Feb. 25, 1899

Measures of unknown line in ε, δ, & ζ Orionis near λ 5410. by superposing on plates having known lines ~~going from Hβ to 5415~~

Let ~~x~~ a = dist. λ bet. line 5406 and 5415 in spec. of α Aurigae, x8109, α Orionis x8113, and α Carinae x8114

Let x = dist. of unknown line from 5406 towards 5415 estimated in tenths

	α Aurigae	α Orionis	α Carinae
x8119 δ Orionis	upper edge x = 0.9	upper edge x = 0.6	upper edge x = 0.6
x8119 ε	upper ~~lower~~ " x = 0.5	" " x = 0.8	" " x = 0.6
x8115 ζ	" " x = 0.8	" " x = 0.9	" " x = 0.9

0.9
0.5
0.8
0.6
0.8
0.9
0.6
0.6
0.9
0.7

5415.4
$54\overset{06}{\cancel{10}}.0$
a = $\overset{9}{\cancel{5}}$.4 in λ unit.
.7
$\overset{6.5}{\cancel{3.7}}$8

$54\overset{06}{\cancel{10}}.0$
$\overset{6}{\cancel{3}}.\overset{6}{\cancel{8}}$
$541\overset{2}{\cancel{3}}.\overset{6}{\cancel{8}}$ = λ of unknown line in δ, ε. & ζ Orionis.

for δ Orionis x = 0.7
∴ λ of unknown = $541\overset{2.6}{\cancel{3.8}}$

" ε " x = 0.6 "
∴ λ " " = 5411.6

" ζ " x = 0.9
∴ λ " " = 5413.5

5412.6 mean as seen above

Feb. 27. 1899

3696 I has spectrum of -21°4864 of class O I on it. Search was made on this image for the nebular band 5007. but no brightness is observed of longer λ than band 4633.

4633, 4471, & Hγ are all bright and nothing else is distinctly seen.

√ X6354 β Pictoris
K single.

2 3
√ X6~~3~~~~7~~1, ^{5} β Pictoris.

K = 0.9 H = 1.2 Hδ
K single, lines well-defined.

√ X6201, ^{4} β Pictoris
K line distinctly double.
Solar lines very hazy
Component of K towards violet = 1/2 of component towards red.
Hydrogen lines are broad.
The original record says the evening was cloudy. X6202 & 6203 were taken on the same night, and show wide lines but no doubling.

Feb. 27. 1899.

✓ X6344, ^{4} β Pictoris

K single, other lines hazy and ill-defined

K = 0.6 H = 0.9 Hδ.

√ X6354, ^{3} β Pictoris

K single and sharply defined. Hydrogen lines hazy, especially Hε.
K seems a little more intense but narrower than Hδ.
Solar lines fairly well-defined

✓ X6365, ^{4} β Pictoris
K single.
K = 0.5 H = 0.6 Hδ.

✓ X6374, ^{4} β Pictoris

K = 0.6 H = 0.7 Hδ
Solar lines well-defined, especially λ4481

✓ X6394, ^{4} β Pictoris
K single
K = 0.5 H = 0.6 Hδ.
Solar lines well-defined.

Feb. 27, 1899.

✓ X7184, 5 β Pictoris

All lines are sharp. K now appears more intense with respect to H and Hδ than on plates 6365, 6374 and 6394.

K = 0.8 H = 0.9 Hδ.

X7406, 4 β Pictoris

✓ K single

K = 0.9 H = 1.1 Hδ

✓ X6319, 4 β Pictoris

K single

K = 0.8 H = 0.9 Hδ.

✓ X6300 β Pictoris

K single

K = 0.9 H = Hδ.

Lines fairly well defined

✓ X4467 β Pictoris

K single

✓ X448 β Pictoris

K single

Feb. 2~~7~~8, 1899.

Identification of unknown lines in red in spectrum of α Crucis X4 , as compared with solar lines in α Scorpii

Lines marked on X Image 2.

"1" the strongest line in red end of α Crucis and nearest Hβ appears to fall about mid-way bet. solar lines 4920.8 and 4924.6, and its wave-length is therefore about 4922.7. It appears to correspond to the helium line 4922.1

"2" too faint to identify

"4" falls very near the solar line 5014.5. "4" is well-marked

"6" has longer wave-length than the solar line 5041.6, and has approximate wave-length 5046.4. This line is faint.

"9" has shorter wave-length than the D line in α Scorpii, and is the line D_3 5875.982 (See Astr. Journ II 1895 p. 76)

8a

8b = 2 large divisions on reticle from D_3 or 20 small div of micr. eye-piece shorter λ than "D_3

Feb. 28. 1899.

Same as preceding page. Image 1. α Crucis.

"1"	Inten 8	λ	4922.	
"2"	" 1	"	4940	
"4"	" 3	"	5018.0	
"6"	" 1.5	"	5050.0	
"9"	" 6	"	5875	D^3

March 1 1899

✓ X 8579 γ Arae

Lines broad.

β Arae not all on. & very poor.

✓ X 9140 ,4 γ Arae

B 2 A Lines broad

β Arae. K 2 M.

✓ X 8221 β Pictoris

K single

Mch. 2, 1899

√ X 8621 $_{2}^{4}$ π Scorpii

Lines broad, and hazy towards end of shorter wave-length.

√ X 9284 ³ π Scorpii
Lines broad.

Mch. 4, 1899

C 11783 A.G.C. 8991.

Too faint to see Hβ.

√ C 11771 A.G.C. 8991
Hβ dark and bright on the edge of greater wave-length. The brightness is about 1.5 in scale of intensity.

√ C 11754 A.G.C. 8991

Hβ bright, but very faint.

√ C 11752 H.P. 1368

Hβ dark, but about 3/4 as intense as Hγ dark.

√ C 11742 H.P. 1368
Hβ dark.

√ C 11761
Hβ dark.

See p. 85. Bk. IV.

Mch. 4. 1899.

√ C11779 H.P. 1368

Hβ dark but there appears to be a bright streak of on the edge of greater wave-length.

Mch. 6. 1899

√ 49095,^{3} ζ Cham.

Poor image, probably K5-M.

√ 49226 ${}_{2}^{4}$ π Scorpii
Lines double
4471, 4387 show the doubling best.
Br. components twr. end of longer wave-length
4144, 4120, 4026, 4009 all very wide

March 7. 1899

η Carinae

Bright band at Hβ measured with new eye-piece extends 1 division. Dist. bet. Hβ and line 4927.7 in α Pavonis = 5 divisions very nearly.

$$\begin{array}{r} 4861.5 \\ 4927.7 \\ \hline 66.2 \end{array} = 5 \text{ divisions}$$

∴ 1 div = 13.2

$$\begin{array}{r} 4861.5\tfrac{1}{2} \\ 13.2 \\ \hline 4874.7 \end{array}$$

∴ the dark line on greater wave length edge of the bright Hβ band in η Carinae is probably line 4871.8 and not 4865.14 as before thought to be.

March 8. 1899

S.M.P. 3369 in Carina ✓ + 49249 A.G.C. 14295

F5G, sharp lines like b Vel. This dispersion is greater than the earlier 1 pr. plates, but the lines appear to be the same.

A.G.C. 14349 ✓ + Too poor. B5 or 8 A.

" 14417 ✓ + Too poor. B8A?

" 14478 α Carinae ✓ + Like α Tauri at red end. 4227 not quite as intense as in α Tauri.

" 14489 ✓ + (Central one of cluster) B

" 14483 ✓ + B

" 14536 ✓ + B3A? 4120 very faint. 4128-4131 not seen

March 8, 1899.

X 9094 r Carinae

A.G.C. 14478 ✓ Thin image, probably K5M.
r Carinae

A.G.C. 14536 ✓ B3A.

" 14489 ✓ B, very poor.

" 14528 ✓ Too poor, sharp solar lines seen

" 14404 ✓ Too poor " " " "

" 14295 ✓ F5G, sharp lines like δ Velorum.

March 8, 1899.

X 9122 r Carinae

A.G.C. 14478 ✓ Probably K5M. G band not sharply divided as in α Tauri, but this may be due to focus.

" 14417 ✓ B8A. 4471 = 4481, focus poor at region of lines 4144 – Hδ.

" 14481 ✓ B. Hβ not distinctly seen. 4387 appears a little more intense than in ε Orionis

" 14483 ✓ B. Hβ not seen, image too faint.

" 14536 ✓ B3A. 4120 ft. poor focus

" 14349 ✓ B8A?

March. 9. 1899

✓ X9011 β Muscae.
B 3 A.
Lines double?

✓ X9017 $_2{}^4$ β Muscae.

B 3 A. Lines wider

X9289 α Gruis & α Pis. Aust.

✓ α Gruis
Lines broad 4471 = 1.5 4481
4144 = 1.4 (4128-4131)

✓ α Piscis Aust.
Lines a little hazy. 4481 well defined, however
K line well defined

X9311 γ & β Arae.

✓ β = K_2 M.

✓ γ - lines double, narrow image.

Mch 9, 1899.

✓ X9197 $_2{}^4$ δ Centauri. (eryth.)

Bright lines in red & blue identified

✓ X9199 $_2{}^5$ β Centauri erythrosin

D_3 well seen, intense and bright on edge of greater wave-length.

✓ X9186 $_2{}^5$ β Crucis.
Lines in red well seen. They appear to be the same as those on X8997 α Crucis which has been measured but the fine ones are more distinct on X9186. Measure?

✓ X8580 $_2{}^3$ β Cor. Aust. (Cramer)

(1) G5 K.
(2) K. Images thin.

Mch. 9, 1899.

Identifications of helium lines in ultra-violet.

X3873 δ Orionis - too poor,
X3856 " "
H_θ is the last hydrogen line seen.
It is faint and H_ξ is more intense than H_γ.
Two faint lines are seen in extreme ultra-violet, but they are too faint to measure with the reticle in the eye-piece. They are probably helium lines

---

Mch. 9, 1899.

Professor Pickering and Mrs. Fleming advised me to take the lines in one star as a standard for intensities, to keep through the table of description of typical stars and it was thought that the intensity of the hydrogen lines in α Canis Majoris might be called 100.

Comparison of intensities of hydrogen lines in ε Orionis X8119 (3 po.) and α Canis Majoris X8091 (3 po.)
X8097 (α Can. Maj.) or ε Orionis

X8091 α Can. Maj.	X8119 ε Or.	
$H\beta$ = 100	$H\beta$ = 50	
$H\gamma$ = 100	$H\gamma$ = 60	
$H\delta$ = 100	$H\delta$ = 60	broader than in Sirius
H_ϵ = 95	H_ϵ = 50	
$H\zeta$ = 100	$H\zeta$ = 50	
H_η =	H_η = too ft.	
$H\theta$ =	$H\theta$ =	
H_ι =	H_ι =	

The hydrogen lines on this plate of ε Orionis ~~are~~ are broad and difficult to estimate.

Mch. 9, 1899.

Comp. of intensities as on preceding page.

X8097 α Can. Maj	X8119 ε Or
Hβ = 100	Hβ = 60
Hγ = "	Hγ = "
Hδ = "	Hδ = "
Hε = "	Hε = "
Hζ = "	Hζ = "

X7967 α Can. Maj	X8119 ε Or.
Hβ = 100	Hβ = 50
Hγ = "	Hγ = 60
Hδ = "	Hδ = 60
Hε = "	Hε = 60
Hζ = "	Hζ = 60.

These plates of α Canis Majoris are so dense that the hydrogen lines are narrow and difficult to compare with those of ε Orionis which are wider and somewhat hazy.

March. 10, 1899

✓ X7993 $_2^4$ η Phoen. + β Pictoris.

η Phoen. Sp. A. Lines very broad K + 4481 the only solar lines that are intense.

✓ β Pictoris. Lines broad, K single.

✓ X7989 $_2^3$ τ3 End.

@ 2 H or 3 F. Too poor

March 16. 1899.

Comparison of intensities of hydrogen lines in ε Orionis.

X7905 α Lyrae	X8119 ε Orionis
Hβ = 100	Hβ = 40
Hγ = 100	Hγ = 50
Hδ = 100	Hδ = 50
Hε = 100	Hε = 50
Hζ = 100	Hζ = 50

X3973 α Can. Maj.	X4041 ε Orionis ~~Hβ = 40~~
Hβ = 100	Hβ = 40
Hγ = 100	Hγ = "
Hδ = 100	Hδ = "
Hε = 100	Hε = "
Hζ = 100	Hζ = "

X6293 γ Cent.	X4041 ε Or.
Hβ = 100	Hβ = 30
Hγ = 100	Hγ = 30
Hδ = "	Hδ = 30
Hε = "	Hε = 30
Hζ = "	Hζ = 30

These two plates 6293 & 4041 are of nearly the same density, and the comparison is the best yet made.

March 16, 1899.

Comp. of intensities (cont.)

X6303 β Carinae	X4041 ε Ori.
all hyd. lines = 100	Hβ = 20 and others = 20.

X6204 (A.G.C.614)	X4041 ε Or.
Hyd. lines = 100.	Hβ = 30 and others = 30

Since intensities in general can be better estimated from plates of one prism, the mean of the last four estimates will be taken for the intensity of hyd. lines in ε Orionis

40
30
20
30

30

March 10. 1899.

Measures of the intensities and width of bright bands in stars of Classes O_I, O_{II}.

The intensities are estimated in the following manner. The dark hydrogen lines on Sirius are assumed to be intensity 100. Since, however, I have no plates taken with 1 pr. of Sirius, in which the density seems comparable with the plates of the bright line stars, I take as my standard Sirian star γ Centauri as photographed on X 6293. The darkness of these hydrogen lines is called 100, and any bright line or band appearing in a spectrum ~~aff~~ and looking as much brighter than the continuous spectrum as these lines look darker, will be called 100.

The measures of width will be made with the new reticle put on the end of my eye-piece. The smallest division on this scale appears to be 1/5 of a mm.

March 10, 1899

Y 7355 A.G.C. 15305. 1 pr.

Plate poor

	Int.	Width
4633	100	1.8 br. 1.4 ft.
4471	5	too indistinct to meas. width
Hγ	5	" " " " "
4059	7	" " " " "

X 4108 H.P. 1311 1 pr.

	Int.	Width
Hβ	5	too indistinct
4688	100	2.8 =0.56 mm.
4606	20	3.9? =0.78 "
4543	20	2.6? = 0.52 "
Hγ	20	2.1? = 0.42 "
4201	20	2.5? = 0.50 "
Hδ	20	2.6? = 0.52 "
4059	20	too indistinct

X 4065 A.G.C 15305 1 pr.

	Int.	Width	
4633	100 br. 15 ft.	2.5 br., space 1, 1.8 ft.	This br. band appears to be made up of 2 bands separated by a space or dark line
4471	5		
Hγ	5		very poor plate, narrow image.

~~X 5058 A.G.C 22763~~

H ~~Int. Width~~

March 10 1899

X 5058 . a G.C 22763 1 pr.

	Int.	Width	
Hβ	~~5~~ 10	1.0 ?	= 0.20 mm
4688	90	1.6	= 0.32 "
4633	50	1.5	= 0.30 "
4543	20	too indistinct	
4514	18	" "	
4471	15	" "	
Hγ	20	" "	
4201	10	" "	
Hδ	30	1.3 ?	= 0.~~2~~26 mm
4059	40	1.0 ?	= 0.20 "

March. 10. 1899.

X 5058 a G. C ~~22763~~ 22827 1 po

	Int.		Width	
4633	100	bor. violet	3.8	= 0.76 mm
4633	40	" red	3.5	= 0.70 "

X 5058 a.G.C. 22748 1 po.

	Int.	Width
Hβ	0	
4688	10	0.5 ?
4633	20	0.8 ?
4543	20	
4514	20	
4471	25	
Hγ	30	
4201	10	
Hδ	30	
4096	18	
4089	25	
4026	30	
Hε	30	
K	20	

x 5058 a G.C 22843 March 10, 1899

~~Int.~~ ~~Width~~

	Int.		Width
Hβ.	20		
4688	30		0.5
4633	25		1.20
4543	10	3 gr. λ	
4514	8	3 " "	
4471	15		
Hγ	12		
Hδ	20	5 gr. λ	
4096	15		
4026	20		
Hε	20		

March 10, 1899.

x 4115 H.P. 13 11 1 for

	Int.	Width	Int. from p. 25.	Width	Mean	Mean
Hβ	5		5		5	5
4688	100	4.2	100	2.8	3.5	100
4606	20	4.0	20	3.9 ?	3.95	20
4543	25	3.2	20	2.6 ?	2.9	22
Hγ	25	2.5	20	2.1 ?	2.3	22
4201	15	2.0	20	2.5 ?	2.25	18
Hδ	25	3.8	20	2.6 ?	3.2	22
4059	25	3.5	20			22

1 division on scale = 1/5 mm.
hence the measures of width reduced ~~to mm.~~ are as follows –

3.5 = 0.7
4688 = 0.7 mm
4606 = 0.79 "
4543 = 0.58 "
Hγ = 0.46 "
4201 = 0.45 "
Hδ = 0.64 "

March 10, 1899. 29 Canis Majoris

X6265 A.G.C. 9311 1 pr.

	Int.	Width
Hβ	20 5 gr. λ	
4712	5	
4688	20	0.6
4633	10 dbl.	0.9 dbl.
4543	6 3 gr λ	
4514	5	
4471	25	
4387	5	
Hγ	30	
4201	5	
4144	3	
4120	3	
4116	3	
Hδ	30	
4096	25	
4089	15	
triple? 4069	2	
4026	30	
Hε	35	
poor focus ~~H~~ K	3	
poor focus 3925	3	
Hζ	30	

March 10, 1899. 2 Prisms.

