

1862phas.prj...203H

KG
11365
203

H. 49

Equatorial.

Dec. 6 1862 - April 9th 1863.

af

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KG-11365.203



KG 11365.203



Teronia (72)

1862 Dec 6th
1865Teronia s.f. star a Temp. by Th. in Chron. 35th 11
Chro. 236 [29.6 slow of Eb]

a	1	12	54.8	58.0	
(72)		16	7.2	10.4	+3 12.40 +0.42

Angle 172° 50' by meridian

a	1	16	46.5	51.6	
(72)		22	1.5	4.6	+3 13.00 +0.23

Angle 171° 8'

a	1	23	40.4	44.3	
(72)					

Reduce comp. with a to Chro. time

129.16 H.M. in a +1.92 +0.4

a	1	27	27.1	31.3	
(72)		30	40.4	44.4	+3 12.20 -0.05
					+3 13.07

Teronia ref star b.

b	1	32	31.0	34.7	
---	---	----	------	------	--

M	1	47	8	26.705
				534

Star - place

Merid	-4	21.7
	-	1.4

1855.0	0	949.2	+1	20' 30"
171		+21.50		+2 20.3

b	1	35	27.8	31.5	
---	---	----	------	------	--

Dist	129.16	-4	23.6
	246	10	

0	10	10.7	+1	22 50.
		+4.25		+27.5

(72)		37	49.6	53.8	
------	--	----	------	------	--

129	26	Elb. Time
17	0	50

-	3	63.07	-4	23.6
---	---	-------	----	------

b	1	39	1.0	5.3	
---	---	----	-----	-----	--

8	28	26
-	1	23

0	13	28.02	+1	18 53.9
---	----	-------	----	---------

(72)		41	23.4	27.7	
------	--	----	------	------	--

8	27	13	Caust. int.
---	----	----	-------------

a	1	43	45	
---	---	----	----	--

71.740

(72)		47	8	
------	--	----	---	--

45.035

Clouded up suddenly

Star a = 0 949.2 + 1° 20' 5" for 1855.0 (observed at Bonn)
 ~ b 10 35.3 1 13.7

The destination from above is rather uncertain. Teronia was exceedingly faint and the seeing was bad, besides full moon.

6. 20.11

(72) - Washington 8^h h m s + 1^m 33.05
 0 17 30 + 0.8
 + 4

For several weeks past weather almost constantly
 cloudy.

