April 15, 1898

Erythrosin plates to compare with X8513 γ Velorum

X8118 α Tauri, good, but 3 prisms
X8218$_2^4$ α Tauri, fair of red end

4

April 16. 1898

X3929 Nova Aurigae

Sp. made up almost entirely of bright bands that coincide in position with those in η Carinae X6592, taken May 25, 1895.

The dark part of Hγ is more conspicuous here.
And a dark band of shorter wave-length than Hγ appears in this spectrum which is not in η Carinae. These ~~a~~ two dark bands are about as far apart as H & K.
The bright bands appear of the same intensity as in η Carinae.

A bright band at about 4925 is stronger in Nova Aurigae than in η Carinae.

April 16, 1898,

X3926 Nova Aurigae
Bright bands appear exactly like those of η Carinae X6592, except that a band having longer λ than Hβ, at about wave-length 4925 is here stronger.

X3932,3 Nova Aurigae
Spectrum the same as on 3926 & 3929.

Nova Aurigae
X3930,2 Too poor

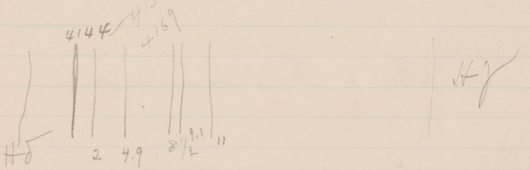
X3931,2 Too poor

April 16, 1898.

X 8119 $_3$: ε Orionis

64 Orion lines from λ 5023 – λ 3819 are identified from Table II in Vol XXVIII. The principal ones are marked on this plate.

There appears to be a slight difference between the lines seen here and given in table at the region of wave-length 4144 – 4200.



This represents the approx. position of the lines in region of λ 4144 and of longer λ.

The numbers are the scale-readings, (mm. scale D 1339 used) thus the first line is about 2 of the smallest scale divisions from 4144, the next, about 4.9, etc.
The line marked 11 seems to be 4200.
All these lines are faint

April 16, 1898.
X 8119 ε Ori. (cont.)

The line at 4.9 (see prec. drawing) is rather well marked in α Par. X 7903.
It is likely the line 4169.2
And there is another line very near 4186.2 not given in Table VI

X 7911 $_2^4$ β Centauri.
compared w. ε Orionis
(See also Bk III p. 178.)
As these two stars are typical respectively of B2A & B stars it is well to note their differences exactly.

In β Cent. there seems to be a faint line near 4925 of longer λ.

April 16, 1898.

ζ Puppis x6144 shows a line
betw. 4712 & 4649, but not the
same line as is seen in τ Canis
majoris and which is called
"dark 4688" in circular
The "dark 4688" is nearer 4712
This line is " 4649.
The 1st plate of ε Orionis is so hazy
~~that~~ this line is not well seen.
It ~~may be~~ is 4675.

This spectrum seems nearer like that of
ζ Arae than like any other.
However the line 4089 is more intense
here. That line is notably weak in ζ Arae
even a little weaker than in β Centauri;
whereas the other Orion lines seem
more like those in ε Orionis.
These two stars differ from δ and
ζ Orionis in not having line 4685
present. In both stars 4675 is seen.

April 18, 1898

β Cent x7911
Lines broad

Line 4697.9, more intense than in ε Or.
In ε Or. this line is very faint.
In β Cent. it is broad and ill-defined,
but nearly as well-marked as
~~4685~~ 4712.

4685.4 appears to be absent in β Cent.

As this line seems to connect ε
Orionis with the stars like ζ Puppis
and Type V, it is interesting to note
its absence or extreme faintness in
the group of following ε Orionis. It makes
a sensible element of division between
the two groups.

4675.3 }
4661.7 } Same intens. as in ε Or.

4649.2 is ~~several~~ 3 tenths less intense than in ε Or.
4641.1 " 2 " more " "
and these two lines form a more conspicuous
pair than in ε Or.

April 18, 1898.

47911 β Cent. (cont.)

The line 4649 is so strong in ε Or. that it overpowers all the other lines near by, and stands prominently out. In β Centauri this line is a little weaker, and 46~~6~~41 a little stronger so that the pair of lines is more conspicuous than the single strong~~er~~ line.

46~~6~~41 is fully 1/2 as intense as 4649.

The other lines bet. 4649 and Hγ are about as intense as in ε Orionis, although they are so much sharper in ε Or. that exact estimates are difficult. There are, however, no great differences.
4387 is about 2 as intense in β Cent.
4542.7 is not distinctly seen.
4200.3 is absent in β Cent.
Lines bet. 4200.3 and 4154 seem also present as in ε Orionis. These lines are so hazy that they are better seen without the magnifying glass.

April 18, 1898.

47911 β Cent.
4144
4120 } 2 as intense as in ε Or.

4116.2 is not seen.

4096.9 is not seen.
4089.2 has not more than 1/4 the intensity in ε Or.
Line seen bet. 4089 & ε Or. that is not seen in ε Or. This is 4093.7.

Triple line seen as in ε Or.

4026.4 = same in ε Or.
4009.5 = 2 " " "
3994.9 = " " " "
3982.8 = same " " "
3975.2 not seen, Hε is too hazy.

3964.6 = same as in ε Or.
3954.8 = " " "
3947.8 = " " "

K is a narrow, sharp line in ε Or.
In β Cent. it is barely seen. Three lines are seen bet. K and Hζ, probably 3927.1 3925.9 (seen as one) 3924.~~0~~6 & 3912.2
K is not so well seen as any of these lines

April 18. 1898.

47911 β Cent. (Cont.)

The image is too thin at the violet end to see any of the faint lines beyond Hγ.
3819.2 = same in ε Or. or slightly fainter.

The lines appear sharper in ε Orionis, but this may be due to the quality of the photographs.

One three prism plate of β Cent. is not sufficient to judge exactly of the nature of the lines.

April 18, 1898.

4837~~9~~6 2 β Cent.

The line 4116 is here barely seen.

Does any star in this series show this line as strong as in ε Orionis?

The line 4685 seems to be present but faint. It is decidedly fainter than 4675, whereas it is decidedly stronger in ε Orionis and even in τ ~~Canis Maj~~ Scorpii which seems to be somewhat intermediate bet. ε Or. & β Centauri.

April 18, 1898.

X8651, $^{5}_{2}$ θ Arae.
The star has been placed under B2A group, Pec.
Examination of the plate for identifying the lines.

April 18, 1898.

✓ X5698, 4 λ Lupi.
A.G.C. 20566 K.
+ This spectrum and that of A.G.C. 20566 are superposed. The latter is too faint to even determine whether it is first or second type, probably second, as the hydrogen series could be easily seen.

The image of A.G.C. 20566 is rather faint, but the group seems certainly determined.

B plates 7806 & 7807 show the two spectra above named to be of about the same type.

April 18, 1898.

✓ X 8119 $_{3}^{4}$ ε Orionis
δ Orionis also on plate.

Lines seen.
Hβ.
4712
4685
4649
4568 very hazy.
4553
4471
4387
Hγ
Faint lines bet Hγ & 4144.
4116 & 4089 are strong.

Sp. cut off at Hδ.

April 18, 1898.

✓ X 8115 $_{3}^{5}$ ζ Orionis

The lines are all broad, and the bright part of the image less intense than in ε Orionis.
Lines seen
Hβ.
~~4472~~ 4712
4685
4649 very broad
4568
4553
4542,7 is twice as intense as in ε Orionis.
and a little more intense than 4553 in this image while the reverse is true in ε Or.
4415 is absent or very faint

4200 is a little more intense than in ε Or.
4186 present.
4481 is present but very faint

April 19, 1898

48657$_2^5$ θ Arae.
Lines are of different intensities from β Centauri.

Lines seen

4925
Hβ
4712
4705 }
4697 } very faint
4675 }
4661
4649
4641 . much more intense than in ε Ori., here it =(0.8)4649

4630 = 0.7 (4649) more intense than in β Cent.

April 19, 1898.
48651 θ Arae.
Hβ = 25
4925 = 7
4712 = 3
4705 = 1
4697 = 1
4675 = 2
4661 = 2
4649 = 4
4641 = 4
4630 = 3
4619 = 1½
4611 = 1
4603 = 1
4598 = 1
4591 = 1
4576 = 3
4568 = * 3
4553 = 4
4542 = 0
4531 = 1
4481 = 3
4471 = 10
4415 }
4417 } strong = 4
4387 = 8
4350 = 2 or 3

Apr. 19. 1898.

~~Hj~~ X 8651 θ Arae

Hj.

4318
4320 } = 3

4267 = 2
4254 = 2

4120 is strong
= 6

4144 = 6

4089 = 3

4026 = 12
4009 = 8
3994 = 7

April 19. 1898.

X 8651 θ Arae

The fine lines show better than in β Cent. This may be due to their sharpness or to good definition.

Lines 4641, 4630, 4619 are two or 3 tenths more intense than in β Cent.

Lines 4267 & 4254 are about one tenth more intense than in β Cent.
4237 + 4242 stand out stronger
Line 3994. is 3 times as intense
Line K is 2 or 3 times as intense as in β Centauri. Sharp-lined stars usually have an intense K line and line 3994.9 more intense than in other spectra.

April 19, 1898.

X 8047 θ Carinae
Has some peculiarities.

Line 4685 is stronger than in ε θ ε.
Line 4116 is not seen

Line 4641 > 4649.

This peculiar intensity of line 4641
has not been observed in any other
spectrum.

April 20. 1898

√ X 4420 γ & β Arae.

A.G.C. 23515 + Sp. very dense.
γ Arae Fine lines scarcely seen,
All look hazy.

A.G.C. 23516 √ K2 M
β Arae +

" 23459 + G5-K? Poor.

" 23603 + Too poor.

" 23656 + Not all on the plate.
Too poor.

April 20, 1898.

√ 44862, 4 γ Arae.

√ β - K2M

γ -, Appears the intermediate bet.
ε Orionis & β Centauri, in the intensity
of lines 4089.2 | , 4116.
Line 4641 is as strong as in β Cent.
The lines are all broad making
it difficult to estimate intensities as
lines near together like 4649 + 4641,
4120 + 4116 | are not well separated.

√
A.G.C. 23459 G5K, faint.

.. 23656 Probably like γ Gruis.
4387, 4144, 4128-4131, 4026,
4009 seen distinctly
4471 + 4481 in poor focus.

April 20, 1898.

√ 44408 β + γ Arae.
Plate thin.

√ β = K2M

γ = B wide lines, only the principal
ones are seen.

√ 45805, 3 β + γ Arae
γ - Sp. rather dense
4089 & 4116 appear fainter
than in ~~β~~ ε Orionis.
4649 is fainter than 4471.
This image looks more like β Cent.

√ β Arae = K2M

A.G.C. 23459 G5K - faint

√
.. 23656 B8A.

April 20, 1898.

✓ 48618$_2$ γ Arae.

γ – This image looks like β Cent. except that the line 4120 looks broader, and as if 4116 is joined to it.
Line 4641 is as strong as in β Cent.
Also " 3994 " " " " " "

4685 is not seen
46775 is seen.
The lines are wide.

✓ β Arae = K 2 M – a good example

✓ 48051$_2$ γ Arae.
γ. Lines wide. 4471 looks double.
Sp. nearly like β Cent.

✓ β = K 2 M

April 20, 1898.

✓ 47823$_2^4$ γ & β Arae.
✓ β = K 2 M
γ, Lines wide not distinctly double.

Lines 4649 & 4641 stand out as a well-marked pair of which 4641 is almost as intense as 4649.

4415 - 4417 nearly = 4387.
4350.1 is more intense than β Cent.

4085 appears to be barely seen.

✓ 47810$_2^4$ γ & β Arae.
Lines very hazy. Orion lines are extremely broad.
4089 is broad & faint.
These lines are broader than in ζ Orionis

✓ β Arae = K 2 M. Lines well defined

April 20. 1898

✓ X8622$_2^4$ γ Arae

γ Lines very broad.
4712.8 is double.
4387 appears double.

Spectroscopic binary?

✓ β = K2M.

✓ X6504,^{4} γ Arae

Lines double?
4089 is barely seen.

The shorter wave-length side of 4120 is strongly dark.
It seems as if the line 4089 is here fainter than 4116.

✓ β Arae = K2M.

A.G.C. 23459 Too faint
✓ " 23656 Probably B8A.

April 20, 1898.

✓ X7859$_2^4$ γ & β Arae.

γ Arae.
4641 > 4649.

4089 is fainter than the triple line near by, seen as one broad hazy line.

✓ X6657,^{3} γ Arae

X6655 α Apodis is superposed.

✓ γ Arae lines broad, and ill-defined. Line 4415-17 seems to be particularly intense.

A.G.C. 23459 ✓ + Sp. K.

X6655
α Apodis
K2M.

April 22, 1898.

✓ X 6849,5 β & γ Arae

γ – λ4089 is very faint.
All lines are broad.

β - Also shows broad lines, poorly defined.

✓ A.G.C. 23459 Probably K

✓ " 23603 Probably K.

" 23656 Probably B8A.

April 22, 1898.

X 4887, & β Arae

γ - Lines broad

β - K or K & M

✓ A.G.C. 23603 mag. 6.6 Probably K. G band seen, also λ4326 and Hγ.
Hγ appears slightly fainter than 4326.
The image shows no other lines, except possibly 4227.
Sp. is either G5K or K.

✓ A.G.C. 23459 mag. 6.4 Sp. K.

Why is A.G.C. 23603 mag. 6.6, given in S.M.P. when A.G.C. 23459, mag. 6.4 and 23656, mag. 6.4 are not given

The spectra of the two latter stars are brighter also than that of A.G.C. 23603

April 23, 1898

X 7626$_2$ μ^2 Scorp. (broken)

μ_1 Lines double brighter component towards violet end.

Sp = B3A.

μ_2 = B3A.

X 8727$_2^4$ α Scorpii (broken)
(See note on cover)

Ma.

X 7920$_3^3$ α Hydri.

Lines very hazy
Hydrogen lines wide and poorly defined.

April 23, 1898.

X 8012 $_2^3$ ζ Gemi. Too poor

April 25, 1898

X4710,^{4c} J Vel. taken June 2, 1893.

F line distinctly bright,
This plate was examined on Dec. 11, 1897 and no note made of this fact. I can not see how I overlooked it, for it is a well-defined bright line superposed on a dark band. I do not know whether it is among the known bright line stars or not, but it is not on my list.
4925 is bright on edge of greater λ.
Hγ is wide and has a slight central brightness. - not a distinct line however.

X7376,^{a} J Vel. taken Mch. 17, 1896.

Image over-exposed
Can not tell whether there is any brightness at Hβ or not, apparently not.

April 25, 1898.

X6376,$^{+}$ taken April 19, 1895.
The hydrogen lines are wide and intense. The Orion lines are well-defined and rather narrow.

Hβ is not ~~distinctly~~ bright as on X4710
There may be a very slight brightness in the centre but it would be taken for an effect of poor definition did the line not appear as bright on X4710.