X8476 A.G.C 22827

	Int.	Width
4633	100 t.v.	8.4
4633	20 t.s.	7.1

X8476 A.G.C 22763

	Int.	Width
4688	80	2.3
4633	50	2.1

X8476 A.G.C 22843

	Int.	Width
4688	75	0.8
4633	70 dbl.	1.2 including both lines

March 10, 1899

X 8476 A.G.C 22748

	Int.	Width
4688	30	0.9
4633	40 dbl.	1.5 including both lines

Stars identified April 14 '99
α = A.G.C. 17540 λ Crucis $4.^m84$ S.M.P.
β = " 17504 - Crucis 5.78 "
suspected var. = A.G.C. 17270 - Crucis, 5.04 " No change observed.

March 13, 1899 $22^h 38^m$

X 7524 β Crucis Exp. 66^m

There is no trace of the spectrum of A.G.C. # 17270 ($12^h 36.^m2$ $-59° 8'$) on this plate, though fainter stars appear than on X 8261 where A.G.C. 17270 is seen.
Since this star may be variable an examination of all the plates of the region will be made

B 9705 (comp stars marked)
A.G.C. # 17270 suspected variable
α 4 v
v 3 β

Since the stars are so bright that estimates are difficult a comp. of the prismatic comparisons will also be made on plates where the prism is used

pr. comp. α 3 pr. comp. v
" " v 3 " " β

March 13. 1899.

B 13207

α 3 v
v 5 β

p. c α 3 p.c. v
p. c. v 4 p. c β

7269 M Sp.
α 3 v
v 5 β

α & v have sp. of 1st type, both Orion.

B 21616
α 4 v
v 5 β

Images distorted

p.c.α 3 p.c. v
p.c. v 4 p. c β

B 21.304
α 3 v
v 4 β

p.cα 3 p.c v
" v 4 " β

March 13, 1899.

B 15882
α 4 v

On edge of plate
β not on plate

p. c. α 3 p.c. v

7227
α 3 v
v 5 β

Trails.

9429 I Sp.

Image on extreme edge. Comp. stars not in field. Another star marked on B 9705, called γ. There is no suitable star brighter than v
v 3 γ

9455 A Sp.
α 3 v
v 5 β

5023 K Sp.
α 3 v
v 5 β

March 13, 1899.

7275 H Trails.
α 2 v
v 5 β

7274 Trails.

α 3 v Plate very poor.
v β β

9298 L
α 2 v
v 4 β

p.c. α 2 p.c. v
" v 5 " β

B 15240
α 3 v
~~v~~
v 4 γ. β not on plate.
γ too far away.

p.c. α 3 p.c. v
" v 5 " γ

March 13, 1899.

B 19869 C Sp.
α 3 v
v 5 β

B 13794 C Sp.
α 2 v
v 3 β Images all burned out.

8956 I Sp
Image on extreme edge. α & β not on
v 3 γ

8957 L

α 4 v
v 3 β

p.c. α 2 p.c. v
" v 4 " β

8958 L
α 4 v
v = β

p.c. α 3 p.c. v On edge of plate
" v 4 " β

March 13. 1899

7228 Trails.

α 3 v
v 4 β

9017 I Sp
On extreme edge of plate.
v = γ. Too poor.

9038 I Sp
Too poor. On extreme edge of plate.

4968 I Sp
α 3 v
v 4 β

7795 I Sp.
α 3 v
v 3 β

B. 15368 L
α 4 v
β not on plate.

p.c. α 3 p.c. β.

March 13, 1899.

B 15520 L
α 3 v
p.c. α 3 p.c. v
β not on plate.

B 15423 L
α 3 v
p.c. α 2 p.c. v
β not on plate.

3396 I Sp.
α 2 v.
v 4 β

3395 IV Sp
On extreme edge. Too poor to estimate but appears of normal brightness

B 18935 L
α 4 v
v 5 β

p.c. α 2 p.c. v.
" v 4 " β

B 21124 L
α 3 v
v 4 β
p.c. α 2 p.c v
" v " β pr. comp. β superposed on another star.

March 13, 1899.

B 21611 L
α 3 v
~~α~~ β 3 v
p.c α 3 p c. v
" v 4 " β.

β on edge and all the stars of the cluster look brighter than other stars

B 19268 L
α 2 v
p.c. α 2 p.c. v

β off the plate

5133 M Sp
Too poor. Image covered by another exposure. Star appears to be of normal brightness.

B 16724 Q Sp.

α 3 v
v 4 β

B 19474 L
α 3 v
β not on plate

p.c. α 3 p.c. v

March 14, 1899 0^h

B 15354 L
α 3 v
β not on plate
p.c. α 2 p.c. v.

9299 L
α 4 v
v 3 β
p.c. α 3 p.c. v
" v 5 " β

9356 L
α 3 v
v 6 β
p.c. α 1 p.c. v
" v 5 " β

9357 L
α 4 v
v 3 β
p.c α 2 p.c v
" v 3 " β

3477 L
α 3 v
v 1 β

Images elongated.

March, 14, 1899

3510 L

On edge of plate. α + β both off plate.
v 3 γ. v + γ are different shapes

3511 L

On edge of plate, α + β both off.
v = 1 δ

4888 He

α 4 v Trails.
v 3 β

B 15540 L

α 3 v
v 3 β
p.c. α 3 p.c. v
" v 4 " β

B 19069 L

α 2 v β off the plate.
p.c. α 1 p.c. v

March, 14, 1899

B 19987 L. Trails

α 3 v
α β 1 v Image of β elongated and dense.
p.c. α 2 p.c. v
" v 4 " β

B 21702 L

α 3 v
v 4 β
p.c. α 3 p.c. v
" v 3 " β

3433 H

α 4 v
v 5 β

B 15506 L

α 4 v
β off the plate
p.c. α 3 p.c. v

B 15293 L On edge.

α 4 v
β off the plate.
p.c. α 3 p.c. v.

4904 N Lf.

α 2 v
v 4 β

March 14, 1899.

7318 N Sp.
α 3 v
v 5 β

B 21714 L 240^{m} exp.
α 3 v
v 5 β

9706 L
α 3 v
v 5 β
p.c. α 3 p.c. v
" v 5 " β

B 13085 O
α 3 v
v 3 β

B 16303 L
α 3 v
v 4 β
p.c. α 2 p.c. v
p.c. β superposed on a star.

B 21708 L 240^{m} exp.
α 4 v
v 4 β

March 14, 1899.

4872 N Sp.
α 3 v
v 5 β

B 19993 L
α 4 v
β too much elongated

p.c. α 2 p.c. v
" v 5 " β

9414. L
α 4 v
v 5 β Images very large
p.c. α 3 p.c. v
" v 5 " β

9422 O Sp
α 3 v
v 4 β

B 19672 L
α 3 v
β not on plate
p.c. α 2 p.c. v

B 13862 L
α 3 v β off the plate
p.c. α 2 p.c. v

March 14, 1899.

9364 L
α 3 v
v 4 β
p.c. α 3 p.c. v
p.c. v 5 p.c. β.

3358 H
On extreme edge
Image appears of normal brightness.

B 21562 L
α ~~3~~ 2 v
v 4 β
p.c. α = p.c. v   p.c. α is elongated.
— v   p.c. β superposed on a star.

On this plate there appears to be less difference bet α + v than on others so far examined but this may be due to the fact that α comes near the edge of the plate.

March 14, 1899

B 21567 L
Image on edge.
α 3 v   β off the plate
p.c. α 3 p.c. v

3378 L
α 4 v   Images diamond shaped
v 4 β

5279 H
Image on extreme edge. α + β off
Image of normal brightness.

5402 H
v = α
v 3 β   α is queer shaped, + has appearance of being double.

5458 L   Sp.
α 4 v
v ~~β~~ 5 β

B 13480 L
α 2 v   β off the plate
p.c. α 1 p.c. v

March 14, 1899.

3309 L
α 3 v
v 4 β

3314 H
α 2 v
v 5 β

3321 H.
α 3 v
v 5 β

Images trailed.

B 12835
α 3 v
v 5 β
p.c. α 4 p.c. v
" v 4 " β

B 12820 O
~~B4v~~ α 4 v
+ v 4 β

Lf.
β has 1st type sp.

B 12802 L
α 3 v
v 3 β
p.c. α 2 p.c. v
" v 4 " β

March 14. 1899.

B 12794 L
α 3 v
v 4 β
p.c. α 3 p.c. v
~~+ v~~ " β superposed on a star.

B 12744 L
α 3 v
v 5 β
p.c. α 2 p.c. v.
" v 4 " β

B 11437 L
α 3 v
v 3 β
p.c. α 2 p.c. v
" β superposed on a star.

B 13028 O Lf.
α 2 v
v 3 β

B 12903 L
α 3 v
v 5 β
p.c. α 2 p.c. v
" v 5 " β

Is α a double star? It looks so on the plate.

March 14, 1899 21h 40m

8312 a Sp.
Image on extreme edge. α & β
Image appears to be of normal brightness

9936, a Sp. Trails.
Too poor.

B 13173 L
α 1 v
v 5 β
p.c.α 2 p.c.v
" v 5 " β

Images very large

B 12878 L
α 4 v
v 2 β
p.c.α 2 p.c.v
~~" v~~ " β superposed on a star.

Images oblong.

B 12905 L
α 1 v
v 5 β
p.c.α = p.c.v
" v 6 " β

p. c. α is lengthened out

March 14, 1899.

B 12904 L
α 1 v
~~α~~ v 5 β
p.c.α = p.c.v
" v 4 " β

7538
α 3 v
v ~~3~~ β

plate marked "useless"

7292 I Sp.
α 1 v
v 6 β

Edge of plate.

7276 H
α 3 v
v = β
p.c. α 3 p.c. v
" β superposed on a star.

B 13563 L
α 2 v
v 4 β
p.c. α 2 p.c. v
" v 3 " β

March 14, 1899

B 13522 L

α 3 v

p.c.α ~~x~~ 2 p.c. v

Image on edge.

β off the plate.

B 12911 L

α 3 v

v 3 β

p.c.α 2 p.c.v

" v 3 " β

B 12993 L

p.c.α 2 p.c v

" v 4 " β

Star images burned out p.c.α round.

B 21371 L

p.c.α 3 p.c v

" v 4 " β

α 3 v

v 4 β

9375 a Sp.

α 2 v

v 5 β

March 14, 1899.

9399 a Sp.

α 2 v

v 4 β

8032 I Sp.

α 2 v

v 3 β

B 18319 L

α 4 v

p.c.α 3 p.c.v

β off the plate.

B 19569 L

α 3 v

v 3 β

p.c.α 2 p.c.v

" v 4 " β

B 16220 L

α 4 v

v 1 β

p.c.α 2 p.c.v

" v 2 " β

B 15679 L

α 3 v

p.c.α 2 p.c.v

β off the plate.

March 14, 1899

9640 L
α 2 v
v 3 β
p.c. α 2 p.c. v
" v 3 " β

B 18284
α 2 v
p.c. α 2 p.c. v.

β off the plate.

9549 H
α 3 v
v 4 β

9485 L
p.c. α 2 p.c. v
" v 4 " β

B 15768 L
p.c. α 2 p.c. v
p.c. β superposed on a star.

B 13438 Q Sp.
α 2 v
v 3 β

March 14, 1899.

B 21801 L
α 3 v

β off the plate.

B 18468 L
α 2 v
p.c. α 3 p.c. v

β off the plate.

B 18810 L
α 2 v
p.c. α 3 p.c. v

β off the plate.

B 16869 L
α 4 v
p.c. α 3 p.c. v

β off the plate.

B 10931 L
p.c. α 3 p.c. v
" v 4 " β

B 11132 L
p.c. α 3 p.c. v.
" v 4 " β

B 16599 L
p.c. α 3 p.c. v.

β off the plate.

March 14, 1899

B 11134
p.c. α 2 p.c. v
" v 4 " β

B 11142 L
p.c. α 1 p.c. v
" v 4 " β

B 16382 L
p.c. α 3 p.c. v β off the plate.

B 11263 Q off
α 2 v
v 3 β

B 11196 L
p.c. α 3 p.c. v
" v 4 " β

B 10815 I off.
α 2 v
v 4 β

B 18778 L
p.c. α 2 p.c. v β off the plate

B 17109 L
p.c. α 3 p.c. v β off the plate.

March 14. 1899.

B 10880 L
p.c. α 3 p.c. v
" v 5 " β

B 11339
p.c. α 2 p.c. v
" v 4 " β

B 17275 L
p.c. α 1 p.c. v β off the plate

B 18675 L
p.c. α 2 p.c. v " " " "

B 18902 L
p.c. α 3 p.c. v
" v 4 " β

B 11338 L
p.c. α 2 p.c. v
" v 3 " β

B 11318 L
p.c. α 3 p.c. v
" v 3 " β

8400 I off
α 2 v
v 4 β

March 14, 1899.

B11340 L
p.c. α 1 p.c. v
" v 5 " β

B16046 L
p.c. α 2 p.c. v β off the plate.

B18576 L
p.c. α 2 p.c. v " " " "

B15922 L
p.c. α 3 p.c. v " " " "

B11341 L
p.c. α 2 p.c. v
" v 4 " β

B15612 a Sp
α 2 v
v = β Images burned out

23h 5m

B 20188 (broken) L.
p.c. α 2 p.c. v β off the plate.

5022 A Sp.
Images on extreme edge. α & β off the plate
v = γ.

March 15, 1899 21h 0m

Examination of A.G.C. 17270 on X plates.

X3975 β Crucis
α 2 v
v 4 β

There is no trace on this plate of a faint spectrum which appears on X7524 near A.G.C. 17270, showing that the film at this point on the latter plate was exposed.

X3976 β Crucis
α 3 v
v 4 β

X8255 β Crucis 2 p.c.
α 2 v
v 5 β ~~β too faint.~~

X4192 β Crucis
α 3 ~~β~~ v β not seen

X6295. β Crucis
v = α β not seen.
α on extreme edge of plate.

March 15, 1899.

Cont. of preceding examination

X 7402 β Crucis

α 3 v

β not seen.

v extremely faint. α also faint.

X 8261 β Crucis

α 2 v

β not seen.

X 8361 β Crucis

v not seen

α + β not seen.

Plate shows only β Crucis..

X 7644 β Crucis

No spectra seen except that of β Crucis.

B 21746 Sp.

α 3 v

v 3 β

4875 N. Sp.

α 2 v

v 3 β

March 15, 1899.

X 6257 ζ Puppis

Measures of bands 4633 and 4688

	Int.	Width	
4688	50	1.0	0.2 mm
4633	30	1.0	0.2 "
Hβ	30	0.5	0.1 "

March 15 1899

Measures of width of bright bands in Classes O_I, O_{II}, O_{III} & O_{IV} with the scale ruled to hundredths of an inch

ψ 5058 A.G.C. 22827

4633 3.9 br. 4.0 ft. 1 inch = 25.4 mm.
1.0 mm 1.0 mm .01 " = 0.254 "

ψ 5058 A.G.C. 22763

Hβ 0.7 = 0.254 × 0.7 = 0.1778 or 0.2 mm
4688 1.0 = 0.254 × 1.0 = 0.254 " 0.2 mm
4633 1.1 = 0.254 × 1.1 = 0.2794 " 0.3 "
4543 0.5 = 0.254 × 0.5 = 0.127 " 0.1 "
4514 0.5 = " " " = "
4471 too ft.
Hγ 0.9 = 0.254 × 0.9 = 0.2286 " 0.2 "
4201 too ft.
Hδ 1.2 = 0.254 × 1.2 = 0.3048 " 0.3 "
4059 0.8 = 0.254 × 0.8 = 0.2032 " 0.2 "

p. 26
4688 0.32
0.25
0.285
p. 26
4633 0.30
0.27
0.285

p. 26
Hδ 0.26
0.30
0.28
p. 26
4059 0.20
0.20
0.20

March 15, 1899

ψ 6257 ζ Puppis

Hβ 0.4 = 0.254 × 0.4 = 0.1016 = 0.1 mm
4688 0.8 = 0.254 × 0.8 = 0.2032 = 0.2 "
4633 0.9 = 0.254 × 0.9 = 0.2286 = 0.2 "

ψ 6265 A.G.C. 9311

4688 0.3 = 0.0762 mm
4633 0.9 dbl. = 0.2286 "
Hγ 0.7 = 0.1778 "

ψ 4115 H.P. 1311

Hβ 1.3 hazy = ~~0.0762 mm~~ 0.3302 mm
4688 3.2 = 0.8128 "
4606 3.3 = 0.8382 "
4543 3.0 = 0.762 "
Hγ 2.1 = 0.5334 "
4201 3.0 = 0.762 "
Hδ 3.5 = 0.8890 "
4059 3.1 = 0.7874 "

March 16. 1899 22h 30m

Comparison of intensities of bands when A.G.C 22763 (X 5058) and H.P. 1311 (~~X 41~~ X 4115) are superposed

Call 4688 in H.P 1311 100

Hβ about same in both = 15

	22763	H.P. 1311
4688	= 90	100
4633	50	35
4543	20	30
4514	15	~~20~~
4471	10	
Hγ	25	30
4201	20	15
Hδ	30	30
4059	35	30

March ~~16~~ 17. 1899. 2h 0m

✓ X 4512 δ' Canis Majoris

This plate has been missing and is just found.

A.G.C. 8631 / H.P. 1311 This image appears different from that of H.P. 1311 on X 4115.