Orion

1863 Jan 9th

As usual definition very bad -

θ^2 seems rather brighter than θ^1 Orionis

Orion Nebula

1863 Jan 17thQuite clear $\text{Ther} + 10^{\circ}$ v. bad definition

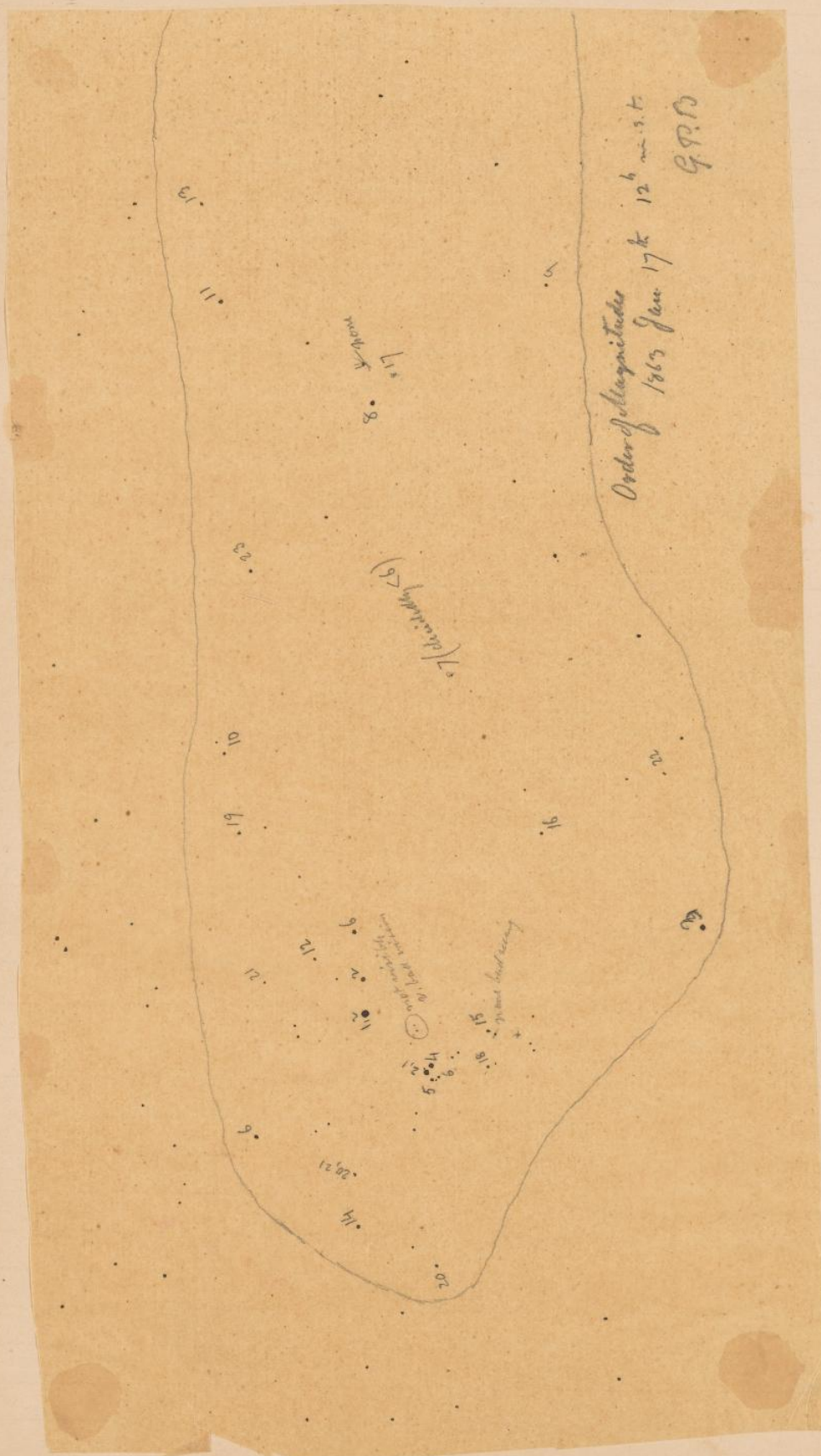
Compared magnitudes of stars on the area [marked in red on Chart A engraved observed March 19 1862] as indicated on the tracing next page - worked from 11^h to 12^h 30^m -

There were but few changes noticed from the order of Mar. 19 1862 There were as follows -

In the notation Mar 19 1862 (15) seems too faint decidedly - and (9) too bright while (24) [mar 13] is too faint - It is brighter than 21

The present order of brightness is as on the tracing - The atmosphere being very much disturbed not a star was visible in the bright part of the nebula excepting the Trapezium - The influence of bad definition seems far greater on a small star involved in nebulosity than on one in open space - as is natural