This may be another star with a bright variable Hβ. It should be followed

4259 appears bright on edge of greater λ.

April 26, 1898.

J Velorum.

B plates examined

5879
7433
17025
12872
and others

The image is too dense to show fine lines on all the plates I can find of the region.

April 29, 1898

X 3975, 5. β Crucis
Plate cover is marked, "Ft. lines bright-edged".
Line 4471 appears a little bright on edge of greater λ but it may be the space between this line and 4481

A.G.C. 17270 Probably B5A.
May be B8A. 4471 = 4481.

" 17540 λ Crucis B 3A.

X 3976, 5 β Crucis.
Line 4387 appears bright on edge of greater λ.
Line 4925 appears bright on edge of greater λ.
Line 4471 appears bright on edge of greater λ.

April 29, 1898

λ3976,5 β Crucis.
A.G.C. 17270 Faint. B8A?

" 17540 B3A.
γ Crucis.

May 4. 98.

Identification of the lines in o² Canis Maj. X8198.

The fine lines are nearest like those in θ Arae. B2A. Pec

Lines present.

4712 = 4
4649 = 1
4641 = 1
4630 = 2
4619 = 1-2

4598 = ½
4591 = ½
4576 = 1
4568 = 1-2
4553 = 2
4481 = 8
4471 = 10
4387 = 8
4267 = 4
4144 = 8
4128 = 2
4131 = 2
4120 = 5
4026 = 12
4009 = 6

3994 = 4

3964 = 3

K = 6 ; hazy
3927 = 5 ; "
3920 = 5 . "

Lines are sharp.
These strong one resemble those in θ Arae, but there are many more in θ Arae.
In θ Arae 3927 > K
" o² Can Maj. K > 3927.

May 4, '98.

46255 σ² Canis Maj.

46819,3 — Lucanae

A.G.C. 30604 Q 2 F. Poor image.

May 10, 1898

✓

A.G.C. 20570 κ Lupi
" 20571 — Lupi

44839 κ Lupi
Superposed.

The line between H & K is the K line of A.G.C. 20571. The spectrum of this star is seen on this plate as a narrow edge on the following side of κ Lupi, the hydrogen lines of the fainter star being south of the hydrogen lines of the brighter star.

The spectrum of A.G.C. 20571 seems to show the line 4481, probably 4471, a little fainter than 4481, & 4144, 4128-4131,

The line K of this spectrum is well-marked. It makes a stronger line across the spectrum of A.G.C. 20570 than even the hydrogen lines Hβ, Hγ, Hδ, Hε of A.G.C. 20571.

If the spectrum of A.G.C. 20571 is B8A it seems rather peculiar for the K line to make a stronger showing than the hydrogen lines, except that the line K crosses the spectrum of κ Lupi in a fainter region than the hydrogen lines.

B plate 13036 examined. ~~The spectrum of A.G.C. 20571 is well shown.~~ ~~It is spectrum F.~~ This is the spectrum of another star. Sp. of A.G.C. 20571 not seen. Star seen [illegible] neat.

May 10, 1898.

√ X 4839 κ Lupi

A.G.C. 20478 + Spectrum K. Poor image

√

" 20450 + B3A. Poor focus.

√

" 20655 + A2F. K is sharp and equal four-tenths of H.
Solar lines not seen as the spectrum is on the edge of the plate and the focus is very poor.

May 10, 1898

List of erythrosin plates.

X 8738$_2$ + α Pis. Aust.

May 17. 98.

X6914,^{3}

A.G.C.25172 + Classed A3F. Poor.

A.G.C.25760 + A4F. K = 0.9H = 1.2Hδ.
Solar lines seen, but faint.
The focus is poor.

A.G.C.25197 + A.
No lines seen except K & the hydrogen.

X6509.4 is hel.

A.G.C.12723 + B5A. Hβ not seen on account of faintness of image at red end.

" 12613 + G5K or K { Image faint.

May 18, 1898.

X6168
ξ Phoen.
Strong line bet. Hγ & Hδ identified as 4215.7.
This line here seems stronger than in any star I have seen. Line 4227 is very weak.
Line 4215.7 is present in α Aurigae and α Tauri but very much weaker than in ξ Phoen.

May 23. 1898.

μ Lupi. A. G. C. 20713 μ Lupi ($\overset{m}{5}$) 15
" 20714 – " ($\overset{mag}{7}$)

These two stars are not seen separated except in the prismatic companion.

See B 19314. for identification.

The spectrum of A. G. C. 20713 is B8A, lines not sharp. Recorded "focus is poor," but the focus seems good for other stars so the lack of definition may be due to the companion.

X6539,4 μ Lupi an excellent plate compared with ζ Crucis and no great difference is seen. The ones lines in μ Lupi are somewhat fainter but still it may be said that there is no evidence of the spectrum of A. G. C. 20714.

May 24. 1898

θ Muscae. Bruce plates examined for close doubles, A. G. C. 17840 (θ Muscae) and A. G. C. 17839. No evidence of doubling seen on chart plates. The Bruce spectrum plate examined shows the image too dense, the bright band is not seen and no dark lines are seen.

α$^1_2$ Crucis. No evidence of a double star seen on the Bruce plates.

X4728 o$^1_2$ Centauri.

A. G. C. 15757 }
" 15758 } Superposed. Both stars are of the first type but the image is too faint to subdivide.

June 4, 1898

X4190, ε Scorpii Like α Bootis
X5658 ε Scorpii, shows the bands much stronger than X 4190, and the absorption seen in class I have called K2M.

June 8, 1898

√ X8420$^{4}_{2}$ β Lupi

β Lupi = B2A.
Lines indistinct. This seems about like the class I have called B2.3A broad lines.

κ Centauri
B3A. Lines decidedly sharper than in β Lupi.

√ X8572$^{4}_{2}$ β Lupi

Lines sharp. The spectrum is almost exactly like that of α Lupi. The fine lines have the same intensities. Lines 4649, 4641 & 4630 are prominent as in ~~β~~ α Lupi.

κ Cent. Lines very sharp.
The triple line 4075, 4072 & 4069 ~~are~~ is clearly seen, the lines 4075 & 4069 being sharper & more intense than the middle one.

June 8, 1898.

X8572 β Lupi. (cont.)

κ Cent.
The line 3994.9 is very sharp.
Sp. is B3A, but by exception, the triple line 4075, 4072 & 4069 are well seen.

✓ X5873^{3} β Lupi.
Sp. narrow and poor.

↓ X8271$_{2}^{4}$ β Lupi

Lines broad & ill-defined.
Spectrum appears to be B3A.

↓ κ Cent.
Partly on the plate – from 4144 – violet end.

June 8, 1898.

X7586$_{2}^{5}$ β Lupi & κ Cent.

✓ κ Cent. in centre of plate.

B3A. Lines very sharp.

β Lupi – on edge of plate.
Lines very hazy.
Sp. seen from 4481 to violet end.
4481 looks double.
All lines very broad.
The difference between these lines and the lines on X8572 is very marked.
This spectrum is on the edge of the plate, but κ Cent. appears on the edge of several of these plates, when the lines are exceedingly well-defined.

June 8, 1898.

X 8424_2^5 β Lupi.

β Lupi = B 2 A, lines slightly fainter than in β Centauri.
4712 = 4649.
4089 is very faint, if really seen.
Lines are fairly sharp.
κ Cent. = B 3 A.

~~X 8271_2^5~~ β Lupi
X 8435_2^4 "

β Lupi = B 2-3 A. Lines a little hazy.

κ Cent. = B 3 A. On edge. Lines sharp.

June 8, 1898.

X 8447_2^5 κ Centauri.
κ Cent = B 3 A. Lines sharp.

β Lupi = B 2-3 A. On the plate from 4481 - violet end. Lines sharp.

X 8264_2^5 β Lupi. In centre of plate.
Lines broad & hazy.

X 8374_2^5 β Lupi

κ Cent and β Lupi are both near the centre of the plate.

The lines are so sharp in κ Cent. that many of the ~~faint~~ characteristic lines of B 2 A stars are seen, They are very faint however.

The lines are hazier in β Lupi but there is nothing to indicate doubling.

June 8, 1898.

X 5885, 4 β Lupi

Lines sharp.
The B3A lines look sharp, & the B2A lines dim & hazy.

X 5874, 5 β Lupi.

B3A, with the B2A lines seen, but fainter than the B3A lines.

X 7485$_2$ β Lupi

Lines hazy. fainter lines lost.

X 8552 β Lupi
B2-3A
Lines a little wide.

June 23, 1898

X 4093 α Scorpii
Sp. Ma
The K band is hazy, and the hydrogen line Hγ is seen.

Hβ, Hγ & Hδ are more intense than in typical star.

The two-prism plates do not show the peculiarities of the spectrum except the intensity of the lines Hβ, Hγ, & Hδ.

X 7623$_2^4$
X 6643$_{}^{4}$ Ma, End of shorter λ not seen
X 7587$_2^4$
X 7493$_2^4$
X 7486$_2^4$ Good of the G band.

June 24, 1898.

See Astrophys. Journal May 1898, p. 367, article on spectra of the southern stars by Frank McLean.

γ Centauri is given as having spectrum I(f) which equals B or B2A of my classification.
δ Centauri is given as having sp. of class II which = "A".
Are these stars mixed, or is the notation different in other catalogues than the A.G.C.

It is here suggested that the extra Orion lines which characterize B & B2A stars are due to oxygen. These are especially the lines 4116 & 4089 and perhaps 4649. They are not due to helium, as are the lines strongest in B3A and B5A stars

June 25, 1898.

A 48989 $_{24}$ L^2 Puppis. + 48983$_2$

✓ L^2 Sp. Md.

Hγ & Hδ are bright.
Hδ = ~~10~~ 9 in scale of brightness
Hγ = ~~9~~ 8 " " " "

Breaks seen at 47~~20~~62, 4954, 5118, 5445, and several ~~[illegible]~~ of still longer λ.
From the double line 4405 4408 to the end of longer wave-lengths no dark lines are distinctly seen, only bands mostly bright.

✓ L^1 spectrum like that of α Doradus.
The image is faint and rather hazy, but the likeness seems close.

June 25, 1898.

X6795,^{3} - Sag.

A.G.C. 24649+ Sp. 12'.

" 24594 a 2 F.

D Nothing but K & the hydrogen lines.

Oct 11, 1898

X7503$_2$ β & γ Arae

γ Arae. Lines wide. Hγ & Hδ look double.

β Arae. K or K2 M. Image too thin

X6672,^{5} β & γ Arae.

γ Arae. Lines a little wide, but much narrower than on 7503.

β Arae. A good banded K star, H & K well seen and line 4227 is no more intense than in α Bootis.

X~~8~~5819,4 β & γ Arae.

γ Arae Lines wide & hazy. Lines of β are well defined.

β Arae. Good image. Much more light in the red end of sp. than in the violet. H & K are faint while the red end is seen well beyond Hβ.

Oct. 11. 1898.

X7815$_2^5$ (β & ζ Arae.

ζ Arae. 4471, & 4387 are double, also 4649 & 4641. The star must be a binary.

β. Arae. Thin image.

X8393$_2^4$ (β & ζ Arae.

ζ Arae. Lines very broad and ill-defined.

β Arae - thin image.

Oct. 22. 1898

X7745$_2^4$ μ'_2 Scorpii

μ^2 - poor, B3A. fine lines not seen

μ^2 Lines very broad and hazy, but not distinctly double. Sep = 1.5.

X7746$_2^5$ μ'_2 Scorpii

μ^2 B2-3A, lines sharp.

μ' Sep = 3

X7747$_2^5$ μ'_2 Scorpii

μ^2 B2-3A.

μ' B3A Sep. = 3

X7759$_2^4$ μ'_2 Scorpii

μ^2 Sp. B3A.

μ' Sep = 3

Oct 22. 1898.

X7752 $_2^5$ μ's Scorpii

μ² B2-3A? Fine lines seen but faint.

μ¹ Sep = 7. Both components appear equally intense.

X7748 $_2^4$ μ's Scorpii

μ² - B3A w. some lines characteristic of B2A present.

μ¹ Sep = 5

X7751 $_2^4$ μ's Scorpii

μ² = B3A, none of the fine lines being seen.

μ¹ Sep = ~~8~~ ~~9~~ 7. All lines widely double. Lines towards red are a little more intense.

Oct. 22. 1898

X7749 $_2^4$ μ's Scorpii

μ² - B2-3A, fine lines faint.

μ¹ Sep = 4.

X7713 $_2^4$ μ's Scorpii

μ² B3A w. some fine lines present.

μ¹ Sep. = 8 Br. comp towards red, the difference however between the two sets of lines being very slight.

X7709 $_2^5$ μ's Scorpii

μ² B3A.

μ¹ Sep = 4

X7710 $_2^3$ μ's Scorpii

μ² B3A

μ¹ Lines a little wide. Sep = 3

Oct. 22, 1898.

X7711$_{2}^{5}$ μ^{1}_{2} Scorpii

μ^{2} = B3A. B2A lines are extremely faint

μ^{1} = B3A. Sep = 5 – lines very wide and hazy.

X7721$_{2}^{5}$ μ^{1}_{2} Scorpii

μ^{2} – Faint lines well seen.

μ^{1} – Sep. = 10. These lines are widely double, and if this separation be called 10, the separation on X7751 (see page 60) should be not more than 7.
Brighter component towards violet, and the lines are about double those towards the red in intensity.

X7712$_{2}^{4}$ μ^{1}_{2} Scorpii

μ^{2} B3A.

μ^{1} Sep = 4

Oct. 22, 1898.

X7707.$_{2}^{5}$ μ^{1}_{2} Scorpii

μ^{2} – B2-3A.

μ^{1} Sep. = 6. Br. towards red, difference in intensity slight.

X7714 μ^{1}_{2} Scorpii

μ^{2} – B3A.

μ^{1} Sep = 9 Br. towards red, Br = 1.2 fainter

X7715$_{2}^{4}$ μ^{1}_{2} Scorpii

μ^{2} = B3A.

μ^{1} Sep = 8 Br towards red and equals 1.2 fainter

Oct. 22, 1898.

Plates of μ^2 Scorpii

47716_{2}^{5}

μ^2 B3A with some B2A lines seen.

μ^1 Sep = 6 br. twr. red, components nearly equal, the one towards red being not more than one tenth more intense.

47722_{2}^{5}

μ^2 $B\underset{\wedge}{\overset{2-}{}}3A$.

μ^1 Sep = 10. Br towards violet and equals 1.7 fainter.

47723_{2}^{5}

μ^2 = B3A

μ^1 Br. towards violet. = 2 fainter.

47703_{2}^{4}

μ^2 = B3A.

μ^1 Sep = 10. Br. twr. violet = 2 fainter.

47724_{2}^{4}

μ^2 = B3A.

μ^1 Lines very wide. Focus poor.
Br towards violet ? Sep. = 8.