Hγ and λ 4059 are here sharper and better defined than the other bands.
Hε is very wide and hazy.
4201 is nearly as intense and well defined as Hγ.
Hβ is rather wide.
4688 is crossed by a dark line. This is certainly seen and the dark line does not agree in position with the bright streak observed in this band on X 4115. For whereas that bright line is towards the edge of shorter λ, this dark line is decidedly towards the edge of greater wave-length. This dark division is no darker than the continuous spectrum, and may therefore be due to a separation in the bright band.

March 17, 1899. X 4512
H.P. 1311

	Int.	Width	
Hβ	15	1.5	= 0.3810 mm.
4688	100	3.9 =0.9906 mm 2.2 tow. sh. λ 1.3 tow. lgr. λ	= .05588 mm = 0.3302 mm
46 ~~23~~ 06	20	2.8 dbl.	= 0.7112 mm.
4543	20	1.5 dbl.?	= 0.3810 "
Hγ	20	0.8	= 0.2032 "
4201	15	0.9	= 0.2286 "
Hδ	15	4.0	= 1.016 "
4059	20	0.9	= 0.2286 "

Scale divided to hundredths of an inch used.

This plate shows faint bands at λ 4026 at Hε, but they are too hazy to measure.

March 17, 1899.

✓ X 4512

A.G.C. 8629 o' Canis Maj. + G-band separated as in α Tauri, and resembles α Tauri at red end. 4227 less intense than in α Tauri.

A.G.C. 862x ✓ + Sp. A.

" 8607 ✓ + ~~A. or~~ A2F.

✓ " 8724 + F or F5G. Solar lines seen. G band resembles F5G, but hydrogen lines are strong.

✓ " 8500 + Sp. A. K line sharp.

✓ " 8495 + and 8496 (m. 8½) A~~2F~~ probably.

March 17. 1899

X 5158,^{4} β^1_2 Tucanae.

✓

Double star.
Two spectra of 1st type.
A.G.C. 467 A or A$_2$F. Lines broad.

✓ X 5162 ,^{4} α Centauri

α^1 seen far into the violet.
α^2 seems like α Bootis.

✓ X 4592 α Centauri.
G band seems divided in α^2.

March 17. 1899 21^h 40^m

✓ C 11786,^{0} H.P. 1368
Hβ dark, with a slight brightness on the edge of greater wave-length. The plate is poor, and the brightness is not well marked.
H.P. 1370 Hβ is not seen bright, nor distinctly dark.
✓ C 11790,^{3} A.G.C. 8991

Too poor. F line not distinctly seen.

B 12543 A.G.C. 17270
α 3 v
v 3 β
p.c. α 2 p.c. v
p.c. β ~~two near~~ superposed on other stars in the cluster.

B 6509 A.G.C. 17270 sf.
α 3 v
v 4 β.

March 17 1899

ψ4115 H.P. 1311

Measured with scale divided to hundredths of an inch.

			ψ4512	
Hβ	1.19	= 0.2794 mm.	1.8	= 0.45 mm.
4688	3.09	= 0.762 "	3.2	= 0.80 "
46~~33~~06	2.80	= 0.7112 "	2.5	= 0.62 "
4543	2.1	= 0.5334 "	2.0	= 0.50 "
* Hγ	1.9	= 0.475 "	0.8	= 0.20 "
4201	2.0	= 0.508 "	1.1	= 0.27 "
Hδ	~~3.1~~ 3.8	= 0.95 "	4.1	= 1.02 "
4059	3.0	= 0.75 "	1.0	= 0.25 "

~~ψ3~~

χ6265 A.G.C. 9311

Hγ	~~1.5~~ 0.6	= ~~0.3~~ 0.1 mm	w.	mm eye-piece
"	0.4	= 0.1 "	"	1/100 inch scale

March 17, 1899.

H.P. 1311 ψ4512

4688	4.0	= 0.8 mm	w.	reticule ~~1/100 inch~~ 1 div. = 0.2 mm
"	3.5	= 0.84 "	"	1/100 inch scale

Examination of the old scale D1339 I first used for measuring lines shows that the smallest division is 1/2 mm.

March 20, 1899 0^h

λ Scorpii X8739 shows the line D^3 in the red.

α Crucis X8997 shows D^3

~~These two plates are the only ones so far found showing this line.~~
See p. 47.

β Centauri X9199 shows D^3

β Crucis X9186 " "
δ Cent. X9197 region too thin

March 20, 1899.
X5058 A.G.C. 22763

Hβ	X8 20
4388	90
4633	50
4573	25
4514	10
4471	15
Hγ	20
4201	15
Hδ	20
4059	30

March 21, 1899. 0h

Lines seen in extreme violet

♃ 3856 δ Orionis First line is violet is hazy indistinct line 17.2m from 3819.2 by measurement in Scale D 1339.

1 (Line a) ♃ 4059 β Centauri
Well marked line in violet as 17.3 scale div. from 3819.2
This appears ~~to be~~ the same line that is seen in δ Orionis. Is it λ 3634?

Hξ to unknown line in β Cent = 6.8
Hξ .. Hγ .. .. .. = 0.8

∴ 3711.8
3704.80
7.8 λ = 0.8 scale

0.8)7.8
9.7

~~0.8)6.8~~
~~.8.5~~

6.8
9.7
476
612
65.96

8.5
390
624
663

37~~0~~4.0 = λ ~~Hξ~~
66.3
~~3767.3~~
3~~7~~6 3 7.7 = λ (approx) unknown line

3704.0
65.9
3638.1 =

March 21, 1899.

♃ 4059 β Centauri

Line (b) in violet 2.2 shorter λ than ~~from~~ 363~~1~~8.~~7~~1

.85
2.2
170
~~170~~
~~1.870~~

9.7
2.2
194
194
21.34

3638.1
21.3
3616.8

~~3637.7~~
~~1.87~~
~~3635.83~~
36 approx λ of line

The line whose wave-length is thus roughly found to be 363~~1~~8.~~7~~1 is more intense than the one of shorter λ and may be the line 3634 due to helium, though it seems impossible to tell from these plates the exact wave-lengths of these lines for they are not sharply marked on any plate I have so far examined.

March 21. 1899.

♃ 3856 δ Ori. ultra-hydrogen lines seen as far as H_δ inclusive.

Intensities

$H\theta$ 30

~~H_ι 30~~

~~H_κ~~

~~H_λ~~

Lines are seen bet. $H\theta$ and H_ι. There appear to be 3. they are distinctly seen, but I can not be sure that they are at exactly the wave-lengths given in Table IV Part I.

	Int.
3779.5	2
3784.6	2
3790.9	2

An examination of the intervals shows that the lines seen are probably the ones given above.

	Int.		Int. 5
H_ι	30	3760.1	30
H_λ	~~30~~25	$H\kappa$	
3728.1	1		
H_μ	22		
H_ν	20		
H_ξ	25		
H_o	10		

Mch. 21. 1899.

The determination of the wave lengths of the indistinct lines seen in extreme violet in β Centauri and δ Orionis does not appear possible with the material now at hand.

♃ 4041 ε Orionis mm. eye-piece

$H\beta$ = 0.4 = 0.08

$H\gamma$ = 0.~~4~~5 = 0.1

It appears that the dark lines in the average spectrum (1 pr.) are about 0.1 mm. wide.

March 21, 1899 22h

X 3856 δ Orionis
(for additional stars)

H.P. 997 or D.M. -1° 913 or A.G.C. 6358 Poor, but shows breaks as in β Hydri, Sp. Ma.

D.M. -0° 970 A–F. Only hyd. lines & K seen.
omit.

-1° 943 Very poor, Orion type, 4026, & 3819 well seen. The other lines are blurred. Probably B3A. 3819 is too strong for B8A.

-1° 949 This sp. may resemble ζ Puppis in having the additional hydrogen lines present, that is, it may belong to class O_I - B. It is faint at red end and Hβ is not seen.
4026 and the line bet. Hε and Hζ which appears to have shorter λ than line K, and may be λ 3927 due to hydrogen. omit.

March 21, 1899.
X 3851 ε Orionis
(for additional stars)

D.M. -1° 935 or A.P. 1010 Too poor. Orion lines 3819 + 4026 seen.

D.M. -1° 943 Probably B3A.

D.M. -1° 949 Too poor. If like ζ Puppis, Hγ and Hδ are not seen. There appears to be a dark line in position of Hγ, but it is seen to be a defect.

D.M. -1° 1004 or H.P. 1047 ✓ B3A Lines blurred.

Mch 21. 1899.

✓ X 8891 π Puppis

K5M.

A.G.C. 9326 $\underline{V}^1$ ✓ Hβ and Hγ bright. Sp. = B3A. Hγ superposed on wide dark band.

" ?

A.G.C. 9338 $\underline{V}^2$ ✓ B3A.

A.G.C. 9276 ✓ B3A. 4481 & 4128-4131 a little more marked than in typical star.

Mch. 23. 1899 0^h

X 8476

Measures of separation of the two components of band 4131 with the scale divided to hundredths of an inch.

A.G.C. 22748

4633 1.1 = 0.27 mm.

A.G.C. 227~~48~~843

4633 1.0 = 0.25 mm.

X

The settings were made on the middle of the dark lines

A.G.C. 22843

Re-measured using 1 inch mag. glass.

4633 0.8 = 0.2 mm.

This measure is the best and will be adopted.

Mch 23, 1899.

ε Orionis
X 8119

	3584				
	3634				
H_o	3697				
H_ξ	3704				
H_ν	3711				
~~H_μ~~	3721				
	3728				
H_λ	3734				
H_κ	3750				
	3760				
H_ι	3770				
	3779				
	3784				
	3790				
H_θ	3798	30			hazy.
	3805				
	3812				
	3819	20	10	20	
H_η	3835	30	15	30	
	3850				
	38~~57~~ 54				
	3856				
	3863				
	3864				

The numbers in black ink are taken from Bk VI pp. 144-
The scale was different there for the hydrogen lines were called 15 and there was no scope for showing differences between the finer lines. It is seen that if we multiply the figures in ink by 2, getting the figures in red ink the intensities for the more intense lines agree closely with those in pencil.

Mch 23, 1899.

X 8119

	3867	1?			hazy. .1.
	3872				
	3876				
	3881				
H_ζ	3889	30	15	30	
	3912	2			ft, hazy.
	3918.7	2			hazy.
	3920.6				
	3925.9				
	3926.8	3			
K	3933.8 3936	6 0	2	4	narrower & more sharply defined than any other fine line
	3947.8	2	1	2	
	3954.8	2	1	2	
	3962.	2	2	4	
	3964.6	5	3	6	
H	3968.6	? 1	0		Line Hε looks diff. on this side, may be focus.
H_ϵ	3970.2	30	15	30	
	3975.2	0	0.5	1	
	3982.8	2.	0.5	1	
	3994.9	3	1	2	
	4009.5	6	2	4	
	4026.4	25	12	24	
	4036.0	1	?		
	4042.2	1	?		
	4069.4	4	2	4	wide double?
	4072.0	~~4~~ 3	2	4	
	4075.9	5	2	4	
	4084.9	2	1	2	
	4089.2	20	10	20	

Mch. 23. 1899.

ε Orionis 48119

	4093.7	2	?		
	4096.9	9	~~6~~ 3	6 ~~12~~	
Hδ	4101.8	30	~~30~~ 15	30	
	4111.2	1	?		
	4116.2	15	~~14~~ 7	14	
	4120.5	8	3	6	
	4128.5	0	0		
	4131.4	~~8~~ 0	0		
	4134.0	?	0		
	4144.0	8	3	6	
	4152.	?			
	4154.7	3	1	2	
	4169.2	2	1	2	
	4186.2	3	1	2	
	4190	2	1		not in Table. λ obt. by scale measures
	4200.3	3	1	2	
	4224.8	0	0		
	4237.4	0	0		
	4242.6	?	0		
	4247	1			1st line nearer 4254 than 4242.
	4254.1	4	2	4	
	4267.4	3	1	2	
	4276.7	3	1	2	
	4285.1	3	1	2	
	4304.4	2	1	2	
	4318.0	} 4	2	4	broad not distinctly double
	4320.7				
	4327.3	2	?		
	4334.5	2	?		

Mch 23. 1899.

ε Orionis 48119

Hγ	4340.7	30	15	30	
	4346	1			
	4358.1	5	1.5	3	
	4361.0	0			
	4367.3	3	1	2	
	4373.2	~~0~~ 1	double?		
	4380.1	3	1	2	
	4387.8	8	4	8	
	4395.7	~~0~~	0		1 Re-examined
	4415.1	} 5			line broad, so I assume that both are present. 1 2
	4417.5				1 2
	4437.9	0	0		
	4447.7	0	0		
	4471.8	2~~5~~0	10	20	
	4481.4	3	1	2	
	4490.6	1	?		
	4514.5	0	?		
	4531.4	?	?		
	4534.5	2		2	approx λ of a line not given in Table IV
	4542.7	2	1	2	
	4553.4	7	3	6	
	4568.6	6	2	4	
	4576.5	2	1.5	3	
	4591.6	2	1	2	
	4598.2	2	1	2	
	4603.7	1	0		
	4611.2	2	?		
	4619.8	1	?		
	4630.6	4	1	2	
	4641.1	6	2	2	

Mch. 23, 1899.

			Int.		
	4649.2	30	16	32	
	4661.7	4	double? very broad & hazy.	~~2~~ 4	
	4675.3	5	1	2	
	4685.4	6	1.5	3	
	4697.9	1	?		
	4705.0	1	?		
	4712.8	8	3	6	
Hβ	4861.5	30	1.5	30	
	4925.7	20	3	6	
	5023	10	2	4	
	5413.9	3			
	X	3			appears triple at upper end, is probably double, fainter line towards violet.

I have made a very careful determination of the above intensities, and do not believe I could improve upon it from this plate.

Mch. 24, 1899 22^h

Estimates of intensities

Estimates of intensities hitherto made have not been on the right plan for no attention has been paid to the width merely the degree of brightness or darkness being observed. I thought the measures of width ~~would~~ as expressed in mm. and the degree of darkness or brightness together would give the whole of it but Prof. Pickering told me yesterday afternoon that I must in estimating intensities consider the amount of light in a bright band or the amount of darkness in a dark line or band.

An independent estimate of intensities will now be made.

X6265 29 Canis Majoris

4688	20	about same amt of light as Hβ in μ Cent
4633	3.5	double.

It seems to me that the int. of the br. lines should have the same relation to the cont. spectrum as the int of the dark lines have

Mch. 24. 1899

Est of intensities

47476

A.G.C. 22763

4688 50

4633 30

A.G.C. 22748

46488 10

4633 15 / 10 Two distinct lines well separated.

A.G.C. 22843

H β 5

4688 ~~20~~ 30

4633 20. 20. two equal lines.

ζ¹ Scorpii

H β 5 gd. R.

A.G.C. 22827

100

47421 ζ Puppis

4688 30

4633 15

Mch. 24. 1899

Est. of intensities

47321 29 Can. Majoris

4688 20

4633 5

45058

A.G.C. 22827

4633 This band is in its brightest part nearly as wide as 4688 in H.P. 1311, and this image is comparable w. H.P. 1311 on X4512, This band is about half as bright as 4688 in H.P. 1311.

If that is 100, this then is 50

A.G.C. 22763

Hβ	~~10~~	8	3
4688	40		40
4633	30		20
4543	8		3
4514	5		2
4471	5		1 or 2
Hγ	10		3
4201	5		2
Hδ	12		4
4059	15		4 or 5
4026	3		1

Mch. 24, 1899

Est. of intensities

X5088

A.G.C. 22748

4688 3 very faint.

4633 8

A.G.C. 22843

4688 20

4633 15

Hβ 10

Mch. 24, 1899

Est. of intensities

46598

A.G.C. 22748

Hβ not seen.

4688 5

4633 10

A.G.C. 22843

Hβ ~~H~~ not seen

4688 30

4633 25

Hδ 5 edge of pl.

Hγ 5 " " "

A.G.C. 22827

4633 ~~60~~ 75 as comp. w. 4688 in H. P. 1311

A.G.C. 22763

4688 ~~30~~ 40

4633 15

March 26, 1899   21h 30m

Est. of intensities of lines in ε Orionis X 4041

		Est. on X8119 pp 82-86	Est. from X4041, June 2, independent of former marks	
4925	10	20	10	
Hβ	30	30	25	
4712	3	8	2	
4685	2	6		
4675	2	5		
4649	25	30	25	
4641	4	6		
4568	5	6	3	
4553	5	7	4	4514.5 | 2 | This line is certainly seen
4481	← 4	3		
4471	20	20	20	1
4415 4417	4	5	3	
4387	6	8	5	
4378	2	3		
4367		0		
4350	3	5		
Hγ			25	
4320 4318	2	4	3	
4254	2	4		
4201	1	3		
4186	2	3		
4169	2	2		
4154	2	3	3	
4144	8	8	5	
4120	6	8	5	
4116	15	15	10	
4096	2	9		
4089	20	20	15	

Mch. 26, 1899.

		Est. from X8119 pp.82-86	
4075 4072	4	5	3
4072		4	
4069	6	4	5
4026	25	25	~~20~~ 15
4009	6	6	3
3994	3	3	2
Hε	30	30	25
K	3	6	Image too ft.
3926	3	3	
Hζ	30	30	

There seems to be a ft. line bet. Hζ & Hη, & nearer Hη, but the image is too hazy to be sure of its position

Hη 3889 Image too ft.