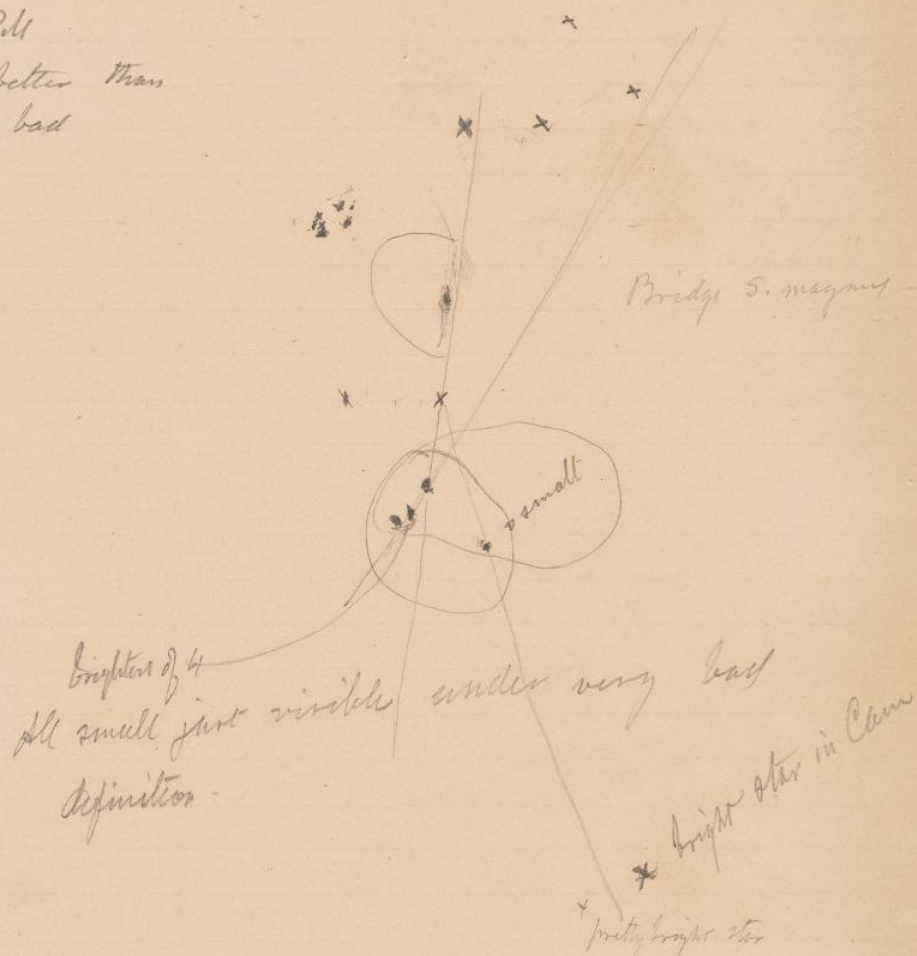
G.P.B.



Orion

Jan 18 1863 12 PM

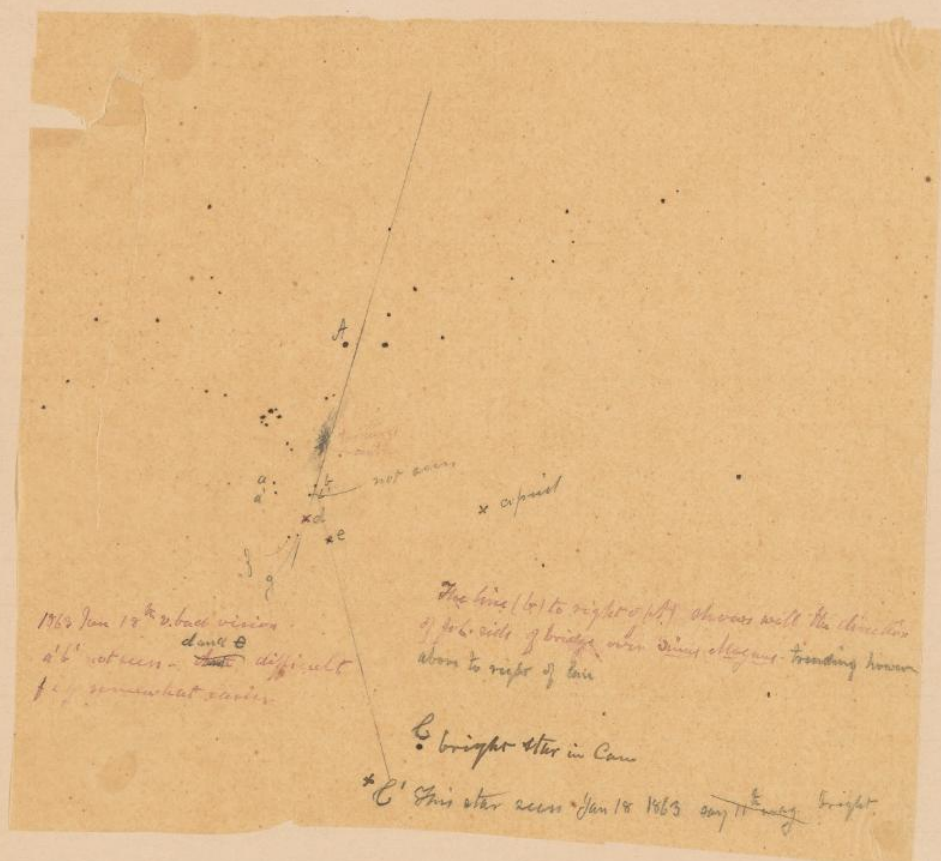
Vision a very little better than
on 17th but still exceedingly bad