Oct. 22, 1898.

Plates of μ^2 Scorpii

47690_{2}^{4}

μ^2 = B2-3A.

μ^1 Sep = 8 br. twr. violet = 1.7 fainter

47708_{2}^{5}

μ^2 = B2-3A.

μ^1. Lines wide Sep. = 4

47700_{2}^{5}

μ^2 = B2-3A.

μ^1 Br. twr. violet Sep = 9.
Br. = 1.7 fainter.

47697_{2}^{4}

μ^2 B2-3A.

μ^1 Sep = 7 Br. twr. red = 1.3 fainter

47694_{2}^{4}

μ^2 = B2-3A.

μ^1. Lines a little wide. Sep. = 3

47687_{2}^{5}

μ^2 = B2-3A.

μ^1 Lines fairly well defined Sep = 1.

Oct. 22 1898.

Plates of μ^2 Scorpii

X7683$_2^3$

Plate too poor.

X5910,^{5}

$\mu^2 = B2 - 3A$.

μ' Sep = 10. brighter twr. violet. = 1.7 fainter

X5776,^{5}

$\mu^2 = B2 - 3A$.

μ' Sep = 9. Intensity nearly equal,

X4382

$\mu^2 = B3A$.

μ' Lines hazy. Sep = 2

X7725$_2^5$

μ^2 B2 - 3A.

μ' Br. twr. violet = 1.5 ft.

X7735$_2^5$

$\mu^2 = B2 - 3A$.

μ' Sep = 5 lines wide & hazy,

X773$\overset{2}{8}$$_2^5$

$\mu^2 = B2 - 3A$

μ' Sep = 5

Oct. 22. 1898.

Plates of μ^2 Scorpii

X7734$_2^4$

$\mu^2 = B3A$

μ' Sep. = 5

X7726$_2^5$

μ^2 B3A. Lines broad

μ' Sep. = 3 Lines broader than in μ^2

X7727$_2^4$

Lines broad in both plates

$\mu^2 = B3A$.

μ' Sep = 2

X7730$_2^5$

$\mu^2 = B2 - 3A$.

μ' Sep = 6 Br. twr. red?

X7736$_2^5$

μ^2 B3A.

μ Lines wide Sep = 4

X8370$_2^5$

$\mu^2 = B2 - 3A$

μ' Br. twr. red = 2 ft.

X7737$_2^4$

μ^2 B3A.

μ' Lines wide. Br. twr. red? Focus poor

Sep = 6

Oct 22. 1898.

Plates of μ^2 Scorpii

X8045$_2^5$

μ^2. B 3 A. Lines broad.

μ' Lines very broad and hazy.
No distinct separation. Sep = 4

X8009$_2^4$

μ^2 B2-3A.

μ' Sep. = 10 Br. twr. violet = 2 ft.

X7980$_3^4$

μ^2 B2-3A.

μ'. Lines widely separated.
Br. twr. violet = 1.5 ft.

X7738$_2^4$

μ^2 = B2-3A.

μ' Sep = 6 Components equal

X7741$_2^4$

μ^2 = B3A poor focus

μ' Sep. = 6 Br. twr. red = 1.1 ft.

X7740$_2^4$

μ^2 = B3A.

μ' Sep = 7 Components equal.

Oct. 22. 1898.

Plates of μ^2 Scorpii

X7743$_2^4$

μ^2 = B2-3A

μ' Sep = 7 Br. twr. violet = 1.3 ft.

X7739$_2^5$

μ^2 = B3A

μ' Br. twr. red = 1.1 ft.
Sep. = 6.

X7742$_2^5$

μ^2 = B2.3A. Good spectrum.

μ' Sep = 9 Br. twr. violet = 2 ft.

X7744$_2^5$

μ^2 = B2-3A

μ' Lines wide Sep = 4

X8411$_2^{30}$

μ^2 = B3A

μ' Sep = 7 Br. twr. red = 1.5 ft.

X7974$_3^4$

μ^2 B2-3A fine lines well seen.

μ' Lines only a little wider than
in μ^2. Sep = 1

Oct 22, 1898.

Plates of μ_2 Scorpii

47919^{B3}_{3}
Too thin and poor of both stars.
Lines wide in μ^1, not double.

47917^{3}_{3}
Lines wide in both stars.
Sep = 1

47902^{3}_{3}
μ^2 = B3a
μ^1 - Sep. = 9 Br. comp. twr. violet = 1.5 ft.

47898^{2}_{3}
μ^2 = B3a focus poor.
μ^{*1} Sep. = 8 Br. twr. red, focus poor

47840^{2}_{2}
μ^2 B3a lines wide.
μ^1 Sep = 1 or 0 lines wide

47851^{4}_{2} This plate is numbered 7720.
μ^2 = B2-3a - fine lines well seen,
μ^1, ~~B~~ Sep = 10 Br twr. violet = 1.5 ft.
Find out to which spectrum the line 4712 belongs.

Oct. 22, 1898.

Plates of μ_2 Scorpii

47850^{B3}_{2}
μ^2 = B 2-3 a
μ^1 Sep. = 9 Br. twr. violet = 1.5 ft.

47837^{3}_{2}
μ^2 = B2-3 a
μ^1 Sep. = 8 Br. twr. red = 1.1 ft.

47820^{4}_{2}
μ^2 = B3 a
μ^1 Br. twr. red = 1.3 ft.
Sep. = 7.

47814^{4}_{2}
μ^2 B2-3 a lines sharp.
μ^1 Sep = 1 lines only a little wide

47790^{4}_{2}
μ^2 = B3a
μ^1 Sep = 9 Br. twr. violet = 1.5 ft.

47782^{4}_{2}
μ^2 B2-3a lines sharp.
μ^1 Sep = 7 Br. twr. red = 1.3 ft.

Oct 22. 1898.

47761_2^4
$\mu^2 = B\,3\,a$
μ' Br. twr. red = 1.2 ft
Sep. = 7

48468_2^5
$\mu^2 = B\,2\text{-}3\,a$
μ' Sep. = 9 Br. twr. violet = 1.5 ft.

47731_2^5
$\mu^2 = B\,2\text{-}3\,a$
μ' Sep = 2

47733
$\mu^2 = B\,2\text{-}3\,a$
μ' Sep = 3

47850_2^3
$\mu^2 = B\,3\,a$
μ' Sep = 9 Br. twr. violet = 2 fainter

Nov. 3. 1898

✓ 48220_2^4 β Aurigae

K, Hδ, Hγ and 4481 all double. Of the two components of K, the one twr. red is a little more intense.

✓ 48146_2^4 β Aurigae

K, Hγ + 4481 are double.
Plate hazy.

✓ 48135 β Aurigae
K double. stronger comp. twr. red. Other lines very broad

✓ 47973_3^4 β Aurigae
All lines very broad. not double.

Nov. 9. 1898

X 7962 $_3^4$ (good) α Piscis Aust.

K = 0.7 H = 1.1 Hδ.

On three previous plates of this star, the K line seems fully as intense as Hδ, though not surrounded by any haze. It is so sharp as compared with the hydrogen lines that it is hard to estimate the relative intensity.

The lines are broad.

X 7942 $_3^5$ α Pis. Aust

K = 0.7 H = Hδ.
Lines are broad & show very little contrast to the bright part of the spectrum.

X 7915 $_3^3$ α Pis. Aust.
poor focus

Nov. 9. 1898.

X 7895 $_3^4$ α Pis. Aust

Lines very broad, may be due to focus, as the width is greater towards red end, and is especially noticeable in the line 4481. which seems double.

X 7699 $_2^5$ α Pis. Aust
Lines well defined.

X 7669 $_2^3$ α Pis. Aust.

Poor focus, lines broad.
Solar lines barely seen.

X 7668 $_2^4$ α Pis. Aust.

K = 0.6 H = 0.9 Hδ.
Lines somewhat broad.

It seems that no quality "5" plate so far obtained shows the lines broad.

Nov. 19. 1898

+ 46399 3 v² Centauri

A.G.C. 19027 v² Cent. Too dense

+

" 18995 A3F probably or A2F

+

" 18929 B5A pert Hβ is off the plate.

Discussion of stars of Class F5-G & F8G slightly peculiar

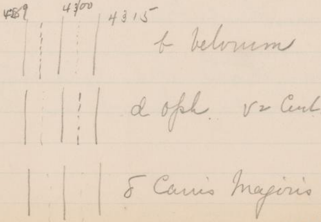
δ Canis Majoris,

The wave-lengths of the lines seem to agree with those of d Ophiuchi, Class F5 G.

Wave-lengths and intensities in stars b Vel. ι' Scorpii, y Carinae are diff. from those of d Oph. or δ Canis Maj.

G band in these stars.

1 prism plates



Nov. 19. 1898

Differences bet ρ Puppis ✗
and δ Canis Majoris ✗

Hβ, Hγ & Hδ more intense in ρ Puppis
H & K wider in δ Canis Maj.

G band diff. as 4294.3 & 4297.1 are barely seen in ρ Puppis.
Wave-lengths in general seem to agree, so δ Canis Majoris is not peculiar as to wave-lengths and intensities like the stars ι' Scorp, b Vel.

4077.9 more intense in δ, though it is well-marked in ρ

The pair of lines 4172 & 4177 stand out more in δ, 4233 is also more intense in δ, and in general the fine lines are more numerous and more intense.

Nov. 19. 1898.

Discussion of F8G stars continued.

β Doradus

on 1 pr. plate is like ν^{2} Cent. except that lines 4294 + 4297 are here glimpsed. This makes the G band more nearly resemble the same band in δ Canis Majoris.

Nov. 25, 1898

Plates from pile that could not before be identified

X 5363 a Carinae.

G5-K

This is a good spectrum and shows the star about like the typical ^{G5} K

[wrong plate $^{X 5362}$ was in this cover]

X 5362 A.G.C. 7066

X 5363 was in this cover

Thin exposure. Sp. K or K2 M.

X 4768, ^{31} γ + β Circini

Very narrow images.

If plate is entered, enter only in ledger of γ Circini.

X 5589 η Gruis

Sp.? K.

A.G.C. 30847. A5 F. Solar lines seen but focus poor as the image is on edge of plate.

Nov. 25. 1898

45581 A.G.C. 25108. in Sag.
Under β Corvi, focus poor. Hγ = 4326.
Hδ much more intense than either Hβ or Hγ.

Dec. 7. 1898

47451 (taken for A.G.C. 25108) but another star was taken.

D.M. −17° in Sag. 5203 B8A. Sp. poor.

H.P. 3121 Also on plate. Sp. K.

Dec. 8, 1898

X7829$_2^4$ β Gruis

To determine the limiting wave-lengths of the bright bands II, I-II, & III in the red, as the wave-lengths given in Miss Maury's volume do not seem right for these plates. X7829 superposed on X 8657 θ Arae where fine Orion lines are well-marked. I commences at end of greater λ at pt. about ~~mid-way~~ one-third way bet. line 4630 and line 4619 in θ Arae, that is one-third away from line 4630. and extends to about the wave-length 4611. Hence the limiting wave-lengths of band I, may be said roughly to be —

Band I - 4611 - 462$\overset{6}{\cancel{5}}$.

4630
4619
3) 11
4

4630
4
4626

Dec. 8, 1898.

X7829 cont.

Band I - II. is readily seen to extend from λ 4556 to 4586, as can be estimated from its nearness on either side to the Orion lines 4553 and 4576.

Band ~~III~~ II not seen in β Gruis.

Band I(a) Another band is seen of longer λ than I, and narrower than I. It has limiting wave-lengths approximately 4659 to 4668. This band is about seven tenths as intense as I.

Band ~~III~~ II in υ Librae X 5944 appears to extend from λ 4491 to about 4515.

Given by Miss Maury,

Band I wave-lengths	4614 - 4648
Band I - II	4556 - 4586
Band II.	4470 - 4525
Band I(a)	not given.

Band I seems to narrow down on the side of greater λ in β Gruis, so that it extends to 462$\overset{6}{7}$ or instead of to 4648. Band I-II agree. Band III is given with wider limits on both sides than by my measures.

Dec. 13, 1898

√ 47750 μ' Scorpii

Lines separated, brighter comp. towards end of longer wave-length.

Brighter = (1.2) ~~[illegible]~~ fainter

√ 47720 μ' Scorpii

Brighter comp. towards end of shorter wave-length.

Brighter = 2 fainter

These two plates are both good and certainly show some variation in the intensities of the lines of one or both components, presumably of the fainter star.

√ 49218_{2}^{4} π Scorpii

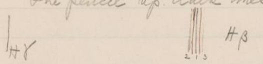
Lines double. 4471, 4387, Hγ, 4144, 4120 appear distinctly double, the brighter component being towards the ~~red~~ violet. The brighter is three or four times as intense as the fainter component

Dec. 14. 1898.

√ 49207 η Centauri

Hβ appears complex. There are two distinct bright lines well separated by a dark line which seems to be in the place of Hβ as mapped up with other plates.

The pencil rep. dark lines or spaces, the red ink rep. br. lines.



The dark lines are very faint, the middle one (1) not having more than 0.1 the intensity of Hγ. (2) is nearly as intense as (1) and (3) is fainter and sharper

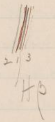
The bright lines are faint about 0.1 as intense as Hβ br. in δ Centauri, and about equal in intensity.

Hγ is fairly well-defined with a wide haziness on side of gr. w'length. All lines broad.

Dec 14, 1898

✓ X 49224

η Centauri



pencil = dark lines
red ink = br. "

The br. line of shorter wave-length is here ~~more~~ 1.5 more intense than the one of gr.

The middle dark line appears to agree in position with dark Hβ on X 8505.

Hγ slightly br. on edge of gr. w'lgth
All lines broad. Orion lines broader than the hydrogen.

Dec. 14, 1898

✓ X 49194 η Centauri

Erythrosin plate. Hβ region cut out by absorption. Hβ not distinctly seen, but appears to consist of two faint bright lines.

All lines broad.

✓ X 49290 η Centauri

Hβ appears to consist of two dark lines br. on edge of greater wave-length. The dark line of longer w'lgth is more intense than the one of shorter and the bright line of greater λ is more marked than the one of shorter.

Hγ slightly bright on edge of greater λ.
Orion lines very broad.

Dec. 15. 1898

√ X 9280 η Centauri

Hβ dark, with bright edges on both sides. The dark line is here more marked than the bright edges whereas on plates 9207 and 9224, the bright lines are more intense than the spaces or dark lines. There seems also to be a faint trace of a dark ~~line~~ component of shorter wave-length than the well-marked line, but this region is hazy.

The change in Hβ is seen by comparing plates 9280 and 9290.
The dark Hβ of shorter w'lgth seen on X9290 is not distinctly seen on X9280.