Mch. 26. 1899

44512   A.G.C. 8631

Hβ	8	
4688	100	
4606	15	
4543	15	
Hγ	15	
4201	15	
Hδ	15	
40~~26~~59	18	
4026	5	} Image ft. at this end.
Hε	5	

Mch. 26. 1899.

Band 4688 covers the position of line 4712.8 in Class O_{I}, O_{II}, O_{III}, but not in O_{II} ζ Puppis.

Tuesday, March 28, 1899. 0h. 30m

Lines in red.

C plates of α, δ Orionis and α Scorpii taken to determine the wave-lengths of the unknown line in δ Or. that appears to be the additional hydrogen line 5413.9.

C11808 δ Orionis } superposed.
C11802 α Orionis }

Lines of gr. λ than Hβ seen in δ Or.

4925 very hazy, too much blurred to est. intensity.
Blur near pos of λ5023, but can not see line clearly.

5413 Int. 4 This line is of decidedly gr. λ than the double line 5406, 5410. which are not seen separate. From this plate the wave-length of this line would seem to be about 5415.

2 bet. 5413 & D3 and nearer 5413.

D3 15. Appears to be present but the image is very thin this far in the red.
When this plate is viewed alone and not superposed D3 is distinctly seen. It has wave-length a little shorter than D3 in α Orionis and is undoubtedly the helium line. It is a thick strong line.

March 28, 1899.

Lines in red.
C 11807 δ Or. } superposed
C 11803 α Or. }

Lines in red in δ Or.

5413 3 Narrow and sharp.
This is the only line clearly seen in this sp. of gr. λ than Hβ.
Region of D3 cut off.

Mch. 28. 1899

√ C11794 $,^{u}$ H. P. 1368.
Hβ dark. Good image
Hβ appears to have a thin bright line on side of gr. λ, but this may not be real.

√ C11796 $;^{o}$ H. P. 1368.
Hβ dark.

√ C11813 $,^{u}$ H. P. 1368.
Hβ dark. Fair image.

Wednesday Mch. 28. 1899. $22^{h}\,20^{m}$

Measures of fb. lines in α Crucis of shorter λ than D³. Image 1.
Lines are numbered on X 8997. of scale and D³

			Int.
8a	8.8 from D³	Scale D, 1839 used	2
8b	7.9 " "		2
8c	~~5.8~~ 6.9 very fb and hazy	from D³	1
8d	5.8	" "	2

D¹ + D² in α Scorpii are 0.3 apart as measured in like manner

$$\begin{array}{ll} D^1 & 5896.0 \\ D^2 & \underline{5890.0} \\ & 6.0 \end{array}$$

∴ 1 div. = 18.0 in λ and roughly
∴ λ of

8a = 5875.88 ~~+~~ − (18.0 × 8.8) =
$$\begin{array}{r} 5875.88 \\ \underline{158.4} \\ 5717.48 \end{array}$$

8b = 5733.7
8c = 5751.7
8d = 5771.4

Mch. 28. 1899

Lines in red in α Crucis (cont.)

Image 2.

Measures from D³ as on preced. page.

8d	5.9
8 ~~d~~ b	7.9

Other lines not b. Image burned out.

γ Scorpii ✕ 8739. 0 of scale on D³

			Int.
8 d	5.8		3
8 b	7.8		2
8 c	6.7	very hazy.	1
8 a	8.6		2

These are evidently the same lines seen in α Crucis

Line seen of shorter λ than 3 (bet 2 + 3)

Call it 2a

2a − 4 = 2.2

3 − 4 = 1.1

λ of 2a ∴ = 5002.

Mch 28, 1899

β Crucis ✕ 9186

This shows more lines bet. Hβ and D³ than any yet examined.

Plate also shows 3 or 4 lines bet. Hβ and 4712 that ought to be measured for they are not given in Table IV.

Scale D 1339.

	Int	
4.8	1	
4.0	1	
3.2	2	
2.5	2	

0 of scale on Hβ.

Four ft. lines bet. Hβ and 4712. Measures from Hβ to end of shorter λ

Measures of lines from Hβ to D.

0 of scale placed on Hβ

Image 1.

	Measure	Intensity
4891	2.2	2
4906	3.3	2
4922	4.5	8
2	6.1	3
2¹ ~~a~~	7.2	~~x~~ 2
	9.9	1
3	10.5	2
4	11.2	5
6	1~~2~~3.6	3
8d	53.1	2
D³	58.2	25
10	59.1	2

March 28, 1899.

4 9186 Image 2 β Crucis

0 of scale on Hβ

	Measure	Int.	Int. from prec. page
	2.1	?	2
	3.2	?	2
4922	4.7	8	8
2	6.1	2	3
3	10.8	1	2
4	11.6	4	5
	12.9	1	
6	14.0	2	3
	~~34.0~~ 24.0	1	
	25.0	1	
8 a	50.0	2	
8 b	50.9	~~1~~ 3	
8 c	51.9	2	
8 d	52.8	~~1~~ 3	2

Mch. 28. 1899.

4 9197 δ Centauri

0 of scale on Hβ.

	Meas.	Int.
4922	4.5	3
4	11.8	2
6	14.0	1
	21.8	1
	28.2	1
	30.7	1
	54.5	1

4 9199 β Centauri " " " " "

Image 1.

	Meas.	Int.	
4922	4.6	8	
2	6.0	~~1~~ 2	
3	10.3	2	
4	11.2	3	
6	1~~8~~.5 3	2	
9³	58.0	20	2 for ?

β Cent. Image 2

	Int.
8 a	1
8 b	2
8 c	1
8 d	3

Thursday, March 29. 1899   22h

		β Cent. X7911 for- Poor plate lines very broad and hazy.	γ Orionis X7978	α Par. X8089	β Or. X7945.	β Cent. X8376 2 pr.	β Crucis X8261 2 pr.	φ Vel X8402 2 pr.	φ Vel. X 1 pr.	γ Gruis X9241	γ Gruis X8689	τ Scorpii	ζ Centauri X8086 or X6499
ς	3584			α Par. X5268 for ultra-violet lines.									
	3634												
Hσ	3683												
Hρ	3686												
Hπ	3691.5												
Ho	3697.4												
Hξ	3704.0			25									
Hν	3711.8			~~35~~ 2~~5~~0									10
Hμ	3721.9			~~30~~ 2~~0~~5									20
	3728.1			~~35~~ ~~25~~									
Hλ	3734.2			~~40~~ 35							30		50
Hκ	3750.2		This plate of γ Orionis does not show the region of shorter λ than 3819. λ	45							80		80
	3760.1												
Hι	3770.8			50							80		90
	3779.5												
	3784.6												
	3790.9												
Hθ	3798.1			50							80		90
	3805.1												
	3812.4												
Hθ'	3815.2												
	3819.2	20? Im ft.	20? Image ft.		10? Image thin	20	20.	Too ft.	15		2		
Hη	3835.5	30 〃 〃 Image too ft.	40	50				40	45		80		
	3850.		0 Image 〃					0					
	3854.2		0 〃 〃		7			0					
	3856.2		1 Image ft.	3	12			0	10				

Mch. 27, 1899.

		(β Cent. ×7911	γ Orionis ×7978	α Pav. ×8089	β Or. ×7945	β Cent. ×8376 2 pr.	β Crucis ×8261 2 pr.	φ vel. 8402	φ vel 1 pr.	γ Gruis ×9241	γ Gruis ×5689	τ Scorpii	Centauri ×8486
Hζ'	3859.8	Image too faint in this region	0	0 This plate does not show the image beyond Hζ.	0	Region too hazy	Region too hazy	0	0				
	3863.2		~~2~~ 1	from 1 pr. plate! 1	10			0	8				
	3864.		~~2~~ 2	0	0			0	0				
	3867.6	4	10	2	5			0	~~8~~ 2				
	3872.4	3	6	2	4			0	~~8~~ 2				
	3876.4	3	6	–	0			0	~~0~~ –				
	3881.7	2	~~2~~ 1	–	0			0	~~0~~ –				
Hζ	3889.1	30	40	40	40	30	30	40	40		80		90
	* 3906.6	0	0	Image too faint	2								
	3912.2	4	4	Image too ft. 1	1 ?	4	3	0	0				
	3918.7	{5 not clearly separate	6	4 {Image too ft. to get good est.	7	5	4	0	5 ~~0~~				
	3920.6	{5	6	4	~~10~~ 7			0	~~0~~				
	* 3924.9	Image too hazy.	~~3~~ 2	Image too hazy	0								
Hζ'	3925.2					0	0	0	0				
	3926.8	5 very hazy	12	3 Image ft.	10	5	4	0	8				
K	3933.8	2 (very hazy.)	7	7 Image ft.	30	2 Focus not as good as in region of λ	2	12	15	2 Focus too poor	6		9
	3936	Too hazy	3	2	2								
	3947.8	2	2	1 Image ft.	0	3	3	0	0	0			
	3954.8	3 double?	3 double Comp γ Or. λ = 3 " ch. " = 2	2 double " "	0	3	3	0	0	0			
	3962	0	0	0	0	0	0	0	0	0			
	3964.6	4	12	9	10	4	4	0	5	0			
H	3968.6	0	0	0	20		0	0	? Hε is more intense than Hζ.	0			
Hε	3970.2	30	40	40	40	20	30	40	45	80			90
	3975.2	0	0	0	0	0	0	0	0	0			
	39~~86~~82.8	3	2	0	6	2	2	0	~~2~~ 1	0			
	3994.9	3	~~10~~ 7	1? very doubtful about this	6	3	3	0	2	0			
	4009.5	10	20	15	10	7	7	7	12	2	2		
	4026.4	25	30	30	20	25	25	20	25	15	15		5 ~~5~~
Hε'	4027.4				0								
	* 4033	Too hazy →	2	0	0	8	0	0	0	0			
	4036.0	1	~~3~~ 4	0	0	0	0	0	0	0			
	4042.2	1	~~2~~ 3	0	0	0	0	0	0	0			
	× 4045	Too hazy	2	0	0	0	0	0					

Sec. p. 116, 118, 119

* Sec. p. 120

Mch. 29, 1899.

		β Cent. X7911	γ Orionis X7978	α Pavonis X8089	β Or. X7945	β Cent. X8376 2 pr.	β Crucis X8261 2 pr.	φ Vel. X8402	φ Vel. 1 pr.	γ Gruis X9241	γ Gruis X5689	τ Scorp X8509	ε Centauri X8486
	4059	0	0	0	0	0	0	0		0			
	* 4065				2								
	4069.4	4	5	2	1	4	4	0		0			
	4072.0	4	4	2	0	3	3	0		0			
	4075.9	5	5	2	0	5	5	0		0			
	4084.9	4	3	1	0	4	4	0		0			
	4089.2	5	3	0	0	5	6	0		0		10	
	4093.7	1.5	2	0	0	1	1	0		0			
	4096.9	2	1	~~01~~ 0	0	1	2	0		0			
Hδ	4101.8	30	40	40	40	30	~~4~~ 30	40		80			90
	4111.2	3	2	0	0	2	3	0		0			
	4116.2	2	1?	0	0	1	3	0		0		7	
	4120.5	~~8~~ 7	~~12~~ 10	~~12~~ 10	6	8	8	~~8~~ 7	8	1	2	~~12~~ 10	~~05~~
	4128.5	1? Lines too hazy.	2	4	15	1	?	~~8~~ 7	12	4	~~3~~ 4		~~3~~ 5
	4131.4	1? " " "	2	4	15	1	?	~~8~~ 7		4	~~3~~ 4		
	4134.0	0? " " "	1	0	0	2	2	0		0	0		
	4144.0	~~8~~ 7	28	~~20~~ 18	8	7	7	~~15~~ 12	15	3	5	12	3
	4152.	0	2	1	0	0	0	0		0			
	4154.7	3	3	3	2	3	4	0		0			
	4169.2	2	4	5	1	~~4~~ 3 double See p. 128	3 double? comp. [illegible] object = 1	0		0			
	4186.2	2	2	1	0	3	3	0		0			
	4190	2	2	1	0	3	3	0		0			
Hδ'	4201.7	0	0	0	0	0	0	0		0		2	
	4224.8	0	2	0	0	0	0	0		0			
	4237.4	0	3	0	0	1	1	0		0			
	4242.6	0	3	0	0	2	2	0		0			
	4247	0	1.5	0	0	1	0	0		0			
	4254.1	5	3	~~2~~ 1	0	5	5	0		0			
	4267.4	4	7	10	8	4	4	~~10~~ ~~8~~ 7	5	0	2		

* See p. 116

Mch. 29, 1899.

		β Cent. 47911	γ Orionis 47928	α Pav. 48089	β Orionis 47945	β Cent. 48376 2 pr.	β Crucis 48261 2 pr.	φ Vel. 48402 2 pr.	φ Vel. 1 pr.	γ Gruis 49241	γ Gruis 45689	τ Scorp. 48539	ε Centauri
	4276.7	4	3	0	0	4	5	0		0			
	4285.1	3.5	2	0	0	4	4	0		0			
	4291 4294	{2		0 0	{2	1.5 1.5	2 2						
	4304.4	3	2	0	2	3	3	0		0			
	4318.0	6 wide	3 wide	0	0	6 both present	3	0		0			
	4320.7		8	0	0		4	0		0			
	4327.3	2	2	0	0	2	2	0		0			
	4334.5	2	1	0	0	~~30~~ 2	2	0		0			
Hγ	4340.7	30	40	40	40	30	30.	40		0			
	4346.	?	0	0	0	2? Space bet. 4346 & 4350 is hazy.	2	0		0			
	4350.1	5 wide	1	0	? See p. 122	4	4	0		0			
	4361.0	0	0	0	0	1	2 {double? of line on side sh. λ	0		0			
	4367.3	3 wide	2	0	0	3	3	0		0			
	4373.2	2 hazy	2	1	0	2	2	0		0			
	4380.1	2 "	0	0	0	2	2	0	~~8~~	0		~~12~~	
	4387.8	8	15	~~20~~ ~~15~~	7	8	8	~~15~~ 10	15	3	4	12	4
	4395.7	1	2	0	0	2	2	0		0			
	4415.1	{7	3	1	2	7	7	0		0			
	4417.5	{						0		0			
	4437.9	1 hazy	4	5	2	2	2	0		0			
×	4442		1	0		1	2						
	4447.7	1 hazy	3	0	0	2	2	0		0		~~20~~	
×	4452		2	0		2	1						
	4471.8	20.	25	20	15	20	15	15 ~~20~~	18	10	10	20 ~~3~~	4
	4481.4	3	~~4~~ 6	8	15	4	4	12 ~~15~~	12	13	12	3	8
	4490.6	1	0	0	0	1	2 double.	0		0			
	4514.5	?	1	0	0	1	?	0		0			
	4531.4	2	3	~~2 may be 1~~ 1	2 may be solar line 4531.2	2	2	0		0			
	4535		1	0	0	0	0	0		0			
Hγ'	4543.6	1	~~2~~ 1	0	0	0	0	0		0		3	
	4553.4	6	5	3	2	6	6	2		0		4	

Poor definition

See p. 123, 124

Mch 29, 99

	β Cent. 47911	γ Orionis 47978.	α Pav. x8089	β Orionis x7945	Good focus β Cent. x8376 2 pr.	Good focus. β Crucis x8261 2 pr.	φ Vel. x8402 2 pr.	φ Vel. x 1 pr.	γ Gruis 49241	γ Gruis x5689	τ Scorp. 48509	α Centauri x
4568.6	4	4	3	2	4	4	0		0		4	
4576.5	2	2	2	1	3	3	0		0			
4591.6	2	1	1	0	3	3	0		0			
4598.2	2	1	1	0	3	3	0		0			
4603.7	? Too hazy.	~~x~~1	0	0	1	2	0		0			
~~4606~~									0			
4611.2	3 . double?	0	0	0	2	2	0		0		2	
4619.8	2	2	0.	~~1~~ 0	1	1	0		0		2	
4630.6	3	~~5~~ 4	0	~~x~~ ~~x~~1?	3	3	0		0		5	
~~4633~~				~~4 1?~~ } See p.122			0		0			
4641.1	6	5 very wide double?	1?	0	6	Double - 4 3 [illegible]	0		0		6	
4649.2	10	6	~~2~~2	0	10	12	0		0		12	
4661.7	3	2	0	1	4	4	0		0		3	
4675.3	~~3~~4	2	0	~~x~~ 0	4	4	0		0		2	
4685.4	0 There seems to be a hazy line of gr. 2.	0	0	0	2	2	0		0		8	
4697.9	x 2 } mistaken separated.	0	0	0	3	3	0		0		2	
4705.0	x { wide, hazy line	0	0	0	3	3	0		0		2	
4712.8	5	7	8	6	5-6	5	5	8	0	1	~~10~~ 6	0
Hβ 4861.5	30	40	40	40	30	30	~~5~~4 0	45	80	80	30	90
4925.7	15	20	20	18			10	10? Image ft.			10	0
4937	3	1	2	0								
5023	~~10~~ 5 image ft.			5			Image too ft.					

Two or three hazy lines bet. Hβ and 4712 are glimpsed in β Cent. They are too hazy to measure but are the same lines as in β Crucis (see p. 101) probably.

Friday, Mch 30. 1899 22ʰ

No. Approx λ

Lines in red.

