
Hβ 1
✓ 5007
4959 60
Hδ 1
Hϵ 1
Hζ

Obj. 13366 Nova Sag. 1, June 15, 1899
Hγ=10
5007=6   Neb.
4686=8
Hδ 2

March 26, 1913

B40864 Neb. −16° 48 20

Neb. 6618   Neb. 6618
very diffuse.

✓ Wide bands

Hγ 10
5007
4959 50

3727? 20

March 26, 1913

B 41397

Teffe F 17 55.2 − 32 43

−32°13123

Obj: 16962 mpf

Too near edge. Get better pl.

Obj: 16963

Nova Sag. 2 May 31, 1910

All bright with appearance of dark edges

✓ Hγ 10

Hβ 8 and narrower than γ.

Hδ 2

Hε 1

Hζ 1

other obj on plate marked Md? var?

18 8.9.7 − 30 54

Faint, but appears to be cont. with

✓ hyd. lines bright.

much better on B 40322

Hγ 10

Hβ 7

Hδ 2

Hε 1 Hζ 1

Put in list Pec!

March 27, 1913

B 39203

not so good as B 24154.

Neb. 6563

✓ Hγ barely seen. Assume 10

then 5007 100

3727 50

Neb. 6565

On edge & not clearly seen.

B 41397 & 40322 where this object comes in centre, show no br. lines.

Best B 13828, A 2093

A 2093, one br. line

B 13828 see p. 155

A 7728 Neb. 17 53.3 − 38 49

✓ Hγ = 10 5007 = 9

4~~[illegible]~~959 = 2

Hβ = 7

Hδ = 3

~~B 13878~~

March 27, 1913

B. 39386

Neb. 6523. Diffuse
Bright bands well seen

✓ $H\gamma$ 10
5007 8
4959

3727 12

Like Orion neb.

B17410 NGC 7009
$H\gamma$ = 10.
$H\beta$ = 8
4959 = 10
5007 = 80
$H\delta$ = 3
$H\epsilon$ = 7
$\left\{\begin{matrix} H\zeta \\ 3869 \end{matrix}\right.$ = 20
4686 = 1
4471? = 1

/

March 27, 1913

B 13828, faint but several lines seen

$H\gamma$ 10 18 5 6 – 28 12
✓ 5007 5
4959
$H\beta$ ·5
$H\delta$ glimpsed
$H\epsilon$ "
$H\zeta$ "

a 2093, shows one bright line.
Can not understand if this is 5007 why it is not brighter on B13828.

B 40334
41397
40322
39322 br. lines glimpsed.

March 27, 1913

B37580.

Neb. 19 0.5 -6 8

✓ Pec. Lines seen apparently

Hγ 10 barely seen
5007 50
4959 Hε 5
Hβ .. Hζ 5
4686 70

See if there is an A plate.

March 27, 1913

B23339

✓ Neb. 6804 Huggins.
Hγ 10
4686 5
5007 30

Neb. 6781 Wendell

✓ One round patch of neb. probably 5007
Plate shows ft. stars.

B10123 Neb. 6803.

✓ 1 br. band, may be 5007

27918
23106 do not show any lines
23117

March 27, 1913

B 11322 Neb. 1292

18 38 −28

Br line seen,

B 39651
B 39469 ← do not show it.
B 39323 Shown on y ft. plates.

May be defect.

March 27, 1913

B 39586

Neb. 6629
6644

Also seen on B 40616 and estimated in R.D. 51, 128 −

B 40741 Neb. 1297

Hγ 10
{5007
{4959 60
✓ Hδ 1 Hβ 1
4686 1
Hε 2
Hζ 2 ✓

B 24086

Neb. 6807 n. g.

March 27, 1913

B 23253

✓ Nova Aq. 1 July 3, 1899

Nova Aq. 1

Obj. 13466

$H\gamma = 10$ strongest line

4686 = ~~1~~ 2

$H\beta$ = ~~0.5~~ 1

5007 = ~~0.2~~ 0.5

$H\delta = 2$

$H\varepsilon = 0.5$

$H\zeta = 0.5$

March 27, 1913

B 23253

Pickering's Neb 6778

$H\gamma = 10$

✓ 5007 = 8

$H\delta = 2$

Ft.