$H^2 > H^1$ (So also in March 1864)

Of notation Jan 17th the order 14, 15 & 10 19, 20, 21, 20 20
is same as on 17th

Orion

Jan 18 1863. 12^h to 12^h 30^m PM

Bridge over Sirius Magnum easily seen with brightening up in the
middle.

Orion

1863 Jan 19th

Order of brightness

10 12 14 as on 17th

22, 21 < 21 or =

See next page.

Chart on pre page was copied from Herschel's
stars not in my engraved chart marked with circle - then
compared with heavens - respectable definition
G. P. B.

Orion

1869 Jan 19th

Looked carefully for all the small stars near the Trapezium but could see only those marked 1 to 11 - all distinct although the sky was not clear nor the definition satisfactory 6th star of ϵ distinct however

I notice that the 5th star of ϵ is almost midway between two lower stars, apparently in greater RA than it used to be.

The bright ridge (in parallel,) in Sinus Magnae was distinct. Dir. gbridge is accurate

Lapele's Valette position of (5) is altogether wrong taking either of his stars - his 1847 Lithograph is good & has the 6 star -

Orion - Jan 19th 1863

Numbers in pencil give order of brightness
 1 & 2 easily seen. 7, 8, 9, 10 rather
 difficult. No signs of 'h' star. 10 = 11 nearly



Orion

7"7" 2u below1869 Jan. 23rd

Mem. Following stars to be compared -

1) The group about $\alpha''' \wedge 0'''$ to see if all are correct2) " above $\alpha''' \wedge 0'''$ Agree with Chart ^{after correcting γ_2'''} ~~corrected March 26 1862~~There is another γ faint star3) Two new stars inserted near γ''' on Chart 1862 March 26 to be compared with γ''' which is well determined. This group lies between

$$\begin{array}{rcl}
 + 26' 00'' & \wedge & + 31' 00'' \\
 \text{Dist. } 1 \ 00 & \wedge & 4 \ 00
 \end{array}
 \begin{array}{l}
 \text{Comp. with } \gamma''' \\
 * 13^{\text{th}} \text{ } R = \gamma''' - 12.5 \\
 * 14 \text{ " } = \gamma''' + 2.5
 \end{array}
 \begin{array}{l}
 \text{Dist. } = \gamma''' - 1' 12'' \\
 \text{" } = \gamma''' - 1 \ 26
 \end{array}$$

4) $\beta_1'' \wedge \beta_2''$ to be examined { Group sufficiently exact but β_2'' (18th mag) not made out }5) Find place of a star n.f. z'' of chart on next page

(No such star found)

Of the two stars s.f. z'' the dist 2' 30" the prec is 11-12th the fol 9/10
Dist = 25" [perhaps variable in magnitude]

2 March 26 1862

Spid from diagrams & Dr. 1863 Jan 23 the following results

Star 12 th	-1' 26"	Dr. 4' 50
13	-0 25	4 13
13	-0 11	4 12

By projection from diagrams
For star near $0'''$
(Mag 18th = $0'''$) $R + 2' 56''$ Dr. 8' 12"The two stars s.f. z'' are 7"7" & 8"9" - Note mag. 7 7 7"

Orion

1863 Jan 23

θ^m

L^m

But $\approx 1''$
in $\approx 1/2''$

$\cdot R''$

$18 \cdot \beta''$ $16 \cdot \beta''$
 $18 \cdot \beta''$ $16 \cdot \beta''$

$\cdot R''$

don't well enough

This group to be examined
no star

follows the star

don't may
another
 $12 \frac{1}{2}''$

Orion

1863 Jan 23 (continued)

12 P.M. Clear but vision too much disturbed for small stars

The little star δ quite easily seen - Much brighter than σ which was difficult. Its distance from bright star of Trapezium, M' , is perhaps a little larger than the longest diagonal of the Trapezium. and its direction points half way between the apex of the bright nebula and the star R'' . This is precisely (to within limits of δ say $\pm 1''$) in the computed place as in annexed diagram