1 ~~4891~~

– means that the image is too ft. or dense to determine presence of line

2 ~~4906~~

2a λ's by formula

No.	Approx λ	No.	Approx λ	ε Orionis X8119	δ Orionis X8119	ζ Orionis X8115	ζ Puppis X8233	θ Carinae X9184	α Crucis X8997	β Crucis X9186	λ Scorpii X8739	β Centauri X9199	δ Cent.	ε Canis Maj. X8940	η Canis Maj.
2'a	4889.0		4891	~~0~~ –	–	–	0	0	0	2				0	0
3	4906.4		4906	0 –	–	–	0	0	0	2				0	0
4	4922.1	1	4922	7	~~+0~~ 7	2	0	10	10	8	10	8	3	10	8
5	4942.0	2	4937	0 –	–	–	0	0	+2	3	1	2		1.5	1
6	4959.7	2'a		0 –	–	–	0	0	1	2					0
7		2a	5002	0 –	–	–	0	1	1	1	2			0	1
8a	4999.3	3	5008	0 –	–	–	0	3	1.	2	2	2		3 double	1 d.
8b	5015.8	4	5014	5	~~5~~ 3	1	0	4	4	5	4	3	2	5	5
8c		5	5030	0 –	–	–	0	0	0	—	0			1	
8d	5046.6	6	5046	2	~~2~~ –	–	0	3	3	3	3	2	1	4 wide	2
8		7	5052	0 –	–	–	0	2	1	1	1			0	0
9	5677.5 ~~5721.8~~	[illegible]	5413.9	3	6	5	15	4							
10	5697.7 ~~5738.2~~	8a	5717	0 –	–	–	& Region n. S	2	2	2	2	1		0	0
	5721.8	8b	5733	0 –	–	–	0 " "	1	2	3	2	2		0	–
	~~5757.6 Sup. 144.~~ 5738.2	8c	5751	0 –	–	–	0 " "	0	1	2	1	1		0	–
	~~5773.4~~	8d	5771	0 –	–	–	0 " "	2	2	3	3	3		0	–
	~~5859.0~~	8	5860	0 –	–	–	0 " "	–	2	1	0			Im. inft.	Region n. S
		9 (D3)	5875	Region n. S.	Region n. S	Region n. S.	Region n. S	–	15	25	10 ap. ft.	20 $\underline{2}$ gr.)	Region n. S.	" " "	"
		10	5882	" " "	" "	" "	" "	–	2	2	Im. inft.	1	" "	" " "	" "
			5202				3	0							
		γ	558~~9~~⁵?	3	3	2	Region n. S	0							
		y	~~0~~ 5695	~~3~~ 0 +	$\underline{3}$	$\underline{2}$	" "	0							

This line appears where slightly shorter λ than solar line 5587.0 in α Aurigae γ

Cont. on p. 160.

Friday, Mch. 30, 1899.

Line near 4069.4 in β Orionis.

Measures — Scale D 1839

From said line to line 4069.4 in β Or. = 1.0
" line 4069.4 to 4075.9 " " " = 1.4

4075.9
4069.4
1.4) 6.5 (4.6
5 6
90
84

4069.4 – 4.6 =
4065.8
λ of line
in β Or.

Line near 4042.$\overset{2}{\cancel{0}}$ in β Or. & γ Or. λ.

From line 4042.$\overset{2}{\cancel{0}}$ to unknown = 0.7

4.6
0.7
3.2

4042.2
3.2
4045.4 = λ of unknown.

Line on sh. λ side of 4036.0 same distance as above line is from 4042.2

4036.0
3.2
4032.8

See measure on p. 153, Bk VIII.

Friday, March 31. 1899 2h 20m

Measurements to determine wave-lengths of two lines between K & Hε.

	B Can. Maj.	C 6.424
	Hη	0
3889.1	Hζ	7.5
	1	10.4
	2	11.5
	3	12.6
3933.8	4	13.3
394~~7.8~~5.0	5	14.9
3954.8	6	16.1
	3964	17.3
3970.2	Hε	18.1
	4009	22.8
	4026	24.8

Nov. 2. 1899. An error was found in applying correction to line ~~[illegible]~~3945.0, so that the given wave-length in Table IV. part I vol 28. is wrong. It is there given 3947.8 See Envelope No. 4, Orion Lines Determinations of wave-lengths in material for part I. vol 28.

X 8119
ε Orionis.

3889.1	Hζ	0
3933.8	K	14.2
394~~7.8~~5.0	"5"	14.1
3954.8	"6"	16.8
	3962.	18.3
	3964.6	19.1
3970.2	Hε	20.5

March 31. 1899

X 7978 γ Orionis.

				Int.		3889.0+4r	Diff
3889.1	Hζ	0	0	40	mean	3889.0	+0.1
3912.2	3912	5.8	5.8	3	5.8	3912.2	0
	3918.7	7.8	7.6	3	7.7	3919.8	-1.1
	3920.6	8.2	8.0	3	8.1	3921.4	-0.8
	3925.9	9.2	9.2	1	9.2	3925.8	+0.1
	3926.8	9.6	9.7	5	9.65	3727.4	-0.6
3933.8	K	11.3	11.3	4	11.3	3934.2	-0.4
3936.1		11.9	11.9	2	11.9	3936.6	
394~~7.8~~ 5.0	"5"	14.2	14.1	2	~~14.15~~ 14.2	3945.8	~~+2.0~~ -0.8
3954.8	"6"	16.8	16.8	2d.	16.8	3956.2	-1.4
	3964.6	19.1	19.1	7	19.1	3965.4	-0.8
3970.2	Hε	20.4	20.4	40	20.4	3970.6	-0.4

-0.5

3889.1	0	0	3889.1
3933.8	11.3	45.2	3888.6
3970.2	20.4	81.6	3888.6

3889.0 + 4r

45.0
3933.8
scale 2.9) 11.2 (3.9 λ
8 7
2 5 0
~~2 3 2~~
~~1 8~~

1 scale = 3.9 λ.
0.6
2.34

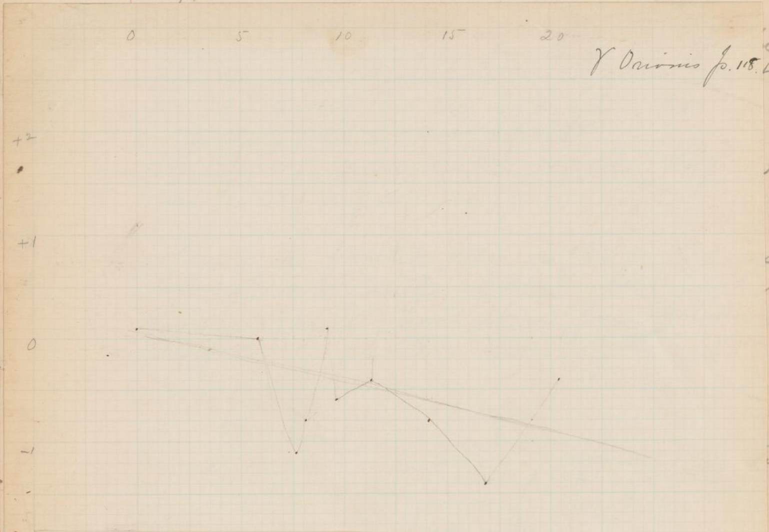
11.9
11.3
0.6

3933.8
2.3
3936.1

X 7911 β Centauri. Lines very hazy.

3889.1	Hζ	0
3912.2	3912	6.0
3918.7	3918	7.9
3920.6	3920	
3926.8	3926	10.1
3933.8	K	11.8
394~~7.8~~ 5.0	"5"	14.2
3954.8	"6"	16.9
	3964	19.3
	Hε	20.6

Saturday, Mch. 31. 1899. 22h



3889.1	0	0	3889.1
3933.8	11.3	45.2	3888.6
3970.2	20.4	81.6	3888.6

3889.0 + 4r

H = reading
V = diff. on large scale

Mch. 31 1899

Line in β Orionis bet. Hγ & * 3918. measures

Hγ	0
Unknown	4.6
3918.7	7.8
3920.6	8.2
3926.8	9.7
12.8	11.4

```
  3918.7
  3889.1
7.8) 29.6 (3.8
     23 4
       620
       624

 3.8
 4.6
 228
 152
 17.48
```

3889.1
17.5
3906.6 = approx λ of this line

Scale D1339.

Monday, April 2, 1899 22^{h}

Measures of two hazy lines bet Hβ & 4712 in β Or. 47978.

		Int.
Hβ	0	
From Hβ tow. violet	4.8	1
" " " "	6.5	1

Measures in β Centauri 47911

		Int.
Hβ	0	
Hβ tow. violet	3.9	2
" " "	5.0	2
" " "	6.7	2

These lines are seen but they are too faint to measure accurately

Measures of lines near 4649.2 in β Crucis to determine whether line 4685.4 is present.

	1st	2nd	Mean	Diff in λ	Diff. in meas. corresponding to diff. in λ.
4641.1	0	0	0		
4649.2	0.8	0.8	0.8	8.1	0.8
4661.7	1.9	$^{1.8}$3.0	1.85	12.5	1.0
4675.3	3.0	3.8	3.0	13.6	1.2
4685.4	3.8	5.0	3.8	10.1	0.8
4697.9	4.9	5.3	4.95	12.5	1.2
4705.0	5.2	6.1	5.25	7.1	0.3
4712.8	^{5}6.9		6.0	7.8	0.8

Line 4685.4 appears to be present.

From this plate the lines 4697.9 and 4705.0 seem closer together than the wave-lengths imply. Probably a small correction is necessary, and the λ of 4705.1 is probably a little too great.

Thursday April ~~4~~ 5. 1899. 23ʰ

Solar Lines in β Orionis

4629.9 Was first taken for the Orion line 4630.6 but was seen to have shorter wave-length. It is apparently the solar line with intensity 3, or about 1 on Miss Maury's scale. It is clearly visible on C 4016 (β Orionis) and appears double, the companion line being on the side of greater wave-length and apparently coinciding with the Orion line 4630.6. The line of greater wave-length is fainter.

	Int
4584.0	3
4549.7	3
4522.9	2
4508.5	2
4352.0	3

The Orion line 4350 may be glimpsed on the side of shorter wave-length.

Cont. on p. 129.

Friday, April 6, 1899 22ʰ

β Cent 48376. shows a line of slightly greater λ than 4447.~~4~~7.

Measures to determine wave-lengths of these lines.
Scale D 1339.

4417.5	0
4447.7	2.9
4471.8	5.5

4471.8
4417.5
5.5) 54.3 (9.87
49 5
4 80
4 40
400

9.9
2.9
891
198
28.71

4417.5
28.7
4446.2 which is probably line 4447.7 as given in Table

Another line is clearly seen of greater wave-length than this line, and half as far away as line 4437.9 is on the side of shorter wave-length.

4447.7
37.9
2) 9.8
4.9

4447.7
4.9
4452.6 approx λ of this line

April 6, 1899

✓ 48376 β Cent.

A faint line is distinctly seen between 4437.9 and 4447.7, about half-way.

4437.9
4.9
4442.8

It is fainter than lines 4437 and 4447, and may be called intensity 1, though the sharp definition of this plate makes it distinctly visible.

48261 β Crucis

A faint line appears between lines 4437.9 ~~4395.7~~ and 4415.1. It appears well defined at lower edge and hazy at upper edge. It may be a defect

April 6, 1899

48376 β Cent.

Shows 2 faint lines bet 4285.1 ~~4318.0~~ ~~4320.7~~ & 4304.4

~~and one faint line bet Hγ and 4327.~~

4304.0
4285.1
2) 18.9
9.4

4285.1
9.4
4294.5 = approx λ of line of gr. λ bet. 4285 & 4304.

94.5
4285.1

Est. to be 1/3 away 3) 9.4
3.1

4285.1
3.1
4288.2 =

approx. λ of line of sh. λ bet 4285 & 4304.

These lines are hardly as intense as those called 2 but are seen. They are about 1.5 in intensity.

48261 β Crucis.

The two lines above referred to are here seen and have intensity 2.

April 6. 1899.

√ Measures of lines discussed on the preceding page
Measured on X 8261 β Crucis
Scale div. to 1/100 of an inch used.

4285.1 0
1.3
2.0
4304.4 3.9

4304.0
4285.1
3.9) 18.9 (4.8
15 6
3 30
3 12

4.8
1.3
14 4
4 8
6.2 4

4285.1
6.2
4291.3 = approx. λ of line of sh. λ.

4.8
2.
9.6

4285.1
9.6
4294.7 = λ of line of gr. λ

Saturday, April ~~7~~ 8. 1899. 0h 20m

√ Line in ζ Orionis between 4242.6 and 4254.1, very faint.
Measured on Scale D 1339.

42426 0
1.2
4254.1 2.5

4.6
1.2
5.52

4254.1
42.6
2.5) 11.5 (4.6
10 0
1 50

4242.6
5.5
4248.1 which is probably the same line seen in ε Orionis, see p. 84

May 27.99. On superposing the plates 8119 of ε Or. and 7978 of ζ Or. these faint lines do not appear to be the same. The line is certainly seen in ζ but it may be a defect in ε.

April 8, 1899.

Measures of lines between Hδ & Hγ in
β Cent. D 8376
Scale D 1339.

Hδ	0		
4120.5	2.4		
4144.0	5.7		
41~~60~~54.7	6.9	1.2	
x	8.1	double	Int. 2
4169.2	8.9		3
4186	10.9		
4190	11.3		
4254	19.3		
Hγ	29.3		

~~1.2) 10.7 (9~~
~~9~~
~~0.8~~
~~7.2~~

~~4169.2~~
~~9~~
~~4160.~~

~~4169.2~~
~~7.2~~
~~4162.2~~

4169.2 = 8.9
4144.0 = 5.7
25.2 3.2

3.2) 25.2 (8
25 6

0.8
8
6.4

4169.2
6.x
4162.8

4169.2 = 8.9
4154.7 = 6.9
14.5 2.0) 14.5
7.25
1.2
1450
72~~8~~0
8.700

4154.7
4163.4

8.1
6.9
1.2

April 8, 1899.

Solar lines in β Orionis
cont. from p. 122.

	Int.
4233.0	5
4179	2
4173	~~1~~ 2
4163	2
4067	2

Monday, April 9, 1899. 23h

Measures of lines in φ Vel. ∓ 6270, bet. Hη and Hζ.

Hη	0	λ 3835.5
1st line	1.6	
2nd "	2.2	
3rd "	3.0	? maybe defect.
Hζ	4.3	3889.1

$$\begin{array}{r} 3889.1 \\ 4.3)\ 53.6 \\ \hline 12.5 \end{array}$$

$$\begin{array}{r} 12.5 \\ 1.6 \\ \hline 750 \\ 125 \\ \hline 20.00 \end{array} \qquad \begin{array}{r} 3835.5 \\ 20.0 \\ \hline \text{1st line } 3855.5 \end{array}$$

which is therefore probably line 3856.2

$$\begin{array}{r} 12.5 \\ 2.2 \\ \hline 250 \\ 250 \\ \hline 27.50 \end{array} \qquad \begin{array}{r} 3835.5 \\ 27.5 \\ \hline \text{2nd line } 3863.0 \end{array}$$

probably line 3863.2

$$\begin{array}{r} 12.5 \\ 3.0 \\ \hline 37.50 \end{array} \qquad \begin{array}{r} 3835.5 \\ 37.5 \\ \hline \text{3rd line } 3873.0 \end{array}$$

This line is too hazy to identify or measure with any degree of certainity.

April 9, 1899.

✓ ∓ 9103 S.M.P. 2849.
Too poor. K or K5 M.
very thin. Little seen except the two bright bands I & II

A.G.C. 12593 ✓ B3A.
z Velorum.

Other stars too poor.

Wed April 12. 1899 0h

ζ Puppis X 2 pl.

Hβ 0
X 22.5
5413.9 33.8

33.8) 22.50 (.66
2028
2220

δ Orionis X 8119 3 pos.

Hβ 0
30.2? Extremely faint.
5413.9 52.8

52.8) 30.20 (.57
2640
3800

This faint line in δ Orionis may coincide with the unknown line in ζ Puppis between Hβ and Hβ′, but it is too faint in δ Orionis to measure with accuracy.

Thursday. April 13. 1899 0h 35m

γ Gruis X 9241
Solar lines found.

λ	Int
4233.	2
4173.6	1
4179.5	1

Friday, April 14, 1899   0h 10m.

D. M. -21°4864

B 13462 shows a good image of this bright line star. Between bands 4633 and 4471, ~~this~~ a faint bright band appears which is double. One of these components may be the additional hydrogen line 4542. Between Hγ and Hδ, a faint bright band is seen, but appears to be of longer λ than the line 4201 due to hydrogen. This may be due to the difficulty of mapping up the broad hydrogen lines of this star exactly with those of a first type star.

A well-exposed photograph should be taken of this spectrum with the Draper Telescope.

April 14, 1899.

Measures of the length of the spectrum as photographed with 1, 2, & 3, prisms.

α Pavonis X 5688   1 pr.   Scale D 1339

Hβ 0
Hθ 58.8

α Pavonis X 9233   2 pr.