Marked with red lines

≡ =

Obj. 13469 −4° 4678

Br. lines. 18 56.3 −4 31.5

Type V, but can not class from this plate

B38111 shows the best, but I can not class certainly on inspection

Also Neb. 6741 18 57.5 −0 35

✓ on pl. but not marked.

Lines seen

$H\gamma = 10$ Plate scratched.

5007 = 100
4959
3869 = 40

March 28, 1913.

A 2901 Large Mag. Cloud,
Gas Neb. + Type V

Obj 250, 5 40.6 − 69 49 1900 announced 1900 pos.

.14 Hγ = 10
5007 = 5
Hδ = 2

Cont. sp. seen quite strong from Hγ to violet, rather faint.

See Gas neb. list Table II Vol. LVI
Table IV Vol. LVI
Note "Two gas neb. superposed" in Mrs F. Book 96

Obj 249 Bright object 5 40.6 − 69 42 −69°475 see also Note in Table IV Vol. LVI

15 Bright lines, broad & overlapping a cont. sp.

Hγ = 10
✓ Hβ 5
4959 = 15
5007 = 5
Hδ = 5
Hε = 3
Hζ n.S
3869 n.S

Pl. 7577 shows this line due to two gas. neb.

Pec. in having 4959 stronger than 5007.

On A 2211, these lines appear equal but the focus is not so good.

March 28, 1913

A 2901

Obj 247 5 41.4 − 69 43 = Announced 1900 pos.

A very faint object, Conf. Neb. List XIII N.G.C. 2086.

In Neb. Hγ = 10
5007 = 5 Pl.

17 ✓

Too faint. Lines seen but it appears like neb.

Obj 246 C.P.D. −69° 478 5 41.0 − 69 26 (1900) Magn. 10.8

Cont. sp.
H lines br. (Hβ 40
Hγ 10
Hδ 10
20 Hε 2

✓ 246a ~~A faint patch~~ 5 40.9 − 69 27 (1900)

In Type V A slight brightness may be 5007 but too indistinct. Lines seen

c9?

257 Bright lines too indistinct.

n.S.m. A 4112 An appearance of bright lines in several stars of group.
In second book N.P. H. vac?

18

248 Distinct wide bright band announced 1900 pos. 5 40.7 − 69 27
H.D. 38448 ✓

Neb. or Type V?

In Neb. Transferred to Class Oe, Stars so close in region that it seems impossible to determine the exact nature of this object.
So published in [illegible]

March 28, 1913

A 2901

Obj 255 Announced 1900 pos. 5 37.6 -69 30

Oa One br. br. band

✓

12

Obj. 256. -69° 420 5 37.2 - 69 26 (1900) = -69° 420

Cont. sp. in H. lines br.

Hβ = 30 56,6.

11

Hγ = 10 and has dark line on edge

Hδ = 10 of shorter λ

Obj. 261 5 35.2 - 69 49 (1900) Announced pos.

Oa. One broad br. band

13

Obj 265 C.P.D. -69° 401 5 36.2 -69 44 (1900) 9.5

Cont. sp.

Too dense on A 4112

Hβ = 10

Hγ = 10 dark on shorter λ

Hδ = 1 " " " "

O.K.

In H lines br.

March 28, 1913

A 2901

N.S. on A 4112

Obj 259 Announced pos. 5 36.8 -69 44 (1900)

Too ft. Hγ appears slightly brighter, others too ft.

There is an appearance of bright line which seems to correspond to a nebulous group on chart.

Intyd. lines br.

Originally marked 252 on A 2901

Obj. ~~preceding~~ following 30 Dor.

5 39.5 -69 5 (1900) = C.P.D -69° 462

Type V.

✓

3

Oa One broad band and 2 fainter bands near Hδ.

Certainly Type V.

Obj 263 5 32.0 - 71 5.7 = (1900) = Announced pos. (1900)

23

One broad bright band

✓

Appears the 4686 of the brightest star of a group of 3.