Hγ hazy towards end of greater w'lgth.
Orion lines very broad

Dec. 1~~7~~6, 1898

Examination of plates of ι Piscis Austrin~~us~~i

X4970 very poor, no lines well seen except those of hydrogen, focus poor on X4969

X 5004 lines broad. broad also on X5005

X5653 Lines broad, very sharp on X5652 and X5654.
Record says "Control clock had stopped"

X5849 Lines broad. also broad on X 5851

X6798 Lines broad, also broad on 6797.

X6945 Lines very sharp. K & 4481 narrow & thin

While the lines seem to show changes, it may be due to focus,

Dec. 19. 1898

S.M.P. 6412 ✓ A.G.C. 24818 in Corona Aust. 46646

Sp. K, good image

A.G.C. 24968 ✓ very poor. 4077.9 is the strongest solar line.

K = 0.8 H.

A 3 F? Appears to be something like δ Normae. Omit.

S.M.P. 7168 ✓ + 49259, ³ ζ Indi

very poor.

All lines blurred and hazy.

G band blurred.

4227 strong.

Probably K5M

Red end shown well beyond F line.

The dispersion appears to differ on these plates from that of earlier one-prism plates.

S.M.P. 4724 ✓ A.G.C. 18920 49260 in Centaurus

very poor. 2nd type and that is about as near as one could come to it with such a plate as this.

Dec. 19. 1898.

S.M.P. 5282 – Lupi 49261. ✓

very poor. Sp. seen from a little beyond F in the red to G band. Bands I & II are well marked but I–II is not seen. Breaks at F. Sp. is apparently like the K stars that show a decided break at F, or possibly it is K2M.

Wait for plate 9126. Qual. "2"

S.M.P. 5924 + – Scorpii ✓ 49262, ³

Probably like α Aurigae, but may be G5K.

Hβ not seen. Hγ = 1.5 4326.

S.M.P. 6019 – Scorpii ✓ 49263, ³

Sp. too poor to classify.

No lines seen except those of hydrogen. Probably B9A, but may be B8A or even A. Omit?

✓ 49245 ⁴ ₂ γ Triang. Aust.

Sp. A. Lines somewhat wide.

Solar lines very few.

4471 distinctly present, about one-half as intense as 4481.

Dec. 19, 1898.

✓ X 9241 $_2^5$ γ Gruis

K line very sharp + double
Lines exceedingly well defined.

✓ X 9239 $_2^3$ α Sag.

Too poor to see fine lines

✓ X 9238 $_2^4$ λ Sag.

Sp. K. Excellent example

✓ X 9237 $_2^3$ δ Librae

Third-type. Too poor to subdivide.

✓ X 9236 $_2^4$ γ Hydrae.

G5 K. Good plate.

✓ X 9232 $_2^4$ τ Sag.

Poor.
Shows great absorption from X 227 to violet end. Appears to differ from λ Sag.

Dec. 19, 1898.

✓ X 9233 ^{5} α Pavonis

B 3 A², excellent plate.

✓ X 9234 $_2^3$ ι Octantis

Too poor.

✓ X 9235 $_2^3$ ε Crucis

Too poor

S. M. P. 7910 +
θ Octantis

✓ X 9265 $_1^3$

Sp. K.
Poor image.

✓ X 9247 $_2^3$ ε Pavonis

Sp. A. Poor plate

✓ X 9248 $_2^2$ β Pavonis

A5 F or F. Poor plate

Dec. 19. 1898.

S.M.P. 4157 F Centauri +

√ X 9253$_{1}^{3}$

Like γ Hydri. Sp. Ma.
Different prism is used, having greater dispersion than season plates less than 9000

S.M.P. 4798 + – Centauri

√ X 9254^{4}

Sp. K.

S.M.P. 5464 – Lupi +

√ X 9255$_{1}^{3}$

Sp. K.

S.M.P. 6857 ι Telescopii

√ X 9257$_{1}^{2}$

Second type, but too poor to subdivide

S.M.P. 7009 ξ Telescopii

√ X 9258$_{1}^{3}$

Too poor.

Dec. 19. 1898.

√ X 9231$_{2}^{5}$ α Arae.

Hβ bright.
Hγ bright is double, but the bright lines are very faint, especially the one of greater wave length.

Sp. B3A, lines broad.

√ X 9246 α Arae.

Hβ bright
Hγ wide and dark. The two bright lines which are seen on plate 9231 are not here visible. The lines are very broad on this plate

Lines 4128–4131 and 4481 are very faint on these plates.

√ X 7809$_{2}^{5}$ α Arae (re-examined)

On this plate the bright lines at Hγ are well seen.
Hδ looks triple, consisting of a central dark line and a fainter dark line on each side. Other lines wide.

Dec. 19. 1898.

All the plates of α Arae should be examined together to see if the hydrogen lines show changes other than those due to focus.

√ $X\,9228_2^4$ ζ Centauri

Lines ~~well defined~~ single.
Sp. B3A.

√ $X\,9227_2^4$ β Muscae

B3A. lines broad

Dec. 19. 1898.

√ $X\,9294_2^5$ β Lupi

Lines broader than in κ Cent., which is on extreme edge of plate.

√ $X\,9179_2^3$ β Lupi.
Too poor.

√ $X\,9291_2^5$ β Lupi.

Lines a little broad.

√ $X\,9181_2^4$ β Lupi.

Enth. Lines somewhat broad, may be focus.

√ $X\,9282_2^5$ β Lupi
Lines fairly well-defined, more fine lines are seen than on 9294, 9291, or 9181.

√ $X\,9272_2^5$ β Lupi
Lines a little hazy.
√ η Centauri is all on from Hβ to Hζ. Lines sharp.

Dec. 19, 1898.

√ X 9274 $_2$.^{5} β Lupi.

Lines fairly well-defined.

√ η Centauri. B3A. lines sharp

√ X 9202 $_2$.^{4} β Lupi.

Earth. Lines br. tow. violet, also rather broad bet. Hβ + Hγ.

√ X 9225 $_2$.^{5} β Lupi.

B2A. lines a little broad.

√ κ Cent. B3A. lines sharp.

√ X 9229 $_2$.^{5} β Lupi.

Lines fairly well-defined, but B2A lines are not seen.

√ η Cent. B3A. on edge, lines sharp.

Dec. 19, 1898.

√ X 9172 $_2$.^{5} β Lupi.

Fine lines well seen.

√ κ Centauri B3A, traces of B2A lines.

On this plate the stars are equally near the centre.

X 9275 $_2$.^{4} μ^{1,2} Scorpii.

√ μ^1. Br. comp towards violet = 2 or 3 fainter

√ μ^2 = B3A.

X 9208 $_2$.^{4} μ^{1,2} Scorpii.

√ μ^1 Br. comp. towards violet = 2 or 3 fainter

√ μ^2 = B2A ~~or B3A~~,

X 9230 $_2$.^{5} μ^{1,2} Scorpii.

√ μ^1 Lines separated but they appear very nearly equal. The comp. tow. red appears slightly more intense than the one tow. violet.

√ μ^2 = B$\overset{3}{2}$A

Dec. 19, 1898.

X9219$_2^5$ γ Arae.

√ β Arae = K or K2M. Lines intense on this plate.

√ γ Arae, Lines very broad and hazy, not distinctly separated broader, however, than on any plate I now remember.

√ X9276$_2^4$ β & γ Arae.

β Arae = K or K2M.

√ γ Arae. Lines very broad.

49209$_2^4$ γ Arae.

√ β = K2M

√ γ = Lines very broad, perhaps double.

Dec. 20, 1898

√ X9298$_2^4$ α Telescopii

(1) B3A. 4120 a little fainter than in the typical star. 4128-4131 barely seen

Lines fairly well-defined.

√ (2) B8A.
4481 nearly equals 4471
4140 & 4128-4131 hardly seen,
4026 = same in γ Gruis.

√ (3) B5A.

√ 49297$_2^4$ G Scorpii.

Sp. K good example.

Dec 20, 1898.

✓ X 9296$_2^5$ β Lupi

β Lupi (1) B2A. The triple line bet. Hδ and 4026 is seen also 4649, 4641, and other B1A lines
Lines fairly well-defined.

✓

γ Centauri (2) ~~B~~ B3A. Triple line seen but not 4149.

✓ X 9317$_2^4$ γ Tucanae

F5 G. 4227 seems more intense than in the typical star.

✓ X 9316$_2^4$ ε Gruis.

A3 F. Solar lines hardly seen. K = Hδ = 0.8 H

Dec. 20, 1898.

✓ X 9315$_2^5$ β Lupi

β Lupi (1) B2A. Lines fairly well-defined, B1A lines well seen. Excellent example.

✓

γ Centauri. (2) On plate from red end to 4140
B3A.

X 9314$_2^4$ β Gruis and α Piscis ~~Aust~~.

Two exposures on plate.

✓ (1) α Pis. Aust.?
A3 F Lines a little broad but 4481 looks well-defined.

✓ (2) Md (2) β Gruis?

Good spectrum. No change in light at G. Breaks bright-edged. Band I–II very bright, VII faded out.

Dec. 20, 1898

X 9310$_{2}^{4}$ μ' Scorpii

√ (1) Lines broad almost double.
This is μ' Scorpii

√ (2) B3A nr. 4649 seen.

√ X 9309$_{2}^{5}$ β Lupi

(1) B2A. Lines a little broad

(2) On plate from red end to 4140
B3A

√ X 9304$_{2}^{3}$ δ Arae

B8A very poor.
Lines broad.

✗ √ X 9303$_{2}^{3}$ η Pavonis

Sp. K. Poor and narrow like 9304.

Dec. 20. 1898.

√ X 9302$_{2}^{4}$ α Arae

Hβ bright α Arae?

Hγ appears to consist of two bright lines of which the one having greater wave-length is more intense.

The other hydrogen and Orion lines are very broad and indistinct.

X 9301$_{2}^{4}$ γ Arae

√ γ Arae
Lines broad and double, but it is evident that the clock was not running right.

√ β Arae. K2M.

X 9300$_{2}^{5}$ μ' Scorpii.

√ μ' Scorpii. Sep. = 4

√ μ^{2} Scorpii B2A. B1A lines very faint

Dec. 20. 1898.

√ 49299$_{2}^{5}$ β Lupi

β Lupi (1) B2A. Lines a little broad.

η Centauri. (2) On plate from red end to a little beyond 4009.
B3A.

√ 49250,^{4}

A.G.C. 18039 + Sp. K. Poor image, under exposed.
– Muscae √
S.M.P. 4480

√
A.G.C. 17939 √ A. Lines very broad, none
+ seen except K and the hydrogen.
Focus poor.

Dec. 20. 1898.

√ + 49251,^{4} e Lupi.
A.G.C. 20591 √ B3A.

" 20670 √ √ B3A. 4120 seems faint, focus poor
+ at that region. 4481 not seen.

Other stars on plate are too faint.

√ 49252,^{3}
A.G.C. 15571 Very poor. Probably K5M.
+
– Centauri
S.M.P. 3785
√
" 15619 √ Sp. K.
+

√ 49256,^{3}
√
" 24348 Sp. Ma.
+
– Scorpii Other stars too poor.
S.M.P. 6276

Dec. 20. 1898.

✓ X 9264,^{4}

A.G.C. 25500
– Pavonis
S.M.P. 6572

Very poor. All lines broad.
Probably A2F.

" 25574 ✓ A3F or A5F. Lines in poor focus.
θ Pavonis.
S.M.P. 6594

This sp. may come out better on X 9117.

" 25454 ✓ K?
S.M.P. 6566

S.M.P. 7168 ✓ X 9318,^{3}
+
ζ Indi

Image thin.
Too poor to classify with certainty
K or K5M or Ma.
Probably K.
Looked up on B plate where it appears to be K.

S.M.P. 7573 + ✓ X 9319,^{3}
✓ α Tucanae

Mb or Mb12
probably Mb.

S.M.P. 7816 ✓ X 9320,^{3} ι Phoenicis
+
Sp. A. Image poor, may resemble θ' Microscopii. Focus extremely poor.
4077.9 seen
Also brightness bet. 4128–4172.

✓ Dec. 20, 1898.

S.M.P. 6857 X 9321,^{3}
+
ι Telescopii

Sp. too poor, focus extremely poor.
G5-K or K.

Dec. 21. 1898

√ X 9200 $_2^4$ ζ Sag.

Sp. K.

W Sag. √ another spectrum on plate which is F5 G or F8 G. This is W Sag.

√ X 9201 $_2^4$ α Muscae

B3A Focus poor.

√ X 9187 $_2^4$ μ Vel.

G5K

√ X 9193 $_2^4$ ζ Centauri
a.

very poor focus.

√ X 9168 $_2^4$ ζ Centauri.

Poor, lines broad.

Dec. 21. 1898.

√ X 9169 $_2^4$ χ² Lupi

very poor. B9 H or A.

√ X 9170 $_2^3$ α Arae.
Poor, two exposures.
Bright lines at H ζ not well seen.
H's bright.
All lines broad.

√ X 9171 $_2^3$ θ Pis Aust.

Very poor. narrow.
A or A2F

+ √ X 9177 A. G. C. 12809. Taken for S.M.P. 2433 but R.A. was 1 hr. out.
B3A. λ4120 ft.

√ X 9185 $_2^3$ θ Carinae.

Very poor.
B1A. Line 4685 is strong.

Dec. 21, 1898.

√ $X9184_2^4$ θ Carinae

Enthrongi

B1A. pec. Lines in red seen.

This plate may be needed to get wave-lengths of lines in red.

√ $X9183_2^3$ ~~β~~ σ Sag.

B3A. Lines broad.

√ $X9182_2^4$ ε Scorpii

K.

Good of red end

√ $X9180_2^4$ γ Crucis

Good of red end.

√ $X9203_2^4$ δ Scorpii

B1A. Lines broad.

Dec. 21, 1898.

√ $X9195_2^5$ θ Scorpii

F

Good of red end

√ $X9196_2^5$ ε Sag.

A

Red end

√ $X9198_2^4$ ι Cent.

Poor of red end

√ $X9221_2^3$ θ Indi

A3 F?

Poor.

$X9220_2^4$ β^2 Sag.

√ F. Line 4077.9 seems a little more intense than in ordinary F plates.

√ Other image β^1?

B8A?

Dec. 21, 1898.

✓ $X\,9210_2^3$ τ Sag.

Sp. K. Poor.

✓ $X\,9192_2^3$ γ Cent.

Good of red end.

✓ $X\,9191_2^4$ λ Sag.

Good of red end.

$X\,9190_2^3$ α Arae

Too poor Not α Arae.

✓ $X\,9189_2^4$ α Lupi

Good of red end

✓ $X\,9188_2^3$ β Corvi

G5K, poor.

$X\,9277_2$ α Arae

✓ Hβ bright. Hγ consists of two bright lines faint. Bright streaks as in μ Centauri X8362 are seen.

Dec. 21, 1898.

✓ $X\,9278_2^3$ ζ Cap.

G peculiar.

✓ $X\,9279_2^5$ α Gruis.

Broad lines

4128-4131 is a little fainter than 4144.

4481 = 3/4 (4471)

4120 barely seen

✓ $X\,9281_2^3$ γ Triang. Aust.