Hβ 0
Hθ 124.2

β Orionis X 7966   3 pr

Hβ 0
Hθ 195.2

1 Div. on scale = 1/2 mm

∴ the 1 pr. spectra are 29.4 mm. from Hβ to Hθ
" 2 " " " 62.1 " " " "
" 3 " " " 97.6 " " " "

Saturday, April 15, 1899 0h 45m

Measures of lines in G band in α Tauri

		Approx. λ	
4337.6	0		
4326.0	2.0		
4315 ?	3.9	4315.0	Lines 4314.3 and 4315.2 prob. joined
Thick line	5.1	4308.0	4308.0, 4309.5 joined, also prob. 4302.6 and 4305.8.
	6.8	4298.2	4299.2 & 4300.8
fine line	7.5	4293.9	4294.3, 4292.2, 4291.2
thick line	8.2	4290.0	4289.9

4337.6
4326.0
2.) 11.6
5.8 1 scale div. = 5.8 units wave length

5.8
3.9
522
174
22.62

4337.6
22.6
4315.0

5.8
5.1
58
290
29.58

4337.6
29.6
4308.0

5.8
6.8
464
348
39.44

4337.6
39.4
4298.2

5.8
7.5
290
408
43.70

4337.6
43.7
4293.9

5.8
8.2
116
464
47.56

4337.6
47.6
4290.0

Monday, April 17, 1899 2h 0m

Identification of the solar lines measured in α Scorpii 4

	Interval	λ		2nd col / 4th col
16525		5896.0		
	117		6.0	19.5
16642		5890.0		
	2080		10~~8.4~~ 6.7	19.4
18722		5781.6 5785.0 83.3	~~106.7~~	
	4142		195.0	21.2
22864		5587.0 5589.6 88.3	132.5 ↓	23.4 ↓
	3110			
25974		5455.8		
	214		9.7	22.0
26188	4	5446.1		
	282		12.2	23.1
26470		5434.8 5433.0 33.9		
	642		23.9	26.8
27112		5410.0		
	120		4.0	30.0
27232		5406.0		
	205		8.7	23.5
27437		5397.3		
	658		26.5	24.8
28095		5371.6 5370.0 70.8		
	3898		143.7	27.1
31993		5227.1		
	15~~08~~10		54.2	27.8
33503		5172.9		

April 17, 1899.

	166	λ	5.3	31.3
33669		5167.6		
	3836 ~~166~~		126.0	30.4
37505		6041.6		
	3839		117.0	32.8
41344		4924.6		
	182		3.8	46.3
41526		4920.8		
	2065		59.3	34.7
43591		4861.5		
	7466		193.5	38.5
51057		4668.0		
	8353		185.5	45.0
59410		4482.5		
	7252		141.8	51.1
66662		4340.7		

April 17, 1899.

Same as preceding, only the mean of E. M. S. measures taken.

16526	
	120
16646	
	2079
18725	
	4162
22887	
	3094
25981	
	212
26193	
	650
26843	
	270
27113	
	124
27237	
	200
27437	
	662
28099	
	3894
31993	
	1522
33515	
	155
33670	
	3849
37519	

April 17, 1899.
Continuation of preceding page.

37519	4031
41350	
	183
41533	
	2065
43598	
	7472
51070	
	8333
59403	
	7267
66670	
	4451
81121	
	9127
90248	

April 17, 1899.

Determination of the wave-lengths of bands I, I-II, II and I(a) as seen in third-type spectra by identifying the limiting solar lines.

Band I(a) seen in α Scorpii 4 and is limited by the lines 4657.0 and 4668.0, that is, the space between these lines is like a bright band. This band is separated by the dark line 4663.7.

In β Gruis 47829 this band is more marked. The line 4663.7 is here seen also.

The other bands I, I-II and III, have no well-defined limiting solar lines, and their limits must be taken as determined from superposing on slates showing Orion lines (see Bk VI pp 82 & 83)

Band I does not extend towards red as far as λ4648 (as given in Part I) in α Orionis 47972 or in ζ Hydri 48323. The bright band ends at about 4625 & a distinct bright line appears at about position of line 4630

Friday, April 21, 1899   8h

C 11830   H.P. 1368.

Hβ dark.

Hβ br. in A.G.C. 1370 ω Canis Majoris.

Monday April 30, 1899,   22h 30m

Measures of lines in red in β Centauri
4 9189   Image # 2.

	Dist.	
Hβ	0	
4922	4.7	
4	11.3	
6	13.8	
8a	49.2	
8b	50.1	
8c	51.2	
8d	52.1	3

Image # 1

Hβ	0
4922	4.8
2	6.1
	10.6
4	11.4
6	13.8
	15.1
D^3	58.0

April 30, 1899.

$49\overset{18}{\cancel{01}}6$ Image 1

β Crucis

Hβ	0
4922	4.7
2	6.1
4	11.3
6	13.7
D³	57.9

Image 2

	Hβ	0	
	4922	4.8	
	2	6.1 .	
λ's ob. by	4	11.4	
microm. measures.	6	13.8	
5721.8	8a	49.3	
5738.2	8b	50.1	0
	8c	51.2	1.1
5773.4	8d	52.1	2.0

5773.4
5738.2
2) 35.2
17.6
1.1
176
176
19.36

52.1
50.1
2.0

5738.2
19.4
5757.6

48739 ~~ϑ~~ λ Scorpii

Hβ	0
4922	4.5
3	10.2 ~~5.2~~
4	11.2 ~~6.2~~
6	13.8
D³	58.1

April 30, 1899.

49184 θ Carinae

			Int.
Hβ	.0	0 .	
4922	4.6	4.5	18
3	10.5	10.4	3
4	11.3	11.3	4
6	13.8	13.7	3
Hβ'		36.0	4
		48.8	~~7~~ 1
8a		49.2	2
8b		50.1	1
8d		52.2	2

48997 ~~β~~α Crucis

Image 2

Hβ	0
4922	4.5
2	6.0
3	10.5
4	11.4
6	13.6
8a	49.9
8b	50.3
8d	52.6
D³	58.6

48994 ζ Puppis 2pr. long

measured at top of line

4861.5	Hβ	0	Int.
		23.2	2
		27.0	1
5413.9	Hβ'	36.1	10

λ 5216.5 approx.

5413.9
4861.5
36.1) 552.4 (15.3
361
1914
1805
1090

15.3
23.2
306
459
306
354.96
4861.5
355.0
5216.5

April 30, 1899.

48994 ζ Puppis   Bottom of lines measured

Hβ	0	
	24.1	2
	36.1	

5413.9
4861.5
3) 552.4
184.1
2
368.2

4861.5
368.2
5229.7

48739 μ Scorpii

Hβ	0	
1	4.6	
2	6.1	ft.
2a	9.1	"
3	10.2	
4	11.3	
6	13.8	

Tuesday, May 1, 1899. 22h

48743 δ Scorpii. Erythrosin

Line 5413.9 present, but very faint. The presence of this line was suspected since the line 4685 is well-marked in this star.

48509 τ Scorpii

Lines 4201 & 4543 the additional hydrogen lines are certainly present in this spectrum with fully as great intensity as in ε Orionis. The line 4649 is however no more intense than in β Centauri. The lines 4089.2 & 4116.2 are intermediate in intensity between β Centauri and ε Orionis. It does not make much difference whether this spectrum is classed B Pec or B1A Pec, as the facts are stated, except that, as the addit. hydrogen lines are certainly seen, it might be better to class it B, as these lines disappear in Class B1A.

May 2, 1899. 1^h

Helium lines in ζ Orionis from Table D.

Series	λ	Int
b	3705	Sup. on Hξ?
	3819	20
	4026	30
	4471	25
c	3867	10
	4120	10
	4712	7
d	3964	12
	5015	
e	3872	6
	3926	12
	4009	20
	4144	20
	4387	15
	4925	20
f	3876	6
	4169	4
	4437	4
	5048	

May 2, 1899.

4 9203 δ Scorpii Eyepiece

The line 5413.9 is seen but faint.
The line 4543 is also present,
intensity 1.5.
4201 not seen, focus poor
at this point.

May 2. 1899.

List of erythrosin γ plates. with prisms.

Record book 5.

Assume that all are erythrosine except very [illegible] "Eryth. plates" these were used.

				pr.
47635	γ Crucis	12h 25.6m	2	
			"	
7644	β Crucis	12 41.8	"	
7645	α1/2 Cent.	14 33	"	
7646	δ Scorpii	15 54	"	
7647	σ Sag.	18 49	"	

~~This~~

	7656	α Arae	17 24	2
	7666	α Tucanae	22 11.6	"
	7667	α Pis. Aust.	22 52.1	2
?	7668	" " "	" "	
	7669	" " "	" "	"
	7721	μ Scorp.	16 45	3
	7726	" "	" "	"
	7728	β Phoen.	1 1.6	"
	7807	τ4 Erid.	3 15.1	"

May 2. 1899.

Erythrosin plates
Record book 6

Isochromatic	8071	α Hydri	1h 55.6m	2	
"	8072	γ Hydri	3 48.8	"	
"	8073	A.G.C. 11534	7 55.3	"	
"	8074	" "	"	"	
"	8080	" "	"	"	
"	8081	"	"	"	
"	8082	α Scorpii	16 23	3	
"	8083	α Aquilae	19 45	"	
"	8084	α Gruis	22 01.9	"	not in box
"	8085	α Pis. Aust.	22 52	"	
"	8086	α Eridani	1 34	"	
"	8087	α Hydri	1 55.6	"	
Erythrosin	8088	α Pavonis	20 17	"	
Isochromatic	8090	α Lyrae	18 33	"	
"	8091	α Aquilae	19 45	"	
"	8092	α Gruis	22 01.9	"	not in box
"	8093	α Eridani	1 34	"	
"	8104	β Orionis	5 9.7	"	
"	8105	α "	5 49	"	
"	8106	α Tauri	4 29	"	
"	8107	β Gruis	22 36	"	
"	8108	α Pis Aust.	22 52	"	
"	8109	α Aurigae	5 08	"	
"	8112	α Tauri	4 29	"	
"	8113	α Orionis	5 49	"	

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	Isochromatic	8114	α Carinae	6 21.8	3
	"	8115	ζ Orionis	5 35	"
	"	8116	α Geminor.	7 27	"
	"	8117	β "	7 37	"
	"	8118	α Tauri	4 29	"
	"	8119	ε Or.	5 31	"
	"	8120	α Gem.	7 27	"
	"	8218	α Tauri	4 29	2
	"	8219	α Aurigae	5 08	"
	"	8228	ζ Puppis	8 0	"
	"	8230	" "	" "	"
	"	8233	" "	" "	"
	"	8309	α Horolog.	7 10	2
	"	8338	R Carinae	9 29	"
	"	8340	δ Cent.	12 03	"
Book 7.	"	8513	γ Vel.	8 06	"
	"	8728	α Scorp.	16 23	"
	"	8729	" "	"	"
	"	8730	α Pav.	"	"
Slide 1915	"	8731	α Gruis	"	"
	"	8732	α Cent.	14 33	"
	"	8733	α Tri. Aust.	16 38	"
? 8734 β Gruis	"	8735	ε Scorp. ~~α Cent.~~	16 43.7 ~~14 33~~	"
	"	8736	ε Sag.	18 17.6	"
	"	8737	β Gruis	22 36.7	"
	"	8738	α Pis. Aust.	22 52	"
	"	8739	λ Scorp.	17 26.8	"
	"	8741	σ Sag.	18 49	"

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Isochromatic	8742	α Tucanae	22h 11.6	2	
"	8743	δ Scorpii	15 54	"	
"	8744	δ Sag.	18 14	"	
"	8745	γ Gruis	21 47	"	Slide 1957
"	8746	β Arae	17 17	"	
"	8747	β Hydri	0 20	"	
"	8748	α Hydri	1 55	"	
"	& 8749	θ Erid.	2 54	"	
"	8925	α Phoen.	0 21.3	"	
"	8926	α Erid.	1 34	"	
"	8929	α Pis. Aust.	22 52	"	
"	8930	β Phoen.	1 1.6	"	
"	8931	α Carinae	6 21	"	
"	8932	π Puppis	7 81	"	
"	8935	β Leporis	5 24	"	
"	8936	β Columbae	5 47	"	
"	8939	α Columbae	5 36	"	
"	8940	ε Canis Maj.	6 54	"	
"	8943	β Hydri	0 26.2	"	
"	8944	α Hydri	1 55	"	
"	8945	θ Erid	2 54	"	
"	8946	α Tucanae	22 11.6	"	
"	8947	α Hydri	1 55	"	
"	8948	δ Canis Maj.	7 04	"	
"	8955	η Canis Maj.	7 20	"	
"	8956	λ Vel.	9 04	"	

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From copy of records

Isochromatic	8989	L² Puppis	7^h 10.5^m	2
"	8990	δ Volantis.	7 16	"
"	8994	ζ Puppis	8 0.1	"
"	8995	π Puppis	7 13.6	"
"	8996	β Carinae	9 12.1	"
"	8997	α Crucis	12 21.1	"
"	9180	γ Crucis	12 26	"
"	9181	β Lupi	14 52	"
"	9182	ε Scorpii	16 43.7	"
"	9183	σ Sag.	18 49.1	"
"	9184	θ Carinae	10 39	"
"	9185	" "	" "	"
"	9186	β Crucis	12 41.8	"
"	9187	μ Velorum	10 42	"
"	9188	β Corvi	12 29	"
"	9189	α Lupi	14 35	"
"	9190	α Arae	17 24	"
"	9191	λ Sag.	18 21	"
"	9192	γ Cent.	12 36	"
"	9193	" "	" "	"
"	9194	η Cent.	14 29	"
"	9195	θ Scorpii	17 30	"
"	9196	ε Sag.	18 17	.
"	9197	δ Cent.	12 3	"
"	9198	ι Cent.	13 15	"
"	9199	β Cent.	13 57	
"	9200	γ Sag.	17 59	"
"	9201	α Muscae	12 31	"

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From copy of records.

				hr.
Isochromatic	9202	β Lupi	14^h 52^m	2
"	9203	δ Scorpii	15 54	"
"	~~9222~~			
"				
"				

May 2, 1899

Erythrosin or Isochromatic plates

Class B {
ξ Orionis 8115$_3$
ε Orionis 8119$_3$

δ Scorpii 7646$_2$ 8743$_2$ 9203$_2$
θ Carinae 9184$_2$ 9185$_2$

B1A {
β Crucis 7644$_2$ 9186$_2$
β Centauri 9199$_2$
α Crucis 8997$_2$
ε Canis Majoris 8940$_2$
A.G.C. 10534. 8073$_2$, 8074$_2$, 8080$_2$ 8081$_2$

B2A {
β Lupi 9181$_2$ 9202$_2$
α Lupi 9189$_2$
λ Scorpii 8739$_2$

Marked end

B3A {
ν Scorpii ~~7721~~$_2$ 7726$_2$ Slide 1949
α Pavonis 8088$_3$ 8730$_2$
α Muscae 9201$_2$
σ Sag. 7647$_2$ 8741$_2$ 9183$_2$

B5A {
α Eridani 8086$_3$ 8093$_3$ 8926$_2$
η Canis Majoris 8955$_2$

B8A {
~~α Sag. 7647$_2$~~
α Gruis 8084$_3$ 8092$_3$ 8731$_2$
γ Gruis 8745$_2$
β Orionis 8104$_3$

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Class Q {
ζ Puppis 8228$_2$ 8230$_2$ 8233$_2$ 8994$_2$
γ Velorum 8513$_2$

Orion with br. hyd. lines {
α Arae 7656$_2$ 9190$_2$
δ Centauri 8340$_2$ 9197$_2$
α Columbae 8939$_2$
η Centauri 9194$_2$

A {
α Lyrae 8090$_3$
α Gem. 8116$_3$
ε Sag. 8736$_2$ 9196$_2$
β Carinae 8996$_2$
γ Cent. 9192$_2$ 9193$_2$

A2F {
θ Erid. 8749$_2$ 8945$_2$
ι Cent. 9198$_2$

A3F {
α Pis. Aust. 766~~6~~7$_2$, 7668$_2$ 7669$_2$ 8085$_3$ 8108$_3$ 8738$_2$ 8929$_2$

F {
θ Scorpii 9195$_2$
α Carinae 8114$_3$ 8931$_2$
α Hydri 8071$_2$ 8087$_3$ 8748$_2$ 8944$_2$ 8947$_2$
α Aquilae 8083$_3$ 8091$_3$

F8G {
δ Canis Majoris 8948$_2$
δ Volantis 8990$_2$

May 2, 1899.
Isochromatic plate.

G
α Aurigae 8109_3 8219_2
α_2 Centauri 7645_2 8732_2
β Hydri 8747_2 8943_2
β Leporis 8935_2
β Corvi 9188_2
a Velorum 9187_2

K
α Phoen. 8925_2
β Phoen. 7728_2 8930_2
ε Scorpii 8735_2 9182_2
λ Sag. 9191_2
λ Vel. 8956_2
α Tauri 8106_3 8218_2 8112_3 8118_3
α Tucanae 7666_2 8742_2 8946_2
β Gem. 8117_3
α Horolog. 8309_2

α Triang. Aust. 8733_2
β Arae 8746_2
π Puppis 8932_2 8995_2
β Columbae 8936_2
γ Sag. 9200_2
δ Sag. 8744_2

M
γ Hydri 8072_2
γ Crucis 7635_2 9180_2
τ_4 Erid. 7801_2
α Scorpii 8082_3 8728_2 8729_2
α Orionis 8105_3 8113_3
β Gruis 8107_3 8737_2
R Carinae 8338_2
L^2 Puppis 8989_2

Wednesday, May 3, 1899 0^h

X 5689 γ Gruis, X 6499 λ Centauri X 6293 γ Centauri superposed show the ~~change~~ increase in intensity of the line K, the the decrease in the lines 4026, ~~the~~ and 4471, slight increase in hydrogen lines, and the incoming of the solar lines

X8745 γ Gruis Isochr.

4925 not surely seen, though when this plate is superposed on X9199 β Cent, a ft. line is suspected at 4925
No Orion lines seen in red,

X8731 α Gruis Iso.
No Orion lines seen in red

Thursday, May 3, 1899 22^{h}

Lines in red. cont. from p. 114.