In Type V

Oa

24 Obj 268 5 24.6 - 71 26 (1900) announced pos.

One br. band

✓

Oa

In Type V

25 Obj 279 5 23.9 -71 43 (1900) Announced pos.

✓

One br. band

Oa

In Type V

March 28, 1913

A 29$\overset{0}{\text{x}}$1

Obj 264 5 27.1 −68 55 announced pos. 1900
One wide br. band.
27 Appears blue 4686 of one star
or 5007 of another. Can not
✓ tell which
~~Omit~~ Conf. ~~on~~ other plates
In type V

30 Obj 266 Neb. 5 25.6 − 68 33 (1900) announced pos.
Hγ 10
N.G.C. 1949. Hβ 10 This is in H lines br.
{4959 4 56.6.
✓ {5007 4
A2897 certainly shows 5007.
v = +260 Faint Transfer to neb.

[illegible] 4112 Obj 257
Too ft.
Probably K5

Obj 258 5 35.6 − 67 39: announced 1900 pos. neb?
ff 4112 No br. lines. K or K5
✓N.G.C. 2029 Apparent nebulosity near too faint to classify.
v = +297± Lick observes faint N₁ line alone.

March 28, 1913

A 2901

Obj. 262 5 30.4 − 67 30 announced 1900 pos.
N 4112 Class Oa (A2897 best of this
✓ One broad br. band with a dark
line superposed on it.

Obj. 265 C.P.D. − 67° 433 5 26.3 − 67 35 (1900) 9.6
One br. bright band
[illegible] Oa
Super. on chart plates.
Hδ bright.

On A2897 better seen, bright
band shows slight contrast
to cont. sp.
H ~~K~~ + K dark

69
Obj. 2~~88~~ Neb. 5 22.5 − 68 41 (1900 announced pos.)
26
Hγ 10 hazy lines.
✓ Hβ 3
{4959 15
{5007 v = +292
Hδ 2

March 28, 1913

A 2901

Obj. 271 -69° 356 5 18.9 -69 21 (1900) 9.4
Cont. br. hyd. lines.
Too dense on A 4002
Hγ 10
Hβ 18
o.K. In H lines br.
Hδ 5

Obj. 270 -69° 361 5 20.1 - 69 45 (1900) 9.4
Oa
One broad br. band
✓ 31 cont. sp.
prec. p 2. May be Ob

Obj. 273 5 10.2 -69 0 (1900)
Class Oa
32 One broad br. band.
✓

An Type V list announced 1900 pos. 5 10.3 -69 1 Same star 225a on A 2900
273a nothing seen but a cont. sp
33

35 274 Difficult C.P.D. -70° 343 {5 0.3 -70 20 (1900) / 5 0.5 -70 22 (1875)} 9.6
Seems like 5007 of a faint star

In ~~Type V~~ H lines br.

March 28, 1913

A 2901

275 Oa or Ob 4 47.8 -68 33 (1900) 57.8? ?
one wide br. band
✓ 41

276 Ma 4 55.1 -69 21 announced 1900 pos.
39 In Neb. Look up on other plates.

277 Neb. -69° 302 4 54.6 - 69 21 (1900) announced pos.
Hγ = 10
Hβ 3
5007 8
✓ 4959
38 Hδ 5 $v = +260$
Hε 2

278 4 52.6 -69 33
Hγ = 10
37 Hβ 7 ~~4686~~
✓ {5007 10
{4959
Hδ 3 $v = +265$
Hε 1

March 28, 1913

A2901

30 Doradus CPD -69° 456 5 39.4 −69 9 (1900)

Originally marked 253 on A2901 see Mrs F's Book 96

$H\gamma$ 10

$H\beta$ 10

4959 2

5007 16

$H\delta$ 5

$H\epsilon$ 3

$v = +275$

✓

object not marked on plate 2901

~~This was originally marked 253 on A 2901~~

Appears there a bright line about 4686

March 28, 1913

Pl A 2900

Obj. 219 ← -69° 356 5 18.9 − 69 21 (1900) 9.4 Vol LVI H. lines br.

220 Only one seen

7 or dim on A 4412 See Obj. 271 on 2901

Obj. 225 Announced 1900 pos. Vol. LVI Type V 5 10.2 −69 0

Oa

32

Obj. 225 a Announced 1900 pos. Vol. LVI Type V 5 10.3 −69 1

Fairly br. cont. sp. with perhaps a trace of 4686 br.