Order of brightness as on chart below

Orion

1863 Jan. 25thClear & Calm $\text{Ther. } \pm 34^\circ$ 10 to 11 P.M.Although promising well the atmosphere not good - 6th star however seen without difficulty.Examined groups $+6'$ Dec $16'$ & found as on Engr. Chart A cor.
rected. $h'h$, not seen. ρ requiring correction in on diagram
 ρ corrects R Dec $7''7''$ is $2/3$ mag. brighter than M''' but less than E''' With regard to any change
of magnitude of $7''7''$ it is to be considered that the mag. scale of obs. in 1857-58 seems to
give too high numbers. [22 Jan 58]Order of magnitudes carefully marked on Chart No 24 (Eng. & Dred)
Forms 1 to 10 the numbers may be relied upon as well determined but the smaller
stars 11 & 12 especially those in bright nebulous regions were affected by the
deterioration of atmospheres - which was getting tumultuous. The star in dark
opening $\frac{1}{2}$ barely discernible Moon in 1st quarter. As difficult tonight as σ , ξ or π
these had no good definition this season as yet.Star g'' in $-12^\circ 00'$ $\delta. 18^\circ 13'$ is faint 17th mag. as in orig. obs.
& in 1862. cannot explain how it came to be marked 13thThe dark streaks from the vicinity of R'' towards L'' are very remarkable -
Region about H'' has strong appearance of resolution. $2u?$ In ξ & π is not π 1" south of ξ & γ'' following as by obs. 1858 March 10To look for resolution in region $\frac{1}{2}$ field s. to Trapezium & s. of north of $7''7''$
" Near η'' Look for star $14''$ $R - 3' 52.5''$ Dec $+20' 24''$ seen 1862 Mar 19 15th / Feb 22 1859 13/14See whether R is not brighter than $2u$ - in 1857 it was a magnitude fainter. In 1858 $R = A$ $R < M$
Correct direction of pair of faint stars in $+0' 30''$ $\delta = 27'$ 3' prec. & a little S of br. x of Cam.The stars O' , C'' , and E'' deserve attention as to changes of magnitude.Examine stars near $+11'$ Dec 38'To see whether r'' to r_4 paper S. of A , as on our chart or north of d as in Herschel (South decidedly)Star Z $R 21' 33''$ Dec $36' 56''$ suspected variable in mag. 12th in 1857 / 9th in 1862Compared in 1862 with $N. M. 13$ & D - was $< M$.To measure ξ & D $R'' - 0' 37'' \delta 3' 4''$ variable? 15th in 1862 $1\frac{1}{2}$ in 1869 $12''$ in 1858

Orion

1863 Jan. 30thAt 2^h 23 Sid 236 ϕ visible28 ρ " = corner triangle γ_1'' & γ_4'' 34 σ easy though faint

• - visible easy
at 2^h 20
2^h 28
transpare?

Fine definition in strong twilight - with however ϕ in 2nd quarter near a thin clouds gathering - 236 = 2^h. 20^m

Was impressed with fact that before any of the nebulosity came in sight the star β (+1^h 13^m Dec 19^h 39^m) was already distinct at 2^h 20^m & must be far brighter than β'' , which came in sight at 2^h 28^m at the same time with ρ - and γ (1^h 22^m 19^h 36^m) - $\phi < \beta$ but ϕ was seen at 2^h 25^m (236)
 γ_1'' & γ_4'' at 2^h 30^m At 2^h 34^m σ was easy to discern.

ψ ξ & π were also seen although the haze & moonlight were detrimental
At no time could the star ϵ_2 be discerned

No sign of ω μ ν ζ χ ν looked for but not seen. Though the sky was full of light & moon-milkiness moon-misty

It is remarkable how much more important tranquillity of the atmosphere is, than its clearness, or the darkness of the sky, for exhibiting the small stars.