No. or letter	Approx. λ ~~λ8926~~	α Eridani λ8926	σ Sag. λ7647	~~β~~α Gruis λ8731	α Gruis λ8084 3 pr.	γ Gruis λ8745	α Muscae λ9201
1	4922	8	10	0		1	8
2	4937	0	0	0		0	0
2'a		0	0	0		0	0
2a	5002	0	0	0		0	0
3	5008	0	0	0		0	0
4	5014	4	4	0		0	4
5	5030	0	0	0		0	0
6	5046	1	3	0		0	3
7	5052	0	0	0		0	0
	5202	0	0	0		0	0
~~H~~β'	5413.9	0	0	0		0	0
~~γ~~	5589?	0	0	0		0	0
γ		0	0	0		0	0
8a	5717	0	~~8~~ –	–		–	0
8b	5733	0	–	–		–	0
8c	5757	0	–	–		–	0
8d	5771	0	–	–		–	0
8	5860	0	–	–		–	0
9 (D_3)	5875	–	–	–		–	10
10	5882	0	–	–		–	0

Friday May 5, 1899 0h

		×8088 α Pav.	×5688 1 pr.	×7625 β Crucis	γ Orionis	ε Or.	β Cent.	φ Velorum	β Crucis ×8361	α Pavonis	Lines very wide α Eridani ×8086 3 pr.
	3819.2			3							10? very hazy.
Hη	3835.5										60
	3850.										
	3854.2										
	3856.2			2							2
Hη'	3859.8										
	3863.2			2							
	3864										
	3867.6			1	6						? ρ so hazy that I can not tell whether Q. is this line or 3867 + 3872
	3872.4				4						
	3876.4				4						
	3881.7										
Hζ	3889.1										
	3906.6										
	3912.2				3	2			2 narrow.		
	3918.7	{5	5		4	{2			{3		2
	3920.6				4						
	3924.9				2						
Hζ'	3925.2										
	3926.8	7	8	2	7	2			4		5
K	3933.8	5	4	8	5	3 very sharp.			(Broad hazy) 2		4
	3936.				2						
	3947.8				2	1.5			2		
	3954.8				D. Each comp = 2	2			2		
	3962.										
	3964.6	56			7	4			2	7	
H	3968.6										

Focus too poor in this region.

Thursday, May 3, 1899   22²

Lines in red. Cont. from p. 114.

No. or letter	Approx. λ ~~X8926~~	α Eridani X8926	σ Sag. X7647	δ² Gruis X8731	α Gruis X8084 3 pr.	γ Gruis X8745	α Muscae X9201
1	4922	8	10	0		1	8
2	4937	0	0	0		0	0
2′a		0	0	0		0	0
2a	5002	0	0	0		0	0
3	5008	0	0	0		0	0
4	5014	4	4	0		0	4
5	5030	0	0	0		0	0
6	5046	1	3	0		0	3
7	5052	0	0	0		0	0
	5202	0	0	0		0	0
~~H~~β′	5413.9	0	0	0		0	0
~~4~~	5589?	0	0	0		0	0
γ		0	0	0		0	0
8a	5717	0	Q —	—		—	0
8b	5733	0	—	—		—	0
8c	5757	0	—	—		—	0
8d	5771	0	—	—		—	0
8	5860	0	—	—		—	0
9(D³)	5875	—	—	—		—	10
10	5882	0	—	—		—	0

Friday May 5, 1899 0h

Lines very wide

		+8088 α Pav.	+7625 β Crucis	γ Orionis	ε Or.	β Cent.	φ Velorum	β Crucis +8361	α Pavonis	α Eridani +8086 3 pr.
	3819.2		3							10? very hazy.
Hη	3835.5									60
	3850.									
	3854.2									
	3856.2		2							2
Hη'	3859.8									
	3863.2		2							
	3864									
	3867.6		1	6				Focus too poor in this region.		? p so hazy that I can not tell whether Q. is this line or 3867 + 3872
	3872.4			4						
	3876.4			4						
	3881.7									
Hζ	3889.1									
	3906.6									
	3912.2	+5688 1 pr.		3	2			2 narrow.		
	3918.7	{5 5		4	{2			{3		2
	3920.6			4						
	3924.9			2						
Hζ'	3925.2									
	3926.8	7 8	2	7	2			4		5
K	3933.8	5 4	8	5	3 very sharp.			(Broad hazy) 2		4
	3936.			2						
	3947.8			2	1.5			2		
	3954.8			D. Each comp = 2	2			2		
	3962.									
	3964.6	5 6		7	4			2	7	
H	3968.6									

May 5 1899,

Dec. 18, 9.

		×8088 α Pav.	47625 γ Grui	γ [illegible]	ε β [illegible]	β Cent.	φ Vel.	β Crucis ×83761	α Pavonis ×8089.	α Lupi 47558	α Erid.
Hε	3970.2				25			35 D. focus,			60
	3975.2				0			8			
	3982.8				2			2			
	3994.9	2		5	2			3	~~2~~1		
	4009.5	10	1	12	~~6~~4			5	10		6
	4026.4	2~~0~~ 5	15	.25	15			20	25		15
Hε'	4027.4										
	4033.										
	4036.0										
	4042.2										
	4045										
	4059.										
	4065										
	4069.4			3	3 broad			3			
	4072.0			3	2			8			
	4075.9			4	3			3			
	4084.9			2	1			2			
	4089.2			2	15			4			
	4093.7			~~2~~ 1.5	1			1			
	4096.9			1	4			2			
Hδ	4101.8				25			35 Dble focus			
	4111.2				0			2			
	4116.2				10			3			
	4120.5	8	2	8	5			7	8		3
	4128.5	3	4		0			1	2	1 ← sharper than 4131 or 4134	2
	4131.4	3	4		0				2	1	
	4134.0								1	1	
	4144.0	15	3	12	5			~~2~~7	12		7
	4152.				~~4~~			~~5~~0			
	4154.7			3	2			3			
	4169.2	~~0~~4		4	1.5			5 line [illegible]	4		

May 5, 1899.

		x8088 α Par.	γ Gruis 47623	γ Orionis	ε Or.	β Cent.	φ Vel.	β Crucis x8361	α Pavonis	α Lupi 47558	α Erid.
	4186.2			2.	2			2			
	4190			2	~~4~~ 1.5			2			
Hδ'	4201.7			0	2			0			
	4224.8			2	0			0			
	4237.4			2	0			0			
	4242.6			2	0			1			
	4247			1.5	0			1.			
	4254.1			2	3			3			
	4267.4	6		5	2			2	6		3
	4276.7			2	2			2			
	4285.1			2	2			1.5			
	4291				0			1			
	4294			Region	0			1			
	4304.4			hazy	1.5			1.5			
	4318.0			1.5	{2.5 ft. [illegible]			2		2 fine	
	4320.7							2		2 double	
	4327.3			1	1.5			1			
	4334.5			0	1.5			1			
Hγ	4340.7	40		40	25			35			60
	4346			0	0			1			
	4350.1			0	3			2, 2, double			
	4361.0			0	1			~~1~~ 1 2,			
	4367.3			2	3			2.			
	4373.2			2	6.			~~0~~ 1			
	4380.1			0	2.5			1			
	4387.8	17	5	12	5	8		8	12		7
	4395.7			1	1			2			
	4415.1			2	3			3 ~~2~~ { sharp			
	4417.5							3 ~~2~~ } double			

May 5, 1899.

	λ8088 α Pavonis	γ Gruis λ7625	γ/β [illegible]	ε Sgr.	β Cent.	φ Vel.	β Crucis λ8361	α Pavonis λ8084	α Lupi λ7558	α Erid.
4437.9			2	0			2	4		
4442			1	0			1			
4447.7			2	0			1.5			
4452			2	0			1.5			
4471.6	25	10	20	15	18		18	22		15
4481.4	6	12	4	3			3	6		4
4490.6			0	1			2			
4514.5			1	Image hazy.			1 ?			
4531.4			2	" "			2			
4535				1.5			0			
Hγ 4543.6			0	1.5			0		0	
4553.~~6~~4			4	4			4	3	4	
4568.6			3	~~4~~ 3			3 { good !	3	3	
4576.5			3	~~3~~ 2			2	2	2.5	
4591.6	0		~~3~~ 1	2			2	0	2	
4598.2	0		~~3~~ 1	2			2	0	2	
4603.7			1	1			1.5	0	2	
4611.2				1			2 or 1.5	0	x 0	
4619.8			2	1			2 "	1	1	
# 4630.6			3	3			2 " "		3	
4641.1			3 d?	5 broad			g = gr. λ, = sh. λ ~~3~~, 2, double		D. comp. gr. λ = 3 " sh. λ = 2	
4649.2			3	26			1 2:	2	5	
4661.7			1	3			2 sharp		2	
4675.3			1	4			2 hazy		1	
4685.4			0	4			2 "		0	
4697.9			0	1.5			2 "		0	
4705.0			0	1.5			2 "		0	
4712.8	5		4	5			3 sharp	6	4	
Hβ 4861.5	40	80	40	25	35		35	40^5		

May 5, 1899

No.		λ 4808 α Par.	47625 γ Gem	δ Or.	ε Or.	α Pavonis
"1"	4925.7	5	0	20	10 Image thin	
2		0				
3		0				
"4"		2			8 Im. thin	
5413.9					3	
4					2 very sharp	

Saturday May 5 1899. 22h
[illegible]

√ λ 3859 α Eridani:
Fl₁₀ lines in violet.
$H_\xi = H_\nu$

H_o is a little more intense than in δ Orionis

Tuesday, May 8, 1899. $21^h 30^m$

✓
+ X 93.24,^{3} S. M. P. 5898. k Scorpii

Class B. or B1A. Lines seen are
Hβ, 4649, wide
4471 double
{4415
{4417 wide or double
4387 ft.
Hγ double.
4144 ft.
4120 & 4116 ft.
Hδ
A conspicuous hazy band, which appears to embrace the triple line 4069, 4072 & 4075.
4026
Hε
Hζ hazy.

This spectrum appears to be peculiar. The material is so slight, however, and not of the best quality, so it may possibly be that the peculiarities are photographic and not real. The line Hβ may be bright or variable.

May 8, 1899.

✓ X 9109 k Scorpii
Re-examined. Class B? Image too dense,
Hβ, 4649, 4471, Hγ, Hδ, 4026,
Hε, Hζ seen. Very poor.

These two are the only plates of k Scorpii so far taken! It ought to be followed as it may be a binary or show other peculiarities.

It seems best to put this spectrum in Class B1A, since 4471 > 4649 and ~~4649~~ 4089 & 4116 are not intense enough for Class B.
Lines 4415 & 4417 are also well-marked as in β Centauri. The wideness of the lines may be due to focus.

May 8, 1899.

σ Arae ✓ X 9325,⁴ . S. M. P. 6193
+

Class A. very poor focus, solar lines indistinct.

✓ X 9326,² λ Hydri.

K or Ma.

This sp. is probably Ma, but the plate is very poor. It also appears to be Ma on 5622 B.

A. G. C. 1210 + ✓ X 9327,³ S. M. P. 220. κ Luc.
probably combined with A. G. C. 1212

F8 G.

Not given double in S. M. P. Why?

X 9328,² ~~η² Pictoris~~ Not η² Pictoris

1st type. No Orion lines seen. Probably Class A. Line K is not seen distinctly.

✓ X 9329,³ S. M. P. 7573

M (b?) very thin.

May 8, 1899.

✓ X 9330,⁴ S. M. P. 7816.

A Peculiar.
4077.9, & 4215.7 noticeably intense.

This is found to be the peculiar star ι Phoenicis already discussed.

✓ X 9331,³ S. M. P. 7910

Too poor. 2nd type. Nothing else can be determined from this plate.

✓
+ X 9332,³ S. M. P. 216

Class G. Excellent image.

✓ X 9333,³ S. M. P. 1276.
Too poor. 2nd or 3rd type.

May 8, 1899

✓ X 49334, 4. S. M. P. 6661.

ε Cor. Aust. F5 G.

Other plates too poor.

X 49335, 2 Nothing on plate but small end of sp.

X 49336, 3 S. M. P. 6572 — Par.

✓ Too thin K line not clearly shown. A or K A2 F. probably.

✓ X 49337, 20 S. M. P. 7009. ξ Tel.

K5 M probably.

Another plate should be taken as all so far have been very poor.

Wednesday, May ~~8~~9, 1899. 22h 30m

Examination of recent C plates of β Lyrae to see if dark line near $H\gamma$ is the same line as the line seen in γ Velorum.

C11927 Scale div. to 1/5 mm.
Unknown band 1.1 from $H\gamma$ towards violet.

C11887 A " " fairly sep. " " & " "
" 11889 " " not surely seen.
" 11920 " " " seen. $H\gamma$ intense & sharp.
" 11896 " " 1.9 from $H\gamma$ tow. violet space btw. is bright.
" 11899 " " 1.6 " " " " " " ".
" 11903 " " 1.5 " " " " $H\gamma$ ft. & hazy, and displaced towd. v.
" 11903 " " not seen. $H\gamma$ intense
" 11906 " " " " or very ft. tow. ed.
" 11913 " " " surely seen. $H\gamma$ intense.
" 11919 " " " seen. $H\gamma$ very intense > than other hyd. line
~~" 11922~~
" 11922 " " 1.9 from $H\gamma$ tow. violet, & very intense, $H\gamma$ hazy.

Position of $H\gamma$ determined by superposing each plate on C 11809.
The band has been seen in γ Vel. only towards the end of shorter wave-length and has shown no shift on plates so far taken.

Thursday May 11, 1899. 0h 30m

✓ A.G.C. 17366 X 9266 ε Crucis

K.

✓ " 17472 Very nearly like ι Phoenicis X 9330 which has the same dispersion. Line 4128-4131 is not as intense as in 79 Eridani and peculiar stars of that class. This spectrum differs from ι Phoen in intensity of line 4233. In ι Phoenicis

" ~~17504~~ 4233 > 4227

In A.G.C. 17472, 4227 is present & well-marked for this image, but 4233 is not distinctly seen.

✓ " 17504 Like α Doradus?

4471 = 4481 ~~44~~ both indistinct.

4387 may be present.

4128-4131 is about intensity ~~2 or 4~~, 3 or 4.

K is fully as intense as in Class H.

The image is very poor.

✓ A.G.C. 17518 κ Crucis & other stars superposed — Orion star but the image is too poor to determine the class exactly

---

Friday May 12 1899 1h 15m

✓ Lines in α Doradus i48018.

	Int.	
~~Hδ~~	90	
4619.8	4	This appears certainly to be the Orion line 4619.

There is a solar line at λ4619.2. How can it be determined which the line in α Doradus is?

A number of faint lines which may be Orion

4481	3	
4471?	2	This line appears to have slightly greater λ than line 4471.8

solar line 4233 Int. 2-3.

K

Lines in violet not seen on this plate.

There are many other faint lines some of which seem to be solar and others Orion.

May 12, 1899.

x9113 ι Crucis.

A.G.C. 17472 Like ι Phoenicis or nearly like it

" 17504 Nothing is seen distinctly except lines 4481, 4471, both very faint, 4128-4131 fairly well marked, K, and the lines of hydrogen. Spectrum is thus probably Class A peculiar.

" 17518 κ Crucis + others superposed

Lines seen,
Hβ, 4471, 4387, Hγ, 4144, 4120
the two latter very faint and hazy,
Hδ, 4026.
K? very hazy

Spectrum

Tuesday, May 16, 1899. 0h 40m

Lines in G-band. For descriptions of typical stars.

α Carinae x 8114 (3 pro.)

	Int.	α Canis Minoris Int.	α Aurig.	Intervals in wave-lengths	α Tauri
4340.7 Hγ	50	40	10	3.1	10
4337.6	4	1		6.7	12
4330.9	~~5~~ 4			4.9	
4326.0	~~8~~ 6	10	10	5.0	12
4321.0	4	3	2	2.1	
4318.9	1	0	1	3.7	
4315.2	8	8	6	2.2	8
4313.0	2	~~8~~ 1	3	3.5	
4309.5	3	10	7	1.5	15
4308.0	4		7	2.2	~~a~~
4305.8	3	1	3	3.2	2
* {4302.6	8	~~10~~ 8	6 ~~8~~	1.8	3
* {4300.8	}	10	10	1.6	10
* 4299.2	6 }			2.1	
4297.1	3	1	~~8~~ 2	2.8	0
4294.3	3.5	1	~~6~~ 3	3.1	4
4292.2		0	0		
4291.2	0	1	0	1.3	
4289.9	8	10	10 See p. 202		12

May 31, From superposing on C α Orionis, it seems that lines 4299.2 + 4300.8 are united, and not 4302.6 and 4300.8 as assumed in note below.

4291 + 4292 make a strong line in α Orionis

* These three lines are seen as two rather broad lines. The one twd. red is wider and has therefore been assumed to unite lines 4300.8 + 4302.8

Thursday, May 18, 1899 2^d

λ of Hβ'. Superposed on various plates showing solar line 5410.9 to determine whether this additional hydrogen line has greater or shorter λ than 5410.9.

X 8994 ζ Puppis superposed on X 9182 ε Scorpii – line in ζ Puppis appears to coincide w. 5410.9. Def. very poor in ε Scorpii
X 8119 ε Orionis " " " 8109 α Aug. " Hβ' " " have shorter λ than 5410.9
" " δ " " " " " " " " " " have very slightly gr. λ than 5410.9
" 8233 ζ Puppis " " 8935 β Lep. " " " " coincide nearly w. 5410.9. Def. poor in β Lep.
" " " " " " 8936 β Col. " " " " have sh. λ than 5410.9.