33

Maybe Oa

236 Neb. Announced 1900 pos. Vol. LVI Gas. neb. 4 55.1 −69 21

✓ 39

$H\gamma = 10$ $H\beta = 10$ $5007 = 5$ $H\delta = 6$ $v = +256^{k}$

Faint

Obj 237 -69° 302 5^4 54.6 −69 21 (1900) Announced Vol. LVI Gas. neb.

38

✓ $H\gamma = 10$ $H\beta = 6$ $5007 + 4959 = 10$ $H\delta = 5$ $H\epsilon = 2$

Lines very broad much broader than in 236

Cont. sp. seen two dark lines

Looks like a nebulous bright star on A 2169

Vel. +260

Lick XIII 91

March 28, 1913

A 2900

229 = 41 on A 4112

Obj 238 Neb. Announced 1900 pos (Vol LVI Gas neb.) 4 52.6 −69 33

✓ Hγ=10 Hβ=8 5007+4959=5 Hδ=3 Hε=2

37 Cont. sp. ft. if really present V=265

230 n.s. on A 4112

Obj 241 Neb. Announced 1900 pos (Gas. neb. Vol LVI) 4 49.9 −69 21

✓ Hγ=10 Hβ=4 5007+4959=8 Hδ=2

Faint & blurry. V=+293

Obj. 240 Neb. 4 52.0 −67 6 (1900) Announced pos. Vol LVI Gas. neb.

V=+309

✓ Hγ=10 Hβ=9 5007+4959=15 Hδ=5 Hε=2

Very ft. cont. sp. ~~Lines~~ Bright bands broad, hazy, [illegible]

Obj 235 Announced pos. 1900 Vol LVI Type V 4 55.7 −66 26

Oa one broad bright band

Obj 234 −66° 343 4 56.4 −66 38 (1900) (Vol. LVI Type V)

Oa?

Strong continuous spectrum.

Obj 232 Announced 1900 pos. (Vol LVI Gas neb.) 4 56.8 −66 32

✓ Hγ=10 Hβ=8 4959=2 5007=10 Hδ=2

Only bright lines. V=+292

Small round planetary.

March 28, 1913

A 2900

Obj 231 Announced 1900 pos. (Vol LVI Gas. neb.) 4 57.3 −66 33

Omit. Two bright lines barely seen. Too faint.

✓ I.C. 2116. A group of stars surrounded by nebulosity. Bright lines not well defined. Not in 76, [illegible]

233. Prob. [illegible] gas. neb. N.G.C. 1763. 4 56.6 — 66 24 (1900) Obs. at Lick as stars in neb. Chart plate shows a group. See 76, as doubtful. Cam ~~[illegible]~~

Obj 227 Announced 1900 pos (Vol LVI Type V) 5 3.0 −66 49

✓ Hγ=10 Hβ=8 46~~[illegible]~~88=40 4633=10 Hδ=20 Cont spectrum barely seen. Probably class Oc

Obj 222 5 14.0 −67 34 (1900) = Announced ~~[illegible]~~ pos. (Vol LVI) Hyd Lines br.

Cont. bright hyd lines

Hγ=10 dark toward violet

Hβ=15 " " "

✓ Hδ=5 Traces of other bright lines.

26

N.G.C. 1936 ✓ Obj 216 Announced 1900 pos (Vol LVI Gas Neb. ~~Type V~~) 5 22.5 −68 4 V=+292

Hγ=10 Hβ=7.5 5007+4959=100 4686=? Hδ=5

~~Lines broad~~

~~+1937~~ / 26a obj. 217. Traces of bright lines, but if real, it appears to be Hβ and Hγ bright. No trace of 5007.

~~26~~ Obj 233 C.P.D. −66° 344 4 56.6 −66 34 (1900) (Vol LVI Gas. neb.)

A hazy cont. sp.

Hγ br. = 10

✓ Hδ = 10 Lines show slight

Hβ = 5 contrast to sp.

Uncertain just what this is. Not good enough on this or 2216 But the H lines bright.

235a

Defect?