A

Very poor, narrow

✓ $X\,9283_2^3$ ζ Lupi

K

Very poor.

✓ $X\,9286_2^3$ α Ap.

Too poor

Dec. 21. 1898.

✓ $X49292_{2}^{4}$ α Triang. Aust.

K 2 M

✓ $X49293_{2}^{3}$ 0 Sag.

K

✓ $X49295_{2}^{4}$ γ Triang. Aust.

Sp. A. Lines broad

$X49287_{2}^{3}$ ζ Scorpii

A.G.C. 22812 ✓ ζ¹ – F line bright Sp. B. A

" 22832 ✓ ζ² K 5 M.

" 22827 ✓ O I

+

Dec. 21. 1898.

A.G.C. 12809 ✓ $X491\overset{7}{\cancel{1}}7,^{3}$

+ in Vela — Sp. B 5 A probably, may be B 3 A, but the lines 4144 & 4120 are not distinctly seen. Enter w. remark Ed.

$9^h 19.$ –47

A.G.C. 25928. ✓ $X49323,^{4}$ ε Corona Aust.

+ S.M.P. 6661 ✓ Focus poor. F5 G or F8 G. Solar lines all blurred so as to be barely visible.

" 25886. ✓ B 5 A or B 8 A.

+ S.M.P. 6653 Appears to be B 5 A. Focus very poor.

✓ $X49322,^{4}$ λ Arae.

S.M.P. 6124

+ Image too poor to decide whether it is F5 G or F8 G. The solar lines are not seen, and the hydrogen lines look strong, but the G band is seen

✓ +

A.G.C. 23835 Sp. K.

Dec 22, 1898

✓ X 9270,^{4} ι_1 Normae

A.G.C. 21694 +
ι_1 Normae
S.M.P. 5486
A.G.C. 21693
(8 mag)

Probably A3 F.
No trace of this spectrum.
The lines are ill-defined in the spectrum of ι_1 Normae but this is probably due to poor focus.

" ✓21827 + ι_2 Normae
S.M.P. 5516

Sp A?
Hyd. line & K line seen, with a blur at position of 4471 or 4481, may be B9 A.

January 26, 1899

✓ X 9037$_2^3$ β Muscae

Image too narrow.

✓ X 9036$_2^3$ κ Carinae

Image thin and poor.
Sp. A?

✓ X 9035$_2^3$ β^1_2 Sag.

✓ β^1 = B8 A.
✓ β^2 = F. or F2 G

✓ X 9034$_2^3$ μ Sag.

B8 A. Sharp lines.
4481 = 1.5 (4471). In this respect, this spectrum seems to differ from that of γ Gruis in which the two lines are equal.

Jan. 26. 1899.

X 9033 β and γ Arae

√ γ Arae. Lines broad.

√ β Arae. Thin. Violet end very faint.

X 9032_{2}^{5} β Lupi & κ Centauri

√ β Lupi in centre of plate.
B2A. Lines not well defined.

√ κ Cent. On edge of plate.
Lines sharp.
B3A, with the characteristic B$\overset{\vee}{3}$A
lines very faintly seen.

√ X 9031_{2}^{4} β Centauri

Image too dense. Three lines of longer λ than Hβ are seen. The wave-lengths of these lines should be determined as only two lines 4927 and 5023 are given in Miss Maury's table.

Jan. 26. 1899.

X 9030_{2}^{4} μ_{2} Scorpii.

√ μ^{1}. Lines double. Sep = 10. More intense lines are towards violet and equal 3 or 4 times the fainter lines. The focus seems poor.

√ μ^{2}. B3A.

√ X 9029_{2}^{3} β Centauri.
Dense. Not as good of the red end as X 9031.

√ X 9028_{2}^{5} β Lupi.

Lines very hazy.

κ Cent. On edge of plate, visible from Hβ to line 4026.
Lines very sharp.

Jan. 26. 1899.

✓ X9019 $_2^3$ A.G.C. 20572. ζ Lupi

Sp. thin. K. & Hγ nearly equal.
λ4326.0.

✓ X9018 $_2^3$ δ Muscae
Too poor.
K. very narrow.

✓ X9016 $_2^5$ λ Centauri
B9A.
Orion lines broad. Solar lines bet.
λ481 and Hβ should be identified

✓ X9015 $_2^3$ κ Carinae

Image narrow, Lines broad.

✓ X9014 $_2^4$ A.G.C. 10534.

Sp. very thin. Lines double.

✓ A.G.C. 10390 $_1^7$ B3A.

Jan. 26. 1899.

✓ X9013 $_2^4$ β Pictoris

Too faint. K barely seen.

✓ X9012 $_2^3$ κ Carinae
Too faint.

X9010 $_2^4$ β Lupi
✓ B2A.
Lines a little wide but narrow
and better defined than on X9028.
(see p. 121)

α Cent. on plate from λ481 to violet.
B3A. with triple line near Hδ seen

✓ X9008 $_2^3$ β Volantis.

Too thin, Probably F

Jan. 26. 1899.

√ X 9007$_{2}^{4}$ A.G.C. 10534

Sep. = 10.

Br. comp towards violet.

Br = 2 fainter.

√ A.G.C 10390. B3A.

√ X 9006$_{2}^{3}$ β Pictoris

Too faint to be sure of details.

√ X 9004$_{2}^{4}$ δ Crucis.

B2A. Lines a little wide

√ X 9003$_{2}^{4i}$ λ Muscae
A5F.

√ X 9002$_{2}^{4}$ A.G.C. 13968 q Vel.

A2F.

Jan. 26. 1899.

√ X 9001$_{2}^{4}$ α Pyxidis
B2A.
Lines very sharp.

√ X 9000$_{2}^{3}$ π Puppis.

Sp. K? Too narrow & poor.

X 9165$_{2}^{5}$ β & γ Arae.

√ γ Arae Lines very broad.

√ β Arae Lines better defined, faint at violet end.

X 9164$_{2}^{5}$ μ^{2} Scorpii

√ Sep. = 9
Br. towards violet.
Br. = 1.5 or 2 fainter.
The line 4387 is clearly double and the two components appear nearly equal in intensity.

√ μ^{2} = B3A.

Jan. 26. 1899.

√ X9163 $_2^4$ π Scorpii
B2A. Lines broad.

√ X9162 η Centauri. May 27, 1898.

Hβ is composed of two dark lines, the one of longest λ being 2 or 3 times as intense as the one of shortest λ. The space between these two lines is no brighter than the bright spaces in the continuous spectrum. The Orion lines look ~~look~~ double but are not well separated as the F line. The lines are more hazy on this plate than on others of η Centauri and the haziness extends to all the hydrogen lines.

Jan. 27. 1899.

√ X9161 $_2^5$ β Lupi. May 27, 1898.
B2A.
Lines a little broad.

√ κ Cent. B3A.

This plate shows good focus so that the haziness and doubling of lines on X9162 η Cent. (see prec. page) is not due to focus.

√ X9082 $_2^3$ d Ophiuchi
Sp. F?
Image
Either F or F2G.

X9081 $_2^5$ δ Arae.
√ Lines very broad and hazy.

√ β Arae. very faint at violet end.

X9080 $_2^5$ μ2 Scorpii

√ Lines double. Sep. = 8 Br. comp. towards violet
Br. = 2 or 3 fainter Est. diff. and uncertain. As the focus is not the best
√ μ2 = B3A. fine B2A lines not seen

Jan. 27. 1899.

✓ X49079$_{2}^{5}$ β Lupi

Focus not the best? The lines are somewhat broad and the spectrum shows only the B 3 A lines with any distinctness. Sp. in centre of plate

✓ κ Centauri. on edge of plate, lines very sharp.

X49078$_{2}^{4}$ ζ Puppis.

✓ The bright band 4688 appears to be crossed by a dark line which coincides in position with line 4685. This gives the bright band a double appearance, with the larger portion towards the end of longer wave length. Band 4633 is very faint in this image and appears to be double. Both series of hydrogen lines are broad

✓ 49077$_{2}^{4}$ β Lupi.

Very narrow and poor.

Jan. 27. 1899.

✓ X9076$_{2}^{3}$ A. G. C. 10534.
Lines burned out. Very narrow spectrum.

X9061$_{2}^{4}$ γ Arae.
✓ Line 4471 looks clearly double. This is as good a plate as I have seen showing the unusually wide lines of γ Arae.

✓ β Arae. Lines well-defined. Faint at violet end. Nothing seen beyond 4227.

X9060$_{2}^{5}$ β Lupi
✓ Lines only a little hazy.

κ Cent. Lines sharp. Almost as many lines seen as in β Lupi. Sp. seen from 45$\overset{7}{6}$8 to end of shorter wave-length.

✓ X9058$_{2}^{3}$ ~~κ Carinae~~ A. G. C. 10534
Too narrow and poor

✓ X9056$_{2}^{3}$ ε Telescop.
Sp. K very poor.

Jan. 27. 1899.

✓ X 9055 $_{2}^{5}$ η Scorpii
Image very thin.
F_2 G or F_5 G.

✓ X 9054 $_{2}^{4}$ β Lupi
Lines hazy.

✓ X 9053 $_{2}$ η Centauri

Hβ consists of two dark lines well separated but neither being very well defined. All the other lines look double or very wide.

✓ X 9052 $_{2}$ η Centauri

Hβ dark distinctly double.
Other lines very wide and probably double but not widely separated like Hβ.

✓ X 9057 $_{2}^{3}$ A.G.C. 10534

Too narrow and poor

Jan 27. 1899.

✓ X 9050 $_{2}^{3}$ π Puppis.
Very narrow and burned out.

X 9049 $_{2}^{5}$ ζ Arae
✓ Lines very hazy.

✓ β Arae Lines well-defined.
Violet end cut out by absorption

X 9047 $_{2}^{5}$ β Lupi

✓ Lines a little wide.

✓ η Centauri Lines well defined

X 9046 $_{2}^{5}$ ζ Arae.
✓ Lines very broad, hazy and peculiar looking.

✓ β Arae. Absorption from 4227 to violet

✓ X 9045 $_{2}^{x}$ μ_2 Scorpii
Lines double. Sep. = 10.
Br. comp. towards red. Hγ, comp. twr. red 1.5 comp. twr. blue; 4387 comp. twr. red = 0.8 twr. blue; 4471 comp. twr. red = 1.1 comp. twr. blue. The image is narrow and rather poor

Jan. 27. 1899.

X 9045 $_2^4$ μ^2 Scorpii

✓ μ^2 = B3A.

X 9044 $_2^5$ β Lupi

✓ Lines a little wide.

X 9043 $_2^4$ μ^2 Scorpii

✓ μ^1 Lines double. Sep = 8.
The lines are of nearly equal intensity but the component of longer wave length appears slightly more intense.

✓ μ^2 = B3A.

✓ X 9042 $_2^5$ β Lupi
Excellent sharp image.
Lines well defined. All the faint lines characteristic of Class B2A are present.

✓ κ Cent. very sharp image.
This is intermediate between B2A and B3A

Jan. 27. 1899.

✓ X 9041 $_2^4$ β Lupi
Lines not as sharp as on X 9042.

X 9040 $_2^4$ μ^2 Scorpii

✓ μ^1 Lines broad. Sep = 5.

✓ μ^2 = B3A.

✓ X 9039 $_2^5$ β Lupi
Lines a little hazy.

κ Cent. B3A.

✓ X 9038 $_2^4$ ζ Hydrae.
G5-K.

Jan. 27. 1899

Identification of the lines in spectrum of ~~29~~ 30 Canis Majoris with known substances.

There are present.
The hydrogen lines Hβ. Hγ etc.
The new hydrogen series as found in ζ Puppis only four of which are seen probably due to faintness of the image.

The helium lines 3819, 4026 & 4471. are the most intense Orion lines and of these three lines 4026 appears the most intense though 3819 is in a faint part of the image so that it is hard to estimate its real intensity.
4026 is superposed on the hydrogen line 4027.
4471 is 0.8 as intense as 4026.

The helium line 4712.8 is present, with intensity 2. 4120 is ~~not seen~~ has intensity 2.
Of the lines belonging to parhelium, ~~4925~~ ~~(intens. 1)~~ 4387, 4144, ~~4009~~ and ~~3927~~ are present but faint, being of intensity 1 or 1-2.
Of the lines in the principal parhelium series, 5023 may be present but the image is not seen so far into the red, and 3964.6 is suspected but not clearly se

Jan 27. 1899
Cont. of preceding page.

Orion lines seen in this sp. not due to helium

4096.9 = 0.7 Hδ
4089.2 =
4116.2
4649 = 0.5 Hδ
4685 = 0.2 Hδ

Jan. 28, 1899

Notes on the place in the series for the Orion stars with bright hydrogen lines.

1. All stars of the first type having one or more bright hydrogen lines fall in one of the subdivisions of "B" stars.

2. The maximum number of bright hydrogen lines observed is 4, viz. $H\beta$, $H\gamma$, $H\delta$ and $H\varepsilon$.

3. The minimum number of bright hydrogen lines is 1, viz. $H\beta$.

4. The intensity of the bright hydrogen lines varies in different stars. When $H\beta$ is from 8 to 10 in intensity, 3 or 4 lines are bright with decreasing intensity from $H\beta$ to end of shorter wave length. When $H\beta$ is faintly bright, all the other hydrogen lines are generally dark though $H\gamma$ may have a central thread of brightness

$H\beta$ in μ Centauri is assumed to be intensity 10. ←

5. The Orion system of lines has been found in 17 stars examined to belong to Classes B2A, B3A, B5A B8A; 4 in B2A, 8 in B3A, 4 in B5A, 1 in B8A, 1 undetermined on account of a superposed spectrum

Jan. 28, 1899.

Cont. of preceding discussion.

6. There seems to be no connection between the brightness of $H\beta$ and the class of "B" stars the spectrum would fall in were all the lines dark, that is, in some B2A spectra, the line $H\beta$ has intensity 10, in others 2.

If the greatest intensity of the bright hydrogen lines were found in the earlier classes B2A & B3A, and if as the Orion lines disappeared towards an A star, the brightness of the hydrogen lines also decreased, it might show that this class of stars shows a transition from early Orion type to A stars, just as the ordinary Orion stars do. But there does not seem to be any connection between the intensity of the reversed portion of the hydrogen lines and the Orion type. Thus it does not appear that these stars necessarily precede an ordinary Orion star. As far as my observations of these spectra extend at present, these stars seem more like peculiar stars of the various Orion classes

Jan. 31. 1899

Notes on classification of Spectra of Type V. called O in the Draper Catalogue.

The stars, not of the Orion type containing bright lines, are called O in the Draper Catalogue, and in A. N. Vol. 127, p. 1, it is suggested that these stars and the planetary nebulae be united into a V type of stellar spectra.
From a study of all the Boyden plates of these spectra, it appears that they are closer allied to the Orion stars than to any other class of spectra and that there are evidences of a gradual development from these spectra to the Orion ~~spectra~~ type.
For photographs showing this development, see Card, containing prints of spectra of A.G.C. 8631, 22763, ξ Puppis, 29 Canis Majoris, τ Canis Majoris and ε Orionis.