As thin clouds passed over the field & the stars grew fainter I noted the following order of magnitudes

γ same as ϵ_2 evidently brighter than ϵ_1 say $3/10$ of a magnitude

μ & ϵ_1 decidedly next to ϵ_2

β'' & β brighter than ρ ($1/2$ mag) [in Catalogue $\rho = 7/8$ β'' & $\beta = 8^{1/2}$]
 $\rho' > \epsilon''$

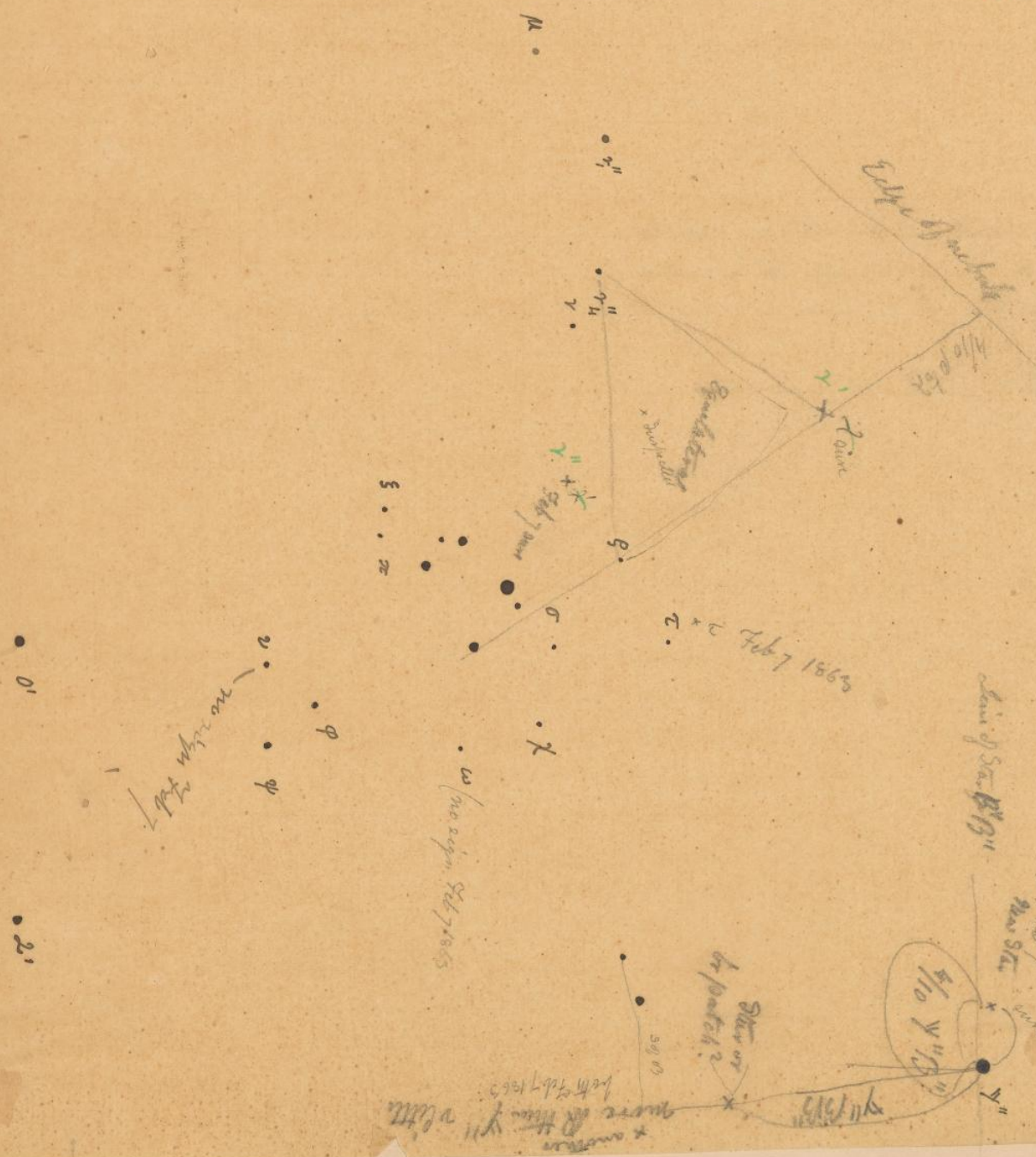
ϵ'' brighter than ζ' of Tropicum

ζ'' perhaps a little $> \zeta'$ (near ϕ')

G.P.B.