March 28, 1913

I 53342
Neb. 7026

Hγ 10
Hβ 3
4686 6
5007 } 60
4959 }
Hδ 3

Hε } 5
3869 }

March 29, 1913

I 33048

obj. 5116 a
one b. line of medium intensity.

obj. 5712 Neb. 6833
one very ft. b. line
19 45.7 +48 35
No better on I 12139
~~I 13[illegible]7 Neb.~~ I 33602
I 33693

Can not subdivide. Prob. 5007 [illegible]

I 36370 Neb. 6884 20 7.2 +46 10
(marked by A. J. C.)
Neb.
Hγ 10
Hβ n.s
5007 } 120
4959 }

Hε } 40
3869 }

March 29, 1913

I 13117

Neb. 4997   20 15.6 +16 25

$H\gamma = 10$ 4363 probably found.
$H\beta = 2$

✓ 5007 4959 = 1

$H\delta = 2$

$H\epsilon$ 3

{ $H\zeta$ 2
{ 3869

I 33226
Not so good of 4997

I 34357
Neb. 4997

✓ $H\gamma$ 10
$H\beta$ 3
4959 1
5007 3

$H\delta$ 1
$H\epsilon$ 2
$H\zeta$ ~~3~~1
3869 2

March 29, 1913

I 31302

22 19.9 +50 28
Neb 5217

One br. band sup. on the sp. of a star south of it.

✓ Band proves the 5007 on superpos on chart plate I 23544
$H\gamma$ also barely seen

$H\gamma = 10$
5007 = 150

March 31, 1913

A 8343
Nova Vel. June 6, 1905

Hγ = 10 4363 = 100
Hβ 10
5007 80
4959 10

4740 30 Assumed pos.
4686 30 " "

March 31, 1913

A 2224 Mch 12, 1897
η Car.

Numerous br. lines seen
Like later Sp.

B 19639
η Car.
June 29, 1897

B 9421 η Car.

Hβ, Hγ, Hδ bright, well marked.
Good image but too near edge
for enlargement.

B 7531, B 7530
Hβ, Hγ, Hδ bright. H & K dark.

March 31, 1913

B7475 η Car
Hβ, Hγ, Hδ ~~dark~~ bright
~~Hε~~ K dark

Traces of dark lines seen.

B7526 η Car
Hβ, Hγ, Hδ dark.

Cont. sp. strong.

B3566 η Car
Traces too poor

X4005
Too poor

X4044
Br. & dark lines
Enlarge?

March 31, 1913

B15357
Too narrow, & too dense

April 21, 1913

B 23024
Neb. 4406

$H\gamma = 10$
$H\beta$ 5
5007 } 70
4959 }
$H\delta$ 5
✓ $H\epsilon$ 12
~~38~~
{ $H\zeta$ } 25
{ 3869
3724 50

Long. disp. plates show only
5007.

April 23, 1913

Gas. neb.
Search for better of above neb. of which
I saw only one line on plate marked

B22853 (orig. pl.)
Neb. 4637 = −40° 11127

B 37634 (better)

✓ $H\gamma = 10$
{ 4959
{ 5007 = 50

Neb. 6309
B37578

$H\gamma = 10$
✓ 4686 = 5
5007 + 4959 = 50
$H\delta = 3$
$H\epsilon = 1$

Apr. 23, 1913

16 24 −40

Neb. 6153
Looked up on B37603, 42498
One br. band

B38554 Neb. 6153

✓

$H\gamma = 10$
$H\beta = 10$
$4959 + 5007 = 80$

Neb. 27921

B40104
1 Bright line

B15318
Too poor.

B39945

✓

$H\gamma = 10$
$5007 + 4959 = 15$
Image faint.

April 23, 1913

Neb. 6369
B39385
Too faint. Only one line seen.

April 25, 1913

I 37987 neb. 6543

$H\gamma = 10$
$4363 = 8$
$H\beta = 12$
$4959 = 10$
$5007 = 70$
$H\delta = 8$
$H\epsilon = 10$
$H\zeta = 2$
$3869 = 12$

Best plate, as 4363 is seen separated from $H\gamma$.