Jan. 31. 1899.

X 9174 ⁴

A.G.C. 15222 — G5 K or K
z Carinae + — Poor image, focus very poor.
S.M.P. 3662

✓

A.G.C. 15269 + — Hyd. lines seen
S.M.P. 3679 — 4471 & 4481 about equal
4128 - 4131 strong.

4026, if present, is very faint.
Sp. resembles γ Gruis, but 4026 is not intense enough, nor 4144.
It may be like the peculiar star ν Fornacis of Class A but the image is in such poor focus that it is hard to decide.
Sp. ~~seems~~ seems nearly like that of α Doradus, but line 4481 is a little more intense & 4471 seems also more intense.

" 1158~~4~~3 — X 9173, ³ C Velorum.
Very poor plate
Sp. K probably, but looks as if it might be G5 K.

" 11614 — Only hyd. & 4128 - 4131 are seen

Jan. 31. 1899

A.G.C. 17390 $X9268^{3}$
S.M.P. 4317. B3A 4120 faint.
in Crux

$X9288_{2}^{4}$ η & ξ^{2} Sag.

✓ ξ^{2} = K
η = Mb
✓ ξ^{1} very thin, probably A.
✓

" 20654 + ✓ $X9267^{3}$ ε Circini
K ~~or K5M~~

" 17936 + ✓ X9176,4 A.G.C. 17936
S.M.P. 4453
in Centaurus

Focus so poor that it shows only the hydrogen lines. Traces of Orion lines 4471, 4387, & 4026.

" 17977 + ✓ F8 G. ~~good~~ fair image
S.M.P. 4467

" 19406 + ✓ $X9269^{3}$
S.M.P. 4858 Too poor. G or F8G.
in Centaurus Put under α Aurigae.

Jan. 31. 1899.

A.G.C. 16162 ✓ $X9175^{3}$
+ S.M.P. 3990 G5K.
in Musca

" 16484 ✓ $X9178^{3}$ κ Chamaeleontis
+ K or K5M probably K5M.

✓ $X9082_{2}^{2}$ δ Ophiuchi
F5G.

Feb. 4, 1899.

Orion lines

		48119	47911	
		ε Orionis	β Centauri	β Crucis
	5023	2 4	1?	
	4925	3 6	6	12
Hβ	4861	~~15~~ 30	17	20
	4712	3 6	2	2
	4705	?	?	1
	4697	?	1	1
	4685	1.5 3	?	1
	4675	1 2	1.5	2
	4661	1 2	1.5	1.5
	4649	16 ~~12~~ 32	7	8
	4641	2 4	1	2 double
	4630	1 2	1	1
	4619	?	1	?
	4611	?	0.5	?
	4603	0	~~0.5~~ ?	?
	4598	1 2	1.5	1
	4591	1 2	1.5	1
	4576	1.5 3	1.5	1.5
	4568	2 4	2	2
	4553	3 6	2.5	2
	4542	1 2	?	2
	4531	?	~~2~~ 1	2
	4514	2 double	~~2~~ ?	?
	4490	?	1	?
	4481	1 2	~~2~~ 1.5	1.5
	4471	10 20	13	12
	4457	0	1	?

Feb. 4, 1899.

Orion lines (cont)

		ε Or.	β Cent.	β Crucis.
	4437	0	1	1
	4417	1 2	2	2 } Pretty double
	4415	1 2	2	2
	4395	0	1	1
	4387	4 8	5	4
	4380	1 2	1	
	4373		1	
	4367	1 2	1	
	4361		0.	
	4350	1.5 3		Double. 2
Hγ	4340	1.5 3	20	
	4334	?	1	
	4327	?	1	
	4320		1	
	4318	2 4	2	
	4304	1 2	1	
	4285	1 2	2	
	4276	1 2	2	
	4267	1 2	2	
	4254	2 4	2	
	4242	0	1	
	4237	0	1	
	4224	0		
	4200	1 2		
	4190	1 2		
	4186	1 2		
	4169	1 2		
	4154	1 2		
	4152			

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Orion lines (cont.)

		ε Or.	β Crucis
	4144	3 6	
	4134	0	
	4131	0	
	4128	0	
	4120	3 6	4
	4116	7 14	2
	4111	?	1
Hδ	4101	15 30	
	4096	3 6	1
	4093	?	
	4089	10 20	
	4084	1 2	
	4075	2 4	
	4072	2 4	
	4069	2 4	
	4042	?	
	4036	?	
	4026	12 24	
	4009	2 4	
	3994	1 2	
	3982	~~1~~ ? 0.5 1	
	3975	? 0.5 1	
Hε	3970	15 30	
H	3968	0	
	3964	3 6	
	3962	2 4	
	3954	1 2	

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Orion lines (cont.)

	3947	1 2
K	3933	2 (sharp) 4
	3926	?
	3925	?
	3920	?
	3918	?
	3912	?
Hζ	3889	15 30
	3881	0
	3876	0
	3872	0
	3867	0
	3864	0
	3863	0
	3856	0
	3854	0
	3838	0
Hη	3835	15 30
	3819	10 20
	3812	
	3805	
Hθ	3798	

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Measures of lines in β Crucis X8361 near ~~At~~ λ 4144 and of ~~shorter~~ longer wave-length, to correct an apparent error in wave-lengths in Table IV. Part I

Known lines	Scale-readings		Rough wave-lengths
4144	0		
	1.2		4154
?	1.5	very faint	4156
	2.8	ft.	4168
	3.2	"	4170
	5.2		4186
	5.8		4191
4254.1	13.9		

When the two wave-lengths 4144 and 4254 ~~the~~ were plotted as abscissas & the readings 0 & 13.9 as ordinates, a straight line was drawn through the two points. Upon this line the other scale-readings were plotted, with the result that the wave-lengths given above were read off.

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1.50

✓ X8501 2^{40} λ Sag.

K. good example

✓ X8502 2^{4} A.G.C. 10534

Lines wide. Sep. = 5

Other stars too poor.

✓ X8503 2^{4} p Vel.

F2G or F5G.

✓ X8504 2^{4} β Muscae

B3A. Lines somewhat broad

✓ X8506 2^{4} η Arae

K5M.

Two other stars on plate

✓ One nearest η Arae is like ε Orionis

✓ Other one is B3A

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√ $X8507_2^5$ ν Scorpii

Brighter star - burned out. λ Scorpii?
B3A?

√ ν Scorpii. B3A.

√ $X8514_2^4$ γ Velorum

V type peculiar

Comp. star is B3A

√ $X8511_2^3$ γ Cap.

G peculiar. Too thin.

√ $X8510_2^3$ γ Arae
Image too thin
Lines broad.

√ $X8508_2^4$ σ Sag.

B3A. Lines broad.

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√ $X8536_2^4$ α Pavonis
B3A. Lines excellently defined

√ $X8535_2^4$ η Pavonis

K or K2M. absorption somewhat marked.

$X8526_2^3$ μ^1_2 Scorpii

√ μ^1 Lines broad. Sep. = 5

√ μ^2. B3A.

γ Apodis $X8525_2^3$

√ K - like α Bootis in not showing absorption

Hγ is somewhat more intense than in α Bootis

δ'_2. - third type. Image very poor

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✓ X 8520 $_2^4$ β Indi
K. Image thin

✓ X 8517 $_2^4$ σ Scorpii
B 1 A.
Fine lines well seen.
Helium lines 4925, 4471, 4387
are sharp, but 4649 and some
other ft. lines are broad.

✓ X 8600 $_2^4$ η Sag.
Mb

✓ X 8589 $_2^5$ α Piscis Aust.
Lines very well-defined

✓ X 8588 $_2^4$ α Gruis
Good image. Orion lines very broad
4481 = 3/4 (4471)
4144 = 4128-4132, and 4120 is considerably
fainter. No fine lines seen beyond Hε

Feb. 7, 1899.

✓ X 8587 $_2^4$ ζ Scorpii
B 2 A.
Lines well defined

✓ X 8581 $_2^3$ ε Microsc.
Too thin

X 8573 $_2^4$ μ's Scorpii

✓ μ¹ Lines double, stronger component
towards the red
Stronger = 1.5 fainter

4471 + 4387 + 4144 seen
distinctly double. The other
lines both broad.

✓ μ² B 2 A. Fine lines well seen

✓ X 8569 $_2^4$ τ Sag.
Image too thin
K or K2M

Feb. 7, 1899

√ X 8568$_2^4$ η Sag.
Mb
There appears to be a break between Hβ and 4754.

Bright lines on plate. Leaks.

√. X 8567$_2^3$ ζ Aps.
G8K.

√ δ² Apodis also on plate.
Two images superposed.

√ X 8566$_2^3$ ε Lupi
B star.
Lines burned out.

√ X 8561$_2^3$ η Sag.
Mb.
very narrow

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√ X 8560$_2$ + θ Oph.
B2A. Lines a little broad
B2A lines ft.

√ X 8559$_2^4$ σ Scorpii
B1A. Lines hazy.

√ X 8558$_2^3$ κ Lupi
B9A or B8A.
2ʰ 28ᵐ Lines wide.

37 √ X 8661$_2^4$ β Pavonis
A5F. Examine G band.

√ X 8660$_2^3$ κ Par.
G. Compare w. ζ Cap. (Not like it)

√ X 8659$_2^4$ η Scorpii
F2G.

√ X 8654^4 ι Gruis
K²

Feb. 7, 1899.

✓ $X8653_2^4$ ν Octantis
K

✓ $X8652_2^3$ ε Micros.
A or A2 F.
Thin.

✓ $X8647_2^4$ ζ Geminis
Sp. K.

✓ $X8646_2^4$ ζ Cap.
G pec.

✓ $X8645_2^4$ κ Pav.

Excellent plate.
This plate shows κ Pavonis to be like δ Canis majoris.

✓ $X8641_2^3$ α Pis. Aust.

Too narrow, burned out.

✓ $X8640_4^3$ κ Gemis.
Lines very broad.

Feb. 7, 1899.

✓ $X8639_2^3$ ε Micros.
Too thin.

✓ $X8635_2^5$ α Pis. Aust.
Lines well defined

$X8634_2^5$ β & γ Arae

✓ γ Arae. Lines very broad & hazy.

✓ β Arae. K2 M.

✓ $X8633_2^3$ ε Lupi

B3A. Lines medium.

✓ $X8630_2^4$ α Pavonis
B3A

✓ $X8629_2^3$ α Sag.
~~Lines broad~~.
Too poor. B8A or B9A.

✓ $X8628_2^4$ δ Arae
B8A. Lines broad.
4471, 4481, & 4026 only are seen clearly except the hydrogen

Feb. 7, 1899.

X 8627$_2^4$ μ^1_2 Scorpii

√ μ^1 Sep. = 6. Br. seems to be toward red, but can not be sure

√ μ^2 – B3A

√ X 8626$_2^4$ η Lupi

Lines broad. Double?
Look up other plates.

X 8623$_2^4$ β^1_2 Sag.

√ (1) B8A.
√ (2) F.

√ X 8620$_2^4$ α Circini

F peculiar.

√ X 8617$_2^5$ α Pavonis

B3A

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√ X 8616$_2^4$ τ Sag.
K.

√ X 8614$_2^4$ ζ Arae

K5M?

√ X 8613$_2^3$ α Apodis
K5M? Obsr

√ X 8608$_2^3$ η Pavonis
K.

√ X 8607$_2^4$ η Scorp.

F2G or F5G.

√ X 8601$_2^4$ o Sag.

K. like α Bootis

√ X 8748$_2^3$ α Hydri

Too poor.

√ X 8743$_2^4$ δ Scorpii
Focus poor. Lines broad.
B.A.

Feb. 7. 1899

√ $X8742_2^3$ α Lucanae (eryth.)

Sp. seen, as far as D line
Focus poor.

√ $X8741_2^4$ ‡ σ Sag. (eryth)

No lines seen beyond 5024 √ in red.
Lines broad: poor focus.

√ $X8740_2^3$ ε Cor. Aust.

Too poor.

√ $X8739_2^4$ λ Scorpii (Eryth)

B2A. Lines somewhat broad.

√ ν Scorpii B3A. poor image.

√ $X8736_2^4$ ε Sag. (eryth)

A. Poor focus.

Feb. 7, 1899.

√ $X8735_2^4$ ε Scorp. (eryth)

K

√ $X8734_2^4$ β Gruis (eryth)

Mb. Excellent of red end

√ $X8749_2^3$ θ Eridani

Too poor

$X8766_2^3$ ξ^2 Sag.

√ K

√ ξ, ? A? very thin image.

√ $X8762_2^3$ τ4 Erid
Mb. Too thin

√ $X8761_2^4$ φ Erid.
B$\overset{2}{8}$A
Lines broad

√ $X8760_2^3$ γ Phoen
Ma

Feb. 7, 1899.

✓ X 8767 $_2^4$ κ Phoen.

κ Phoen. on the edge. Lines broad.
K line not at all

✓ α Phoen. K. Lines beautifully sharp. Light continuous. Excellent image

✓ X 8768 $_2^3$ δ Phoen
Thin. G8K?

✓ X 8778 $_2^4$ α Phoen
K

✓ X 8777 $_2^4$ c^2 Ag.
K

✓ X 8775 $_2^4$ α Indi.
K, Poor

✓ X 8770 $_2^3$ α Horolog.
K. Too thin

✓ - X 8769 $_2^4$ α Erid.

B5A. Lines broad
4481 appears fainter than in the typical star.

Feb. 7, 1899

✓ X 8795 $_2^4$ α Columbae

B5A. with 4481 almost as intense as 4471
Hβ consists of a tiny central bright thread superposed on a wide dark band.
Other hyd. lines dark.
All lines wide

The brightness at Hβ is no greater than the cont. spectrum so that Hβ merely looks double

✓ X 8794 ^{3} s Erid
A or A2 F. poor

✓ X 8793 $_2^4$ κ Phoen

K = Hδ = 0.8 H.
Lines broad.

Feb. 7. 1899.

✓ X 8792 $_4$ ℓ Arae
The dark^2 band on which the bright Hβ is superposed is distinct especially on the side of shorter wave-length and seems on this side to be divided by a bright streak.
Hγ consists of 2, possibly 3, bright lines.

✓ X 8789$_2^3$ κ Phoen.
Too poor.

✓ X 8788$_2^3$ θ Pis. Aust.
A.? very poor

✓ X 8787$_2^4$ ι Pis. Aust.
A3F. Lines somewhat broad

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✓ X 8890$_2^3$ ε Col.
Sp. K

✓ X 8889$_2^3$ d Erid.
K5M

✓ X 8888$_2^3$ g Erid.
Sp. G8K or K

✓ X 8879$_2^4$ θ Erid.
A2F. Lines very hazy
Solar lines faint. May be due to the close companion.
Comp. with another plate

A.G.C. 355 α Phoen. ✓ X 8878$_2^3$ ~~A.G.C. 351 Phoenicis~~
K. Too dense

Feb. 8, 1899.