• 2"

1863 Feb 7



Orion

1863 Jan 31st8^h to 9^h d = N. most star of Trapezium.

Nearly clear
pretty good definition

Bright Moonlight - filling
slightly hazy sky with light - get most
of the small stars in the bright
nebulae are easily seen.

G.P.B.

These micrometric observations projected
on Chart 20 gives for the position of
 φ relative to θ' 2 in Dec point 20' 50" θ' .

 φ $12 + 0' 22".3$ Dec 20' 38".0

Agreeing with previous observations
(See also April 16 1864)

Appended Thr. 28"

 φ From d of Trapezium

120° 50'

118 40

120 20

119 57

Zero 81 55

38 02

Ang. pos. 51 58

Appended hour-

angle from
0^h 50 E to

0 10 W

Appended Thr. +28"

 φ From 0'

185° 50' - 180°

185 30

186 15

185 52

Zero 81 55

103 57

166 03

Ang. pos. =

Dij. Dec . Comp with θ'

57.08

60 92

38.4

77

Dij. Dec φ θ' 37.63Comp. with d

63 16

60 92

2 24

45

Dij. Dec φ d 21.95

Orion

1863 Jan 31st (continued)
 9^h Comp. of magnitudes

$$\beta > \gamma_2''$$

$$\phi > \epsilon$$

$$\gamma_4'' > \rho \text{ a little}$$

$$\sigma = \xi + \pi$$

$$\beta > \epsilon$$

$$\phi > \gamma_2''$$

$$\gamma_1'' > \epsilon$$

$$\rho = \gamma$$

$$\gamma_2'' < \gamma_1''$$

a very little

a very faint star several times suspected
 under pretty good definition
 This was the Feb 7



+ not seen

= bright

+ faint



At 9 to 10 compared order of magnitude on Chart No 26
 Stars of equal difficulty to see steadily in the brighter nebulae
 when viewed attentively are far more intense in light
 than those equally conspicuous but situated in a dark
 ground

Nebula in Andromeda

1863 Jan 31st
 G. P. B. obs.
 2145 ver

Ther 236 2' 29"
 2 32
 2 33

Diameter in direction of axis 0' 30" (not certain time)

2 43 33 Diameter in direction of axis 1' 40"

Clouded up preventing further observations

	Re 1850.0	Dec 1850.0
Andr.	0° 44' 33"	+40° 16'
Nebula	0 34 24	40 26
Dij.	7 9	10

Orion

The subjoined are points of interest to be attended to

U. Struve's remarks on changes of magnitude of the stars

Star (2)5 $\Delta\alpha$ 7".3 $\Delta\delta$ - 27".6 (To measure this) done = p

β 74	H 88	12 ^{1/2}	Struve, Deal	} To be compared for magnitude
γ_1	51	12-13		
ϕ	75	12-13		
γ_2	57	13		

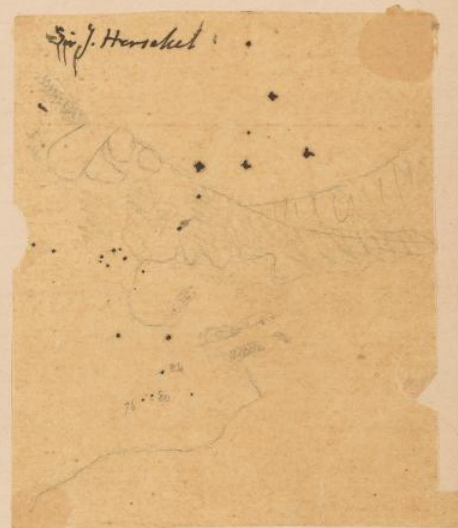
(2)5 > 51 2 (2) < 88 a little
1857 March 20 > 88

5 Afterwards disappeared same