April 30, 1913

Nova Carinae
on B 13027
$H\gamma$ = 10 strongest br. line + distinctly dark on edge shorter λ
$H\delta$ = 6, also dark on edge shorter λ
$H\epsilon$ = 1 " " " " " "

A distinct dark line nearly mid-way bet. $H\gamma$ and $H\delta$.
Region of $H\beta$ very faint, but $H\beta$ appears to be a bright line of intensity 2 or 3

See also p. 89.

Jan 29, 1914

Nova Aurigae.
Dec. 22, 1894
I 12143, 1 br. line, perhaps
5007

Novae having bright lines.

V Persei
Nova " 2
T Aurigae
Nova Gem 1
Nova Vel.
RS Carinae 110361
R Normae
T Cor. Bor.
Nova Arae
~~Nova~~ RS Ophiuchi
Nova Sag. 2 175-327
" " 1
Nova Aq. 2 185604
" " 1 191500
P Cygni
Nova Lacertae
Nova Gem 2

17

novae of wh. we have no neb. sp.
RS Nova Car. br. hyd. w. dark edges.
185604 Nova Aq. 2. " " " "
Nova Sag. 2. " " lines; Hβ, Hγ, Hδ, Hε, Hζ, appeared in chart Mch. 21, 1910 Sp. plate. May 31

Perhaps these 3 form one class.

Tuesday, March 17, 1914

Nova Persei, 2.

Esh, on C

$H\gamma = 10$

4363 = 80

4686 = 30

$H\beta = 20$

5007 = 25

4959 = 2

$H\delta = 20$

$H\epsilon = 80$

3869 = 100

Tuesday, March 31, 1914

Nova Persei 2

I 27061, small disp.
June 10, 1901

$H\gamma = 10$, $H\delta = 2$, $H\epsilon = 15$ 3869 = 21
4686 = 6, broad $H\beta = 2$ narrow 5007 = 2 wide

I 27075 June 11, 1901
Isv.
Lines & intensities as on I 27061

I 27085, June 12, 1901
No change

I 27091, June 13, 1901 short, Isv.

$H\gamma = 10$ $H\delta = 1$ $H\epsilon = 3$, 3869 = 15
4686 double = 5 $H\beta = 1$ 5007 = 2

I 27095 June 15, 1901 long. Isv.
$H\gamma$ consists of a wide bright band separated by a distinct br. line.

$H\gamma = 10$ $H\delta = 2$ $H\epsilon = 7$ 3869 = 15
4471 = 1 4686 = 2 4740 = 3 $H\beta = 4$
4959 = 1/2 5007 = 3

March 31, 1914

Nova Persei, 2.

I 27100 June 16, 1901
Same as on June 15

I 27248 July 22, 1901 long

$H\gamma = 10$, portion to red probably 4363 stronger
$H\delta = 2$, $H\epsilon = 10$, $H\zeta$ & 3869 = 30
4686 = 1 4740 = 5 $H\beta = 1$ 5007 = 2

I 27233 very poor.

I 27247
very poor

I 27234 poor.

I 27331 Aug. 18, long
Narrow. Intensities about the same
3869 & $H\zeta$ almost vanish

March 31, 1914.

Nova Persei 2.

I 27337 Aug. 21, long
4363 = 80
$H\gamma = 10$
$H\delta = 10$
$H\epsilon = 100$
3869 = 200
$H\beta = 5$
~~4~~
4959 = 1
5007 = 10
4740 = 50
4686 = 8

I 27359 Aug. 26, no change

I 27395 Aug. 29, " "

I 27431 Sept. 5, long
Thin, no change.

I 27450 Sept. 7. long
No change

I 27462 Sept. 8, short.
No change

I 27479 Sept. 13 short.
No change

March 31, 1914

I 27529 Sept. 22, long, Nova Persei 2.
No change

I 28006 Nov. 21, 1901 long

$H\gamma$ = 10
4363 = 40
$H\delta$ = 12
$H\epsilon$ = 200
3869 = 400
~~4686 =~~
4686 = 10
4740 = 30

$H\beta$ = 10
4959 = 8
5007 = 25

4363 has lost since Sept.
5007 perhaps gained.
Dark lines appear near 4740 &
bet. it and 4686.

March 31, 1914

All Iso.

I 28157 Dec. 30, 1901 Short.
Probably like 27529 in essentials

I 28174 Jan. 1, 1902 Short.
same?