√ X 8875,^{4} α Columbae

Hβ bright is a central line superposed on a wide dark band.

Other hyd. lines dark, single.
No triple effect noted in hyd. lines

Orion lines broad. B5A.

√ X 8874,^{4} τ4 Erid.

Mb.

√ X 8873,^{4} α Hydri.

F or F5G.
Lines broad.

√ X 8868,^{3} A.G.C. 633
Too poor. Of 1st type, burned out

ξ Phoen. Poor, peculiar

√ X 8867,^{4} s Erid.

A broad lines

Feb. 8, 1899.

X 8863,^{4} Erythrosin

√ ζ Cap.
√ γ Phoen.
√ ν Ceti

Very poor of all. Only a small portion of red end seen, and lines are all so blurred that they would be no use in identifying

√ X 8862,^{3} ζ Sculptoris
very poor. B3A?

Too poor to subdivide with certainty

√ X 8861,^{3} η Gruis

K? very poor.

X 8860,^{3} μ Gruis

√ μ^1 G?

√ μ^2 K?

Feb. 8, 1899

✓ X8859,^{3} ω Cap

K5M. or Ma.

✓ X8855,^{3} π Phoen.

K. Poor.

X8854,^{3} c^3 Aquarii

✓ (1) K c^3 Aquarii

(2) G. too poor. Sp. all burned
✓ out except for a tiny edge. c^2 Aquarii

✓ X8845,^{4} η Cap

A3F.? very poor.

✓ X8844,^{3} c Sag.

Mb. Thin image.

✓ X8843,^{3} κ Pav.
Focus extremely poor
Looks like F8G.

Feb. 8, 1899

✓ X8842,^{3} η Sculp.

Too dense. M?

X8840,^{3} A.G.C. 26384.

Too poor. Several narrow first type spectra on plates of which only the hyd. lines are seen

X8837,^{3} ι Retic.
Too poor.
✓ Three stars δ, γ + ι on plate

✓ X8835,^{3} s Eridani
A. The K line is very faint on this plate.

✓ X8834,^{3} A.G.C. 633

F. Pec.

✓ Other star Sp A.

Feb. 8. 1899.

X 8830,^{2} A.G.C. 49 — Ceti.

Sp. A. Too poor.

✓ X 8829,^{3} A.G.C. 633 ξ Phoenicis

F Pec.

✓ Other star has Sp. A.

X 8826,^{3} A.G.C. ~~226~~ 26384 — Sagittarii.

Too poor.

✓ X 8825,^{3} s Erid.

Extremely poor focus.

K not distinctly seen, Compare with earlier plates.

✓ X 8824^{3} A.G.C. 633

F Pec.

✓ Other star has Sp. A

Feb. 8. 1899.

✓ X 8823,^{4} A.G.C. 24839+

Too poor. Taken to find out whether Hβ is bright. Hβ not seen Ask for more.

η Sag. ✓ Good image Mb(2). No break in light at the G band.

A.G.C. 24888+

" 25020+ ✓ 4471 & 4481 only are distinctly seen except the hydrogen lines.

" 25037+ ✓ K.

Q X 8819,^{3} A.G.C. 22945 — mag 8½

Too poor. Omit.

ξ Lupi ✓ X 8818,^{3} A.G.C. 21586 + 21587 ξ + — Lupi

— Lupi.

A? Lines very broad.

Double star.

ξ Lupi ✓ X 8812,^{3} A.G.C. 21586 + 21587.

— Lupi Lines broad. Look up.

✓ X 8809,$^{3}_{2}$ θ Pis. Aust.

A? very poor.

Lines broad.

X 8827,^{3} A.G.C. 24839

✓ Too poor Hβ not well seen

η Sag. ✓ Mb.

Feb. 8, 1899.

√ X 8995 $_2^3$ π Puppis Eryth.

Poor image

√ ν¹ + ν² also on plate.
F line bright in

√ X 8994 $_2^3$ ζ Puppis

Line in red seen, belonging to
new hydrogen series.

√ X 8990 $_2^4$ δ Volantis

F8G, poor focus.

X 8983 $_2^4$ L² Puppis

√ L² Hγ & Hδ bright. Hγ = (1.2) Hδ
Hβ bright? Hβ ~~is~~ seems to be a very narrow bright
line. This may possibly be a bright space.
Breaks at λ4764 & 4952 seen

√ L¹ - Too thin

Feb. 8, 1899.

X 8979 $_2^4$ α Pis. Aust. & β Gruis.

√ α Pis. Aust.
Lines moderately well defined.

√ β Gruis, Mb.

√ X 8978 $_2^3$ A.G.C. 7731
G8K δ Columbae

√ X 8977 $_2^3$ ε Col.

K.

X 8976 $_2^4$

√ υ₂ Eridani
G8K or K

√ υ₁ Too thin image

√ X 8973 $_2^3$ σ Puppis
Image too thin

√ X 8969 $_2^3$ β Volantis
Thin image
K or K2M

Feb. 8, 1899

√ X8968 $_2^4$ π Puppis

K5M, G band separated.

√ υ^1 Puppis Hβ & Hγ bright. B3A.

√ υ^2 = B3A

√ A.G.C. 9276 = B3A.

X8964 $_2^5$ α Pis. Aust. & β Gruis

√ α Pis. Aust.
Some lines appear well-defined and others hazy.

√ X8956 $_2^4$ λ Vel. Erythrosin

K5M.

√ X8955 $_2^5$ η Canis Majoris, Erythrosin

Lines very sharp.
Like β Orionis

Feb. 8, 1899

√ X8948 $_2^5$ δ Canis Majoris

Erythrosin plate.

√ X8947 $_2^4$ α Hydri
F

Erythrosin plate

√ X8946 $_2^4$ α Lucanae

Erythrosin plate

√ X8945 $_2^4$ θ Eridani Eryth.

Lines very wide.

√ X8944 $_2^4$ α Hydri Eryth

F. Lines broad.

√ X8943 $_2^4$ β Hydri Eryth.
G

√ X8940 $_2^5$ ε Canis Majoris Erythrosin
Excellent plate.
B1A. Lines very sharp.

Feb. 8, 1899.

✓ X 8939$_2^4$ α Col. Eyth.

Hβ bright. B5A. No lines seen beyond Hβ in red.

✓ X 8936$_2^4$ β Col. Eyth.

K

✓ X 8935$_2^4$ β Leporis Eyth.

G

X 8932$_2^4$ π Puppis

✓ K5 M.

✓ υ^1 Hβ + Hγ br.

Many of other bright lines or spaces. These are the same as seen in μ Cent. especially the two at λ 4232 and 4584 approx.

✓ υ^2 B3A.

9276 ✓ B3A.

✓ X 8937$_2^5$ α Carinae Eyth.

~~Little of~~

Good of lines in red near Hβ

Feb. 8, 1899.

✓ X 8930$_2^4$ β Phoenic Eyth.

Sp. K.

Line near 4227 on side of shorter λ is nearly as intense as 4227. Is this sp in α Bootis?

✓ X 8929$_2^5$ α Pis Aust.

K line in this sp. always looks hazy on side of greater λ.

✓ X 8926$_2^4$ α Erid.

Compare lines in red with those in η Canis Maj; 8955

✓ X 8925$_2^4$ α Phoen.

K

X 8996$_2^5$ ~~α~~ β Carinae Eyth.

A.

✓ X 8997$_2^5$ α Crucis

Measure for lines in red.

Feb. 8, 1899.

√ X 9000,$_{2}^{3}$ π Puppis

Too poor.

o Puppis Hβ bright.

Feb. 11. 1899

√ X 9240,$_{2}^{5}$ α Indi.

G5K.

X 8827,^{3} A.G.C. 24839.
very poor.

√ η Sag. on plate.
√Mb.

X 8841,^{3} δ Phoenicis,
B3A? very poor.

√ X 8856,^{3} η Sculptoris
Mb.

√ X 8726,$_{2}^{3}$ α Scorpii
Ma, poor.

Feb. 11. 1899.

✓ $X48727_{2}^{4}$ α Scorpii
Ma

Hβ strong for class Ma

Hγ also strong

Hε & K not seen.

✓ $X48728_{2}^{3}$ α Scorpii Eryth.

Spectrum seen as far as D line.

✓ $X48729_{2}^{4}$ α Scorpii Eryth.

The best plate I have seen of lines in the red. D beautiffully double

✓ $X48730_{2}^{4}$ α Pavonis.

Lines in red not well seen but two, 4925 & 5023(?) are visible.

✓ $X48731_{2}^{3}$ α Gruis

Poor.
No lines seen beyond Hβ in red

Feb. 11. 1899.

✓ $X48732_{2}^{3}$ α Centauri

There is a dark line of ~~longer~~ greater λ than D as compared X 48729 α Scorpii

✓ $X48774_{2}^{3}$ δ Pav.

G5K

✓ $X48733_{2}^{4}$ α Triang. Aust.

Red end resembles α Scorpii closely.

✓ $X48776_{2}^{4}$ α Tucanae

K2 or 5M.

✓ $X48759_{2}^{3}$ ζ Tucanae

very thin. F8G or G.

✓ $X48737_{2}^{4}$ β Gruis

Edges of ~~bright~~ ~~bands~~ breaks remarkably ~~&~~ bright 4 distinct breaks seen and then three near together in the red, Space of longer λ than each bright edge of the break is very dark.

Feb. 11. 1899.

✓ X8744 $_2^3$ δ Sag. Eryth.

Poor

✓ X8746 $_2^3$ β Arae & γ Arae

Erythrosin plate

✓ γ Arae. Lines very broad. No lines seen of greater λ than Hβ.

✓ β Arae. Lines well defined especially at red end.

✓ X8747 $_2^4$ β Hydri.

Lines broad evidently poor focus.

✓ X8745 $_2^3$ γ Gruis.

Image ft. Lines very broad.

Feb. 15, 1899

✓ X6385 $_2^{34}$ A. G. C. 10534. (Excellent plate)

Lines widely separated. I do not remember a one prism plate of any spectroscopic binary which shows the lines so widely separated and so sharply defined.

Br. component is toward the red.

Lines seen double are

Hβ
4471
4387
Hγ
4144
4120
Hδ
4026
40~~2~~09
Hε
Hζ

The difference in intensity seems less marked in the lines 4387 and 4026. that is these two ~~st~~ lines appear to be almost as intense in the fainter comp. than in the brighter.

✓

A. G. C. 10566 } Completely superposed. Lines seen double
" 10568 } are.

4471
4387
Hγ
4144
Hδ
4026
4009 [illegible] very broad

Feb. 15, 1899.

Feb. 16, 1899

B 13462 + B 13433 looked up for D. M. $-21°$ 4864

The spectrum is well shown.
$H\beta$ appears like a thin bright line.
The band 4633 is intensely bright.
$H\gamma$ & $H\eta$ are dark & well-defined.
$H\varepsilon$ appears to consist of a wide bright band shifted twr. end of longer wave-length, and the dark on edge of shorter wave-length.
$H\zeta$ has like appearance as $H\varepsilon$.
4471 is bright,
and there is a slight brightness bet. 4471 and 4633.

Feb. 17, 1899

√ X 9143 $_{2}^{4}$ π Scorpii.

Sp. B2A. Lines a little broad

√ X 9142 $_{2}^{4}$ κ Lupi

B9A. Lines broad.

√ X 9141 $_{2}^{4}$ η Centauri

Hβ is sharp, dark and single, though there appears to be an indistinct, hazy, line on that side of shorter wave-length. The edges of the distinct dark Hβ are slightly bright. The helium line 4925 is very broad. Hγ is quite well-defined but the Orion and the other hydrogen lines are broad.

Feb. 18. 1899.

√ X 9140 $_{2}^{4}$ γ Arae

Lines very broad, while they are well-defined in β Arae
No doubling is, however, seen in the lines of γ Arae

√ β Arae = K or K2 M. Good image but H & K lines are not seen
The image is strong twr. red end.

X 9139 $_{2}^{5}$ μ2 Scorpii.

√ μ1 = Lines single, but a little broad.
Sp. B3A.

√ μ2 = ~~B3A. with 4649 & 4641 seen.~~
B2A

X 9138 $_{2}^{5}$ β Lupi

√ B2A. Lines single and fairly well-defined

√ κ Cent. seen from 4481 - violet end.
B3A.
K is fainter than 3925. decidedly

Feb. 18. 1899.

S.M.P. 4858 ✓ X 9133^{3} A.G.C. 19406 in Centaurus
Probably like α Aurigae, but may be like G5 K. Image is so poor that Hβ is not distinctly seen, though at G band and at end of shorter wave length, the image resembles that of α Aurigae

ι Muscae + ✓ X 9132^{3} A.G.C. 18192 ι Muscae
S.M.P. 4522 K ~~or K2 M.~~

X 9131, 4 A.G.C. 18202 m Centauri
S.M.P. 4521 + ✓ (1) Like α Aurigae - G.
A.G.C. 18232 + ✓ (2) " α Canis Minoris. F5 G
" 18311 (3) May resemble δ Normae. Omit.

+

S.M.P. 7573 ✓ X 9130,^{3} A.G.C. 30709
ν Tucanae
Mb

Feb. 18. 1899

S.M.P. 6202 ✓ X 9129, 4 A.G.C 24169.
in Scorpius +

~~No lines seen except those of hydrogen.~~ 4481 + 4026 hazy and faint. Spectrum probably B9A.

ζ Apodis + ✓ X 9128,^{3} A.G.C. 23378.
S.M.P. 5980
Very poor. K probably may be K5M

S.M.P. 5464 ✓ + X 9127,^{3} A.G.C.
in Lupus G5 K

S.M.P. 4798 ✓ + X 9125,^{3} A.G.C. 19179.
in Centaurus ✓ Sp. K. like α Bootis

S.M.P. 4317 + ✓ X 9124,^{4} ~~A.G.C. 17390,4~~ A.G.C. 17390.
in Crux
B3A Lines very hazy, double

Feb. 18, 1899.

S.M.P. 3933 ✓ X 9123,^{3} A.G.C. 15986
in Hydra + K5M. good image, class defined without a doubt.

S.M.P. 2544 + e¹ Carinae X 9121 ^{3} ~~Z.C. 2722~~.
" 2543 e² (4.76) " Two stars superposed. violet end of
~~in~~ Carinae first-type overlaps over the violet end
of the second type. Hγ of e¹ comes near λ4471 of
e², but a little towards violet, at about wave-length 4461.
e¹ + ✓ 1st type is probably B3A. Lines 4144 & 4120
not well seen. 4471 & 4387 are same as in B3A.
e² + ✓ 2nd type is probably K.

S.M.P. 4724 + ✓ X 9120,^{3} A.G.C. 18920
in Centaurus
Sp. K. like α Boötis.