Saturday. May 20.

α Carinae X 3892 for ultra-violet

15 hyd. lines are counted beyond K. They are distinctly seen except the last which appears fine and sharp at upper edge of the image but is not clearly seen at the lower. The 14th line (Hσ?) appears double.

This makes 19 hydrogen lines, the maximum in any spectrum formed in this series.

Beyond line 15, there is a space without any lines and then far into the ultra violet, several well-marked lines appear

2,	Hη	0	
3	Hθ	3.2	3.2
4	Hι	5.7.	2.5
5	Hκ	7.5	1.8
6	Hλ	8.9	1.4
7	Hμ	10.2	1.2
8	Hν	11.2	1.0
9	Hξ	11.8	0.6
10	Hο	12.4	0.6
11	Hπ	13.1	0.7

Hρ 12	13.6		0.5
Hσ 13	13.8		0.2
14	14.2	dbl. (centre)	0.4
15	14.8		0.6 too indistinct to measure accurately
	19.2	intense	
	20.6		
	21.0		
	22.0		

May 20. 1899.

β Cent. X 4059

3835.5	Hη	0
3819.2 ~~3818.9~~		6 1.8
	Hθ 3	3.4
	Hι 4	5.6
	Hκ 5	7.5
	Hλ 6	9.0
	Hμ 7	10.1
	Hν 8	11.0
	Hξ 9	11.9
		18.8 — Orion line, probably line 3634.

X 3892 α Carinae

Hη		0	0
Hθ	3	3.1	3.2
Hι	4	5.6	5.6
Hκ	5	7.4	7.5
Hλ	6	8.9	8.8
Hμ	7	10.0	10.1
Hν	8	10.9	11.1
Hξ	9	11.8	11.8
Hο	10	12.3	12.3
Hπ	11		12.9
Hρ	12		13.3
H	13		13.8
	14		14.2 double
	15		14.8
	?		19.1 intense
			20.6
			20.9
			21.4
			21.9 } double, hazy
			[illegible]

May 20, 1899.

X3865 α Carinae

Scale D1339.

4861.5		Hβ	0	0
4340.7		Hγ	22.4	22.3
4101.8		Hδ	~~45.8~~ 35.8	35.8
X3970.2		Hε	44.9	44.9
3933.8		K	47.5	47.4
3889.1	1	Hζ	51.0	51.0
3835.5	2	Hη	55.2	~~56.2~~ 55.2
3798.1	3	Hθ	58.3	58.2
3770.8	4	Hι	60.8	60.8
3750.2	5	Hκ	62.7	62.5
3734.2	6	Hλ	64.0	64.0
3727.5	?		64.9	64.8
3721.9	7	Hμ		65.0
	2 ?			65.9
3711.8	8	Hν		66.1
3704.0	9			66.8
3697.4	10			67.2
3691.5	11			67.9
3686.7	12			68.5
	13			

Scale answers

Not in Table V Vol. 28.

3721.9	0
Unk.	0.9
3711.8	1.1

1.1) 10.1 (9.2
.99
20

9.2
.9
8.28

appro λ = 3721.9
8.3
3713.6

See Bk. X. p. 98 for a second determination of this λ.

Tuesday, May 22. 1899 – 21h 40m

Comparison of helium lines in ε Orionis, β Centauri, & γ Orionis –

Hyd. lines in ε Orionis = 25
" " " β Cent. = 3~~0~~5
" " " γ Or. = 40

4026 in ε Or = 15
" " β Cent = 20
" " γ Or = 25

4471 in ε Or. = 15
" " β Cent. = 18
" " γ Or. = 22

Hyd. lines in α Pav. = 45
" " " φ Vel. = 50
" " " γ Gruis =

Tuesday, May 22, 1899.

	ε Orionis	β Cent.	γ Cor.
4649	=Hγ = 25	7	3
4387	5	8	12
4144	5	8 7	12
4120	5	8	7
4116	12	0. Too hazy.	0
4089	15	4 or 5	2
4009	~~3~~4	7	10
3994	2	3	5
4712	5	4	4
4481	2	~~4~~ 3	4

Tuesday, May 22, 1899.

β Crucis 48~~2~~361. Measured w. D1339.

Int.

Hε	0	0	
4009	~~5.7~~	5.6	
4026	~~8.2~~	8.1	
Unknown		13.1	very ft. 1 } Not in table IV.
"		13.4	" " 1 }
4.0~~69~~76		14.5	
4072		14.8	
4069		15.2	
4089		17.2	
Hδ		19.0	

Tuesday, May 23, 1899. $0^h 30^m$

Comp. of intensities of lines on one-prism plates of α Pavonis + β Velorum

	α Pavonis	β vel.	γ Gruis
4925			
Hβ	45	50	
4712	6	6	
4481	6	12	
4471	22	18	
4387	12		
Hγ	45	50	
4267	6	6	
4144	12	12	
4131		8	
4128			
4120	8	8	
Hδ	45	50	
4026	25	25	
4009	10	10	
3994	1		
Hε	45	50	
3964	7	5	
12	5	10	
3926	7	7	
392~~8~~0			
39~~20~~18			
3912			
Hζ	45	50	
Hη	45	58	
~~H~~3819			

α Pavon.	β vel.
12	
45	50
4	
2	
12	
8	
45	
3	
10	
2	
5	
45	
15	
8	
2	
45	
3	
2	
5	
3	
0	
~~12~~	
45	
45	
12	

Thursday, May 24, 1899   22h 15m

Notes on special lines.

Line 4641.1 is very wide in ε Orionis, distinctly double in β Crucis and α Lupi, and in other stars where the lines are sharp. It is probably a fine double in all stars where it is present.

Lines 4415 & 4417 are not seen sep. on 3 prism plates but are clearly separate in β Crucis X 8361 (see p. 167) and in α Lupi X 7558.

In γ Gruis line 4387 appears double. It is probable that the solar line 4383 - 4385 is present.

In λ Centauri the solar lines 4383-4385 are present but not the Orion line 4387.8

Thursday, May 25, 1899   2h

On X 7558 α Lupi line 4350 looks double. Lines are sharp on this plate. It has intensity 2.

On X 8361 β Crucis line 4350 is clearly double. See p. 167.

Line 4346 is clearly seen in β Crucis, X 8261 and also on X 8361

Line 4361.0 is seen in α Lupi X 7558, intensity 1. Also appears to be glimpsed in β Crucis X 8261.

Friday, May 26, 1899 2^h

Line 4327.3 which is not seen in γ Or. X7978, is present in α Lupi, X7558, int. 1.

Lines 4318 & 4320 are separated in α Lupi X7558 into two sharp lines, of int 1.5. In γ Or. the line is ill-defined not double

Line 4169.2 has a faint line on side of shorter λ in α Lupi X7558. as measured in β Cent. on p. 128, and recorded on p. 109 in β Crucis & β Centauri

Hδ
4120.5
4144
4154.7
~~41.~~ 4
4169.2
4186
4190

Monday, May 28, 1899 22^h

Line 4131.4 may or may not be present in β Cent. & β Crucis and other stars of Class B1A. The line 4134 is present in these stars, and is fully 2 in intensity. In 7911, the only 3 prism plate of these stars, the lines are so hazy that 4131 and 4134 can not be separated. On the two prism plates, the line 4134 does not appear double

In ζ Centauri the presence of the helium lines 4120.5 & 4140.0 is at present undetermined. ~~The~~ Faint lines of int. 1 or possibly 2 are seen near positions of both, but since the lines are hazy on two prism plates, it is not possible to determine whether these are the Orion or solar lines. Lines 4118.9, 4122.8 come on either side of 4120.5 and are both present in Sirius. Line 4143.9 ~~is~~ has practically the same λ as 4144.0

May 28. 1899.

In β Crucis the line 4116.2 is more intense than in β Centauri.

In β Cent. X 8376, there are several dark lines bet 4026 & 4069 (the triple line) but they are too faint to measure.
The lines 4036 & 4042 are broad & it can not be determined whether lines 4033 & 4045 are present as in γ Orionis or not.

Line 3954.8 is double in γ Or. Seen together the whole line has int. 3 but separated, ~~each~~ component of sh. λ has int. 2, of lg. λ, int. 1.

Monday May 29. 1899

Int. of 4026 in Class B5A.

h Carinae 4026 > 4471

γ Muscae X8492 4026 wider > 4471
" " X6569 " 1.5 (4471)

Tuesday, May 30, 1899 $3^h 40^m$

Classification of the Typical stars of Part I of Vol. XXVIII

Group I.   ι Orionis
Already classified
Class Oe-B.

Group II   ε Orionis
Already classified
Class B.

May 30, 1899.

Typ stars	Group & Div.		Class	Remark ~~Remark~~
ι Orionis	I	b	Oe-B	
ε "	II	a	B	
δ "	II	b	B lines broad	18
β Canis Maj.	III	a	B 1 A	
α Virg.	III	b	B 2 A lines broad	18
χ² Orionis	III	c	B 2 A. Pec. sharp lines.	like A. G. C. 14656, only 4149 is stronger K > 3926
γ Orionis	IV	a	B 2 A	
η Urs. Maj.	"	b	B 3 A lines broad	18 (good example)
η Tauri	V	a	B 5 A	
τ Orionis	"	b	B 5 A.	C 6403. excellent example. Lines not very broad.
η Canis Maj.	"	c	B 5 A, Pec. sharp lines.	
β Persei	VI	a	B 8 A	Lines sharper than in γ Geminis.
α Leonis	"	b	B 8 A	Lines broad. 18.
β Orionis	"	c	B 8 A. Pec. sharp lines.	
α Canis Maj.	VII	a	A	
ζ Aquilae	"	b	A	Lines broad. 18.
η Leonis	"	c	A	
α Gem.	VIII	a	A A.	4481 strong and sharp
γ Urs. Maj.	"	b	A	Lines broad.
α Cygni	"	c	A 2 F	Pec lines sharp.
γ Argus	VIII - IX	ac	"	" " "
α Pis Aust.	IX	a	A 3 F	
δ Urs. Maj.	"	b.	A 2 F	18 a 3 F on C 425 a 2 F " " 25-26 a " " broad on C 2707.
β Triang.	X	a	a $\overset{5}{1}$ F	
α Aquilae	"	b	a $\overset{5}{1}$ F	Lines broad.
δ "	XI	a	F	
γ Bootis	"	ab	a 5 F	
22 Androm.	"	ac		

May 30. 1899

Typical star	Group	Div.	Class	Remark.
α Leporis	XI - XII	ac	F F5-G	sharp lines α Persei?
α Canis Minoris	XII	a	F5-G	
β Cass.	XII	ab	F5-G, F2G.	
ε Aurigae	XII	c	F5G	Pec. sharp lines, like ι Scorpii
γ Persei	"	ac		Plates too poor.
α Persei	XII - XIII	ac	F5-G F8G sharp lines F5-G "	" Lines sharp.
χ Orionis	XIII	a	G	
δ Canis Majoris	"	c	F8G	sharp lines.
α Urs. ~~Maj.~~ Minoris	"	ac	F8G F8G	" " like δ Can. Maj.
α Aurigae	XIV	a	G G5K	
η Aquilae	"	ac		
ζ Geminorum	XIV - XV	a	K?	Narrow image.
α Boötis	XV		K	
β Cancri	XV - XVI		K2M	
α Tauri	XVI		K5M	
β Androm.	XVII			
α Orionis	XVIII			
ρ Persei	XIX			
α Herculis	XIX - XX			
o Ceti	XX			
~~××~~ 19 Piscium	XXI			
H.P. 1311	XXII			
Composite Orion w. br. hyd. lines				

Wednesday May 31. 1899.

Notes on Miss Maury's typical stars.

α Virginis. Somewhat intermediate in intensities of lines bet. β Cent. & γ Orionis. 4116 not seen, 4089 very faint. 4649 > than 4641 but not nearly so much stronger than in β Cent. Lines so wide on C 3 & 4 pr. plates that intensities are uncertain. From C 2611, one prism, I class it B2A.

Group IV - V of Miss Maury's classification is like B3A of mine. I found more stars with spectrum B3A than with any other Orion division.
ζ Canis Majoris is one of her Group IV - V stars.
It is also in my Class B3A.

May 31, 1899.

G band -

The principal difference in the appearance of this band in α Carinae & α Canis ~~maj~~ Minoris is in the increased intensity of lines 4308 & 4309, which are seen together in α Canis Min. & give the band an appearance of continuity, tow. the red.

June 2. 1899 2h 35m

Comp. of intensities in ε Or. + τ Canis Majoris.

	ε Or. X4041	τ Can. Maj. X6265	~~ζ Puppis. A.G.C. 311~~	~~A.G.C. 10763~~
4925	65	5 Imft.		
Hβ	25	25		
4712	4	5 4		
4685	2	5		
4675	2	0		
4661	2	X1		
4649	25	15		
4641				
4568	4	0		
4553	4	0		
4543	1	4		
4514	2	3		
4481	1	1		
4471	✓ 15	15		
4387	✓ 5	4		
4350	2			
Hγ	✓ 25	25		
4318	2	0		
4320				
4254	2	0		
4201	~~X~~ 1	4		
41~~99~~88	2	2		
4144	5	4		
4120	5	4		
4116	10	6		

	ε Or. X4041	τ Can. Maj. X6265	X6265 29 Canis Maj.
✱ Hδ	25	25	
4096	— ~~X~~	~~7~~	
4089	15	12	
4075	4	3	
4072	5	5	
4069			
~~H~~ 4026	15	15	
4009	1	~~–~~ X3	
3994	1	1	
Hε	25	25	
3964	3	1	0
/L	—	5	
H5'ζ 3926	2	4	
3819	15	15	

Thursday June 8, 1899 2h 40m

✓ Missing plates

X 9083 ε Pavonis
A. Sp. very poor.

✓ X 9048 μ² Scorpii
μ² = B3A. very narrow spectrum

μ¹ Lines double. Sep = 8.
Br. towards red; and there is little difference bet. the intensities of the two components. Lines 4471 & 4387 are the only ones so clearly double ~~that~~ the difference in intensity is noted. Other lines are very broad,

✓ X 9057 = α Pavonis
B3A.

X 8230 = 5 (short) ζ Puppis Isochrom

		Int.
Hβ	0	26 ~~Int.~~
	22.9	2
Hβ'	34.6	8

These two dark lines are the only lines seen of gr. λ than Hβ

June 8, 1899.

X 8230 ζ Puppis (cont.)

Band 4688
Double. The brightness of this band is approximately the same as that of Hβ in μ Centauri. The brightness seems here a little less marked but this is due to the greater brightness of the continuous spectrum. The amount of light is about equal to that in Hβ in μ Centauri.
The band is double and seems to consist of a strong line of greater wave-length, and 1.8 reticle divisions tow. shorter wave-length, there is a faint bright line, ~~this~~ having not more than 1/15 the intensity of the line of greater wave-length.

Band 4633.
Very hazy, wide & indistinct
Has about 1/5 or 1/6 of the intensity of 4688. This estimate is uncertain as the widths are so different in the two lines.

Other lines.
Both series of hyd. lines.
Faint line 4471,
From 4603 - 4630, several faint dark lines appear to be present

Saturday, June 10. 1899

Missing plates. (broken)

46301 A.G.C. 10534.

Lines single.

A.G.C. 10605 A2F. 4481 sharp.

" 10618 1st type. Image too poor. Plate broken & scratched across this spectrum.

" 10566 {Superposed except for narrow edge on
" 10568 {preceding side. Both stars are of Orion type.

" 10588 B3A.

" 10390 B3A.

" 10646 B3A?

" 10689 F?

" 10705 K?

June 10, 1899

48188 $_{2}^{4}$ ζ Puppis. Image a little dense.

Lines seen.

Lines	Int.	
$H\beta$	20	
4688	15	double, fainter line of shorter λ
4633	5	very wide and indistinct.
—		A very ft. dark line at about λ 4619, and one near λ 4641.
$H\gamma'$ (4544)	10	
4471	2	
$H\gamma$	20	
$H\delta'$ 4201	8	
$H\delta$	20	
$H\epsilon'$ ~~$H\delta'$~~	5	
$H\epsilon$	20	
$H\zeta'$	5	
$H\zeta$	20	(wide)
$H\eta'$	2	
$H\eta$	15	
$H\theta'$	2	
$H\theta$	10	
$H\iota'$	1	
$H\iota$	10	

June 10, 1899.

X 8241 $^{4}_{2}$ ζ Puppis.

Hβ 20 or 25

4688 15. The faint ~~line~~ component of shorter wave-length is not seen.

4633 Very indistinct. 4

Hγ' 4544 10

4471 1

Hγ 20

Hδ' 4201 ~~10~~ 8
Hδ 20
Hε' 4027 8
Hε 20
Hζ' ~~Hε'~~ 5
Hζ 20
Hη' ~~Hζ'~~ 3
H~~ζ~~η 20
Hθ' 1

Other hyd. lines too indistinct & hazy.

June 10, 1899.

X 8228 $^{5}_{2}$ ζ Puppis. Isochromatic.

Very thin image.

Slit

Hβ' 5413.9 5
Hβ Cut out.

46~~33~~88 About the same amount of light as ~~+~~ there is darkness in H~~β~~γ', λ 4544.
10, not double that is, the line of shorter λ is not here seen.

4633 very wide though not distinctly double.
4

4610 2. This dark line falls very near the Orion line 4611, but has a little shorter wave-length.

Hγ' 10
Hγ 25
Hδ' 8
Hδ 25
Hε' 8
Hε 25
Hζ' 3
Hζ 20

Too faint in region of shorter λ.

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