I 28239 Jan. 13, 1902 Short,

3869 & $H\epsilon$ still strongest
4363 about same or slightly brighter
than 5007.

I 28567 March 10, 1902 Short. Iso

{$H\gamma$
{4363 = 10
$H\delta$ = 2
$H\epsilon$ 40
3869 100

$H\beta$ n.s absorption
4686-4741 = 3
5007 = 12

March 31, 1914
Nova Persei, 2

I 29441 Oct. 23, 1902 Short. Sea.
very poor.

Hγ + 4363 = 10
~~H~~ 4686 or 4740 = 6,
5007 = 15
Hδ = 1
Hε = 15
3869 = 30

I 29862 Jan. 19, 1903, short

Too poor to estimate but 3869 still the strongest, perhaps due to plate being iso. & region of Hβ not well seen.

I 29908 Jan. 30, 03, ordinary
very poor

Hγ 10 ~~H~~ 4686 – 4740 = 12
Hδ 5 5007 = 15
Hε 5
Hζ+3869

Very uncertain, but 5007 strongest

March 31, 1914
Nova Persei, 2

I 29981 Feb. 13, 1903

About same as on I 29908

I 29988 Feb. 14, 1903.

5007 & 3869 about equal.

I 30682 July 27, '03.

4686-4740 strongest, 5007 next.
very poor

I 30688 July 31, 1903

Narrow. probably like 30682.

I 32086 Sept. 30, 1904
n. s.

I 31009 Oct. 19, 1903.
very narrow & poor.
4686-4740 certainly strongest.
~~H~~ 5007 next
other br. lines nearly gone.

March 31, 1914

I 31581 Apr. 2, 1904.
Poor image.
Bare trace of sp.
Very little seen except one bright
bunch at about 4740.

I 31600 Apr. 12 '04 barest trace
I 32011 Sept. 4 '04 too poor
I 32040 " 15, " " "

April 1, 1914

Nova Aurigae

March 4, ~~91~~ 1892
Dark hyd. split.
Dark K evidently fainter than H.

March 5.
Same

March 7 C 4511
One fairly narrow dark line
remaining of dark band K.

March 13 C 4523
Star much fainter?
Cont. sp. nearly gone
$H\gamma$ bright now the strongest.
Dark lines seen

Mch. 14 C 4529
Faint
Probably like C 4523.

March 15 C 4537
Dark bands faint but seen
$H\gamma$ bright strongest

April 1, 1914

Nova Aur. (cont.)

I 5892 Mch 16, 1892

$H\gamma=10$
$H\beta=3$
$H\delta=3$
$H\epsilon=2$
Other br. line seen

I 5919 Mch. 21, 1892

Only bright hydrogen seen
$H\gamma=10$
$H\beta=10$
$H\delta=5$
$H\epsilon=3$ Cont. sp. seen
$H\zeta=1$
$H\eta=1$

I 5965 March 29,
Not seen distinctly
Companion star clearly seen

April 1, 1914
Nova Aur.

I 5934 March 24, 1892

One br. line seen

I 6844 Nova Aur. Sept. 2, 1892

Two bright bands seen nearly equal
They appear to be 4363 and 5007,
4363 perhaps slightly stronger,

I 7159 Nova Aur. Sept. 21, 1892.

Two bright bands, 5007 undoubtedly stronger
4363 + $H\gamma$ = 10
5007 = 15
Bare trace of $H\delta$, and some brightness bet. $H\beta$ and $H\gamma$.
Cont. sp. n.s.

I 7135 Sept. 20, 1892
4363 + $H\gamma$ = 10
5007 = 12
One br. line about 4653

April 2, 1914

I 8348 Nova Aur. Apr. 2, 1893

5007 quite strong
$H\gamma$ barely seen
$H\gamma$ + 4363 = 10
5007 = 150.

I 8408 Apr. 18, 1893
$H\gamma$ = 10
5007 = 150
~~I 8408 Ap~~

Several ft. lines seen between $H\beta$ and $H\gamma$. One bright line seen of shorter λ than $H\gamma$, nearly equal to $H\gamma$.

I 10165 Dec. 12, 1893.
I 10296 Dec. 26, 1893

One br. band, 5007.