Feb. 18, 1899.

✓ X 9119,^{4} A.G.C. 17540 λ Crucis

Probably B3A. Image too dense
Star already included from plates of β Crucis.

S.M.P. 6979 ✓ X 9118,^{4} A.G.C. 27330 in Pavo
+
Mb.

A.G.C. 27237 + Other star on plate is Sp. A. poor
or S.M.P. 6954 ✓ focus.

S.M.P. 6572 X 9117,^{3} A.G.C. 25500
in Pavo
✓ 1. A2F or A3F. poor focus.
S.M.P. 6594 ✓ 2. A3F. " "
θ Pav.
" 6566 ✓ 3. K " "

X 9116,^{4} A.G.C. 23206 in Scorpius.
The best plate so far seen of these additional stars.
η Scorpii (1) F. Image too dense
A.G.C. 23206 + ✓ (2) G5K. Excellent, sharp spectrum
S.M.P. 5924

Feb. 18, 1899.

√ X 49115, 3 A.G.C. 20654. ε Circini

Sp. K. like δ Sag.

√ X 49114, 3 A.G.C. 17989.

η Muscae 1st type, lines burned out.

A.G.C. 18135 √2. B 3 A.

" 17843 √3 Mb a

+ √ X 49113, 3 A.G.C. 17366 ι Crucis

Sp. K. like α Bootis.

X 49112, 3 A.G.C. 15571. in Centaurus.

or S.M.P. 3794

A.G.C. 15619 + √ 1. Sp. K, like α Bootis

" 15571 + √ 2. K 5 M.

or S.M.P. 3785

X 49111, 3 A.G.C. 25928. S.M.P. 6661

√ very poor

ε Cor. Aust. + √1. K = H. Hyd. lines strong. solar lines barely seen

A.G.C. 25886 + 2. B 3 A?

S.M.P. 6653

Feb. 18, 1899.

⊥ √ X 49110, 3 A.G.C. 24321

S.M.P. 6264 very poor

in Scorpius K 2 M or K 5 M.

S.M.P. 5898 √ X 49109, 3 A.G.C. 23098

κ Scorpii

Too poor. 1st type.

S.M.P. 5486 + √ X 49108, 4 A.G.C. 21694 ι¹ Normae

A 2 or 3 F.

" 5516 √ A? Poor focus.

ι₂ Normae

X 49107, 3 A.G.C. 19406.

S.M.P. 4858 √ Probably like α Aurigae. very poor focus

in Centaurus

X 49106, 3 A.G.C. 17977. in Centaurus.

+ √

A.G.C. 17936 1. Too dense.

or S.M.P. 4463

A.G.C. 17977 √ 2. F5 G. or F8 G.

or S.M.P. 4467 +

Feb. 18, 1899

S. M. P. 4157 ✓ X9105, 3 A. G. C. 16793.
F Centauri
Ma

2 Carinae ✓ X9104, 3 A. G. C. 15222
S. M. P. 3662
+
K.
Others too poor

✓ X9102, 4i ~~A. G. C. 12635~~. b & n Velorum

1. This spectrum appears to resemble those of Class F5G peculiar, like ι Scorpii. The focus is poor and the lines are not clearly defined as in ι Scorpii.
This is b Velorum

2. A2F. Very poor.
This is n Velorum

Plates 9102 and 9103 were numbered wrong.

~~S. M. P. 2303~~ ~~in Vela~~ ✓ X9103, 3 A. G. C. 12635 or S. M. P. 2849 ~~A. G. C. 10861~~. Not A. G. C. 10861
S. M. P. 2849
~~B3A~~.

For discussion of this plate, see Bk VII, p.

Feb. 18, 1899

S. M. P. 6276 ✓ X9100, 3 A. G. C. 24348
in Scorpius
Too poor.
K5M or Ma

X9099, 3 A. G. C. 23448.
Not in S. M. P. limit.
Too poor. 2nd type star

✓ X9098, 3 A. G. C. 21710 η Normae
very narrow
Sp. K.

S. M. P. 4897 ✓ X9097, 3 A. G. C. 19597
in Lupus Too poor. 1st type

X9096, 4 A. G. C. 17936

S. M. P. 4453 ✓ 1. Hyd. lines & either 4471 or 4481 visible.
+
in Centaurus

S. M. P. 4467 ✓ 2. F8G.

Feb. 18. 1899.

✓ + A.G.C. 12180 S.M.P. 2707 49093,^{4} A Velorum

Probably B3A. poor focus, lines 4144 & 4120 not well seen.

✓ + S.M.P. 2277 49092 ^{3} A.G.C. 10769 in Vela

2nd type only a small portion of the spectrum visible exposure too short. Two bright bands I & II stand out, and nothing else is clearly seen.

May be K or K5M, probably the latter.

The only plate.

A.G.C. 9845 S.M.P. 1996 + 49091,^{3} l Carinae

✓ 1. K5M,

✓ + A.G.C. 9697 S.M.P. 1961 2 G5K

" 9954 3. B8A? Omit.

Feb. 20 1899

49089,^{3} e Lupi

✓ + 1. B3A.

A.G.C. 20670 + ✓ 2. B5A.

S.M.P. 4422 + ✓ 49088,^{3} f Centauri

B5A, focus poor, may possibly be B8A, but the focus is so poor at region of 4481 that the intensity of this line can not be fully determined

S.M.P. 3990 in Musca. 49087,^{3} A.G.C. 16162

Too poor only a small portion of the spectrum of longer λ than the band G is seen. Focus so poor that nothing can be determined about the intensities of the lines.

S.M.P. 3369 in Carina 49086,^{3} A.G.C. 14295

Too poor. May be F or F5G or F8G.

Feb. 20. 1899.

S.M.P. 2729 + ✓ X 9085 $_{1}^{3}$ ω Velorum.

F8G. Fair spectrum.

7^h 53.7 $-30°4'$ ✓ X 9084 $_{1}^{3}$ S.M.P. 2171 + in Puppis

A$\overset{2}{\S}$F$\S$ Solar lines not well seen. Probably as good a photograph as could ordinarily be obtained

✓ X 9151 $_{2}^{4}$ δ Arae.

B8A. Lines very broad. 4481, 4471, 4026 only are distinctly seen except the hydrogen lines. 4144, 4128-31 are faint, also 4009.

✓ X 9150 $_{2}^{3}$ υ Librae

K2M

Feb. 20. 1899.

✓ X 9149 $_{2}^{4}$ α Circini - good sharp plate

Lines bet. Hβ & Hγ are of peculiar intensities.

✓ X 9147 $_{2}^{4}$ ζ Capricorni

G peculiar

Other star is G5K.

✓ X 9146 $_{2}^{4}$ ε Pavonis

A.
Line K is as intense as in Sirius. 4481 is well-marked, but other solar lines are very faint and indistinct.

✓ X 9148 $_{2}^{5}$ ~~B2A.~~ ε Centauri

B2A.
Classed as B, A, look up plates.

Feb. 20. 1899.

√ X 9145$_2^4$ α Telescopii

B3A.

√ δ^2 = B8A
√ δ^1 = B5A.

S.M.P. 5625 + √ X 9090$_1^3$ ζ Triang. Aust.

F8G. fair plate.

√ X 9144$_2^4$ α Arae.

Hβ bright superposed on dark band, and appears where a dark thread superposed on itself.
Hγ is broad, dark and hazy, with two well separated bright lines superposed on it.
The other hydrogen lines are dark.
The Orion lines are broad, and are of class B3A or B5A.

Feb. 23. 1899

Measures of unknown line in spectrum of δ, ε, and ζ Orionis, which is near wave-length 5410.

X 8119 ε and δ Orionis, superposed on
X 8113 α Orionis and X8109 α ~~Ori~~ Aurigae
The unknown line is more intense in δ than in ε Orionis. It falls between the solar lines 5410.0 and 5415.4 in α Aurigae and α Orionis, in which λ5410.0 is well-marked but λ 5415.4 is a faint. ~~line~~

Let a = dist. bet. lines 5410.0 and 5415.4
" x = " of unknown line from 5410.0 towards 5415.4

X8119 superposed on X8113	for δ Orionis	x = 0.4 a
	" ε "	x = 0.1 a line ft. obs. difficult.
X8115 ζ Orionis superposed on X8113	" ζ Orionis	x = 0.8 a ~~x = 0~~
X8115 on X8109 α Aurigae	" " "	x = 0.5 a
X8119 on X 8109	" δ "	x = 0.~~3~~5 a
	" ε "	x = 0.3 a

Feb. 23. 1899.

Measures of unknown line in ε, δ, & ζ Orionis continued.

X 8119 superposed on X 8114 α Carinae

for δ Orionis

x = 0 or the unknown line appears to coincide with line 5410.0, in α Carinae

for ε Orionis

x = 0.5 a

The unknown line, though fainter in ε Orionis than in δ Orionis, is sharper.

X 8115 superposed on X 8114 α Carinae

for ζ Orionis

x = 0

δ { x = 0.4
x = 0.5
x = 0.0

ε { x = 0.1
x = 0.3
x = 0.5

ζ { x = 0.8
x = 0.5
x = 0.0

9) 3.1
0.34

5415.4
5410.0
5.4
.3
1.62
5410.0
5411.6 = wave-length of unknown line.

Feb. 24. 1899

47966 β Orionis

Identification of lines and comp. with Tables VII in ~~Aol~~ Miss Maury's volume.

	H_2	Int. two hazy	
	3782.0	not seen	
	H θ	20?	
	3819.2	8	
A η		20	
	3854.2	4	
	3856.2	7	
	3863.2	6	
	3867.6	2	Not in Table VII λ found by superposing on ζ Or.
	3872.7	2	
A ζ		25	
	3912.2 ?	?	ft. line, iden. uncertain
	3918.7	2	
	3920.6	2	
	3926.8	2.5	
K	3933.8	10	
	?	0.5 (ft. line)	λ approx. 3938
	3964.6	3	
H	3968.6	8	
H_ϵ	3970.2	20	
	3994.9	2	
	4009.5	3	

Feb. 24. 1899.

β Orionis (cont.)

		Int.	
	4026.4	5	other ft. lines of slightly gr. λ. than 4067. (4075.9.)
Hδ	4067.0	20	
	41~~44~~20	3	
	4128	4	
	4131	4	
	4144	3	

Feb. 24. 1899.

A.G.C. 8991 C 11731,^{3}

very poor. Hβ appears dark.

" 8991 C 11656,^{4}

Hβ consists of a fine bright line and appears to have a hazy dark band on side of greater λ.
This confirms the bright Hβ first observed on X 6232. See note on cover.

" 8991 C 11722 ^{3}

Star on edge of plate.
Hβ not distinctly seen, but may be slightly bright

H.P. 1368 C 11586, Nov. 21. 1898.

Hβ dark.

" 1368 C 11560^3 Nov. 11. 1898.

Hβ dark^2, well-marked

" 1368 C 11180^2 Apr. 21. 1898.

Too poor. Hβ dark.

Feb. 24. 1899

H.P. 1368 C 11165$^{-}_{2}$ Apr. 9. 1898.

Too poor.

" 1368 C 11635^{-},^{4} Dec. 8. 1898.

Hβ dark.

" " C 11715^{-},^{3} Jan. 11. 1899.

Star on edge of plate. Hβ not distinctly seen.

Feb. 24. 1899.

List of stars sent to Peru to be photographed of mag. 5.0 or brighter.

S. M. P.	Plates taken	
142	1	Not seen
146	1	Not arrived
216	1	" "
220	1	" "
337	1	" "
369	1	" "
1066	1	" "
1214	0	
1293	0	
1310	0	
1388	"	
1416	"	
1583	"	
1649	"	
1685	"	
1775	"	
1943	"	
1996	1	Satisfactory
2171	1	Satisfactory
2277	1	Not satisfactory
2303	1	Satisfactory
2313	0	
2321	0	

Feb. 24, 1899

Cont. of preceding list

S. M. P.	No. Plates	
2415	0	
2433	0	
2536	1	Not satisfactory
2543	0	
2707	1	Not satisfactory
2729	1	Satisfactory
2849	0	
3308		Not all on plates. Should be added to list.
3369	~~0~~ 2	
3428	2	Satisfactory
3662	2	Not satisfactory
3785	2	Satisfactory
3933	1	"
3990	2	"
4069	2	"
4157	2	"
4310	2	"
4317	2	"
4365	1	"
4422	1	Not satisfactory
4453	2	" "
4467	1	Satisfactory
4470	1	Not satisfactory
4480	1	" "
4521	1	S
4522	1	S
4724	2	S

Feb. 24, 1899.

Cont. of preceding list

S. M. P.	No. Plates		
4798	2	S	
4858	3	S	
5170	2	S	
5188	2	S	
5282	2	? N	~~Look x9126~~ L=2
5464	2	S	
5486	2	N ?	
5625	1	S	
5898	2	?	Look up x9324
5924	2	S	
5980	1	N	
6019	1	N	
6093	1		9325 ?
6124	1		9322 ?
6202	1	N	
6264	1	N	
6276	3	S	
6572	3	? S	~~x9117?~~
6661	4	S	
6857	2	N	
6979	2	S	
7009	3	? S N	~~x9101?~~ L. 2. 9337 not come
7168	3	N	9344 not here
7573	2	S	
7910	2	S	

Feb. 24, 1899.

Measurements of unknown line in δ, ε, & ζ Orionis
Preliminary.

In α Aurigae
Hβ to λ 5406.0 = ~~51.6~~ 52.6
Hβ to λ 5410.0 = 5$\overset{2}{7}$.9

In δ Orionis
Hβ to unknown line = 52.3

In ε Orionis
Hβ to unknown line = 52.2

In ζ Orionis
Hβ to unknown line = 52.2.

Feb. 24, 1899

Measures of unknown line in δ, ε, & ζ Orionis as compared with measures of known lines in α Aurigae, α Orionis and α Carinae

	Scale D1339 Hβ to 5406.0	Hβ to 5410.0	Hβ to unknown line	
In α Aurigae X8109	52.4	52.8		
" " Orionis 8113	52.5	52.8		
" " Carinae 8114	52.4	52.8		
	52.4	52.8		
In ε Orionis 8119			52.8 lower edge	52.4 upper
" δ " "			53.0 lower edge	52.4 upper edge
" ζ " 8115			$\overset{5}{\cancel{3}}$3.1 " "	52.3 " "
			52.8	The line is better defined on the lower edge.
			53.0	
			53.1	
			53.0	52.4

∴ 0.4 scale measure = 4.0 ~~wave-length~~ the (ten-millionth mm.

The line is $\frac{53.0 \; 52.\cancel{4}^{8}}{0.2}$ scale-reading towards red than line 5410.0
At this point in spectrum, a diff. of 4.0 in λ makes a diff. of 0.4 in this measure hence a difference of 0.2 = 2.0 in λ and for the lower edge of the line, we have the wave-length 5412.0
Like-wise for the upper edge, we have wave-length 5406.0

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