April 3, 1914

Nova Lacertae

I 37006 Jan. 4, 1911

$H\gamma$ = 10
$H\beta$ = 11
4653 = 8 wide & hazy on edges.
$H\delta$ = 6
$H\epsilon$ 2
$H\zeta$ = 1
$H\eta$ = 1
Dark lines of shorter λ than $H\delta$

Helium 5014 & 4922 seen

I 37015 Jan. 5
Same as above

I 37024 Jan. 12
Poor. Probably same as above

I 37027 Jan. 16
Bright bands widely double.

I 37028 Jan. 17
Bands double
Good plate

Apr. 3, 1914

Nova Lac. (cont.)

I 37032 Jan. 18
Lines hazy + dimmer

I 37034 long Jan. 23 I 37035 short
Same as above

I

I 37040 Jan. 28, 1911 short

Same as above, Hγ strongest.

I 37047 Jan 30, 1911

No decided change

I 37052 Feb. 5, 1911
No decided change

April 4, 1914
Nova Lacertae

I 37056 Feb. 10, 1911.
Poor plates

I 37057 Feb. 11
Poor plates, Hγ strongest

I 37058 Feb. 15
No decided change

I 37060 Feb. 16, 1911
No decided change

I 37063 Feb. 18
Hγ growing stronger
Hδ fainter!

I 37068 Feb. 21
No decided change

I 37073 Feb. 23, & I 37074 Feb. 25
No decided change.

April 4, 1914

Nova Lacertae
I 37222 long. July 22, 1911
very faint cont. sp. seen, with
5007 bright, wide, probably
including 4959

Apparently this is the last we have.

I 37088 Feb. 28, 1911

$H\gamma = 10$ 4653 = 3 wide $H\gamma = 2$ narrow
band fainter than $H\beta$. 5007? = 1.

April 6, 1914

Nova Gem. 1, See also p. 76.

I 30216 Nova Gem. 1, Mch. 25, 03

$H\gamma = 10$. $H\delta = 8$ $H\beta = 5$ 4653 = 12
$H\epsilon = 2$ $H\zeta$,
very poor, in edge

I 30250 Mch. 29

$H\gamma = 10$ 4653 = 6 wide $H\beta = 6$ narrower

$H\delta = 12$ $H\epsilon$ 1 $H\zeta$ 1

Appearance of dark lines
near $H\epsilon$ + $H\zeta$

I 30251 poor,
$H\delta$ strongest line

I 30252 long,
$H\delta$ very wide

I 30257 Mch. 31
$H\delta$ no stronger than 4653

April 6, 1914

Nova Gem 1
I 30266 Apr. 1, 1903

4653 slightly brighter
Dark lines at violet.

I 30282 Apr. 5
very poor
Hδ + 4653 stronger

I 30283 Apr. 5

very poor

I 30290 Apr. 10, '03

Narrow No change

I 30309 Apr. 17

Hγ = 10 4653 = 15 Hβ = 3
Hδ = 12

I 30321 Apr. 18

No change

April 6, 1914

Nova Gem 1
I 30345 Apr. 20.
Too.
Probably no change

I 30352 Apr. 21

4653 slightly stronger
Hδ weaker

I 30368 Apr. 25
Poor
No change

I 30335 Apr. 19

4653 stronger.

I 30377 Apr. 27
Too poor

I 30395 Apr. 29
very poor.

Apr. 6, 1914

I 31350 Dec. 27, '03
Not covering.

I 31374 Jan. 10, '04

Not covering.

I 31462 Feb. 11, 1904

Nova Gem. 1 n. S.
No plate found after Apr. 29, 1914

The change very slight in this sp.
from March 25 to April 29.

Pec. Spectrum

B 22862.

J Cor. Aust. See p. 147.
Appears to resemble RS Oph. Hβ, 4686,
Hγ br.
Var. small, if real.

17 38.2 −46 3 See p. 145.
✓ Cont. w. br. hyd. lines.
In Table XIII, σ6, 6.

18 9.7 − 30 54 on B40322, p. 152
✓ In Table XIII, σ6, 6.
Cont. w. br. hyd. lines. Est. on p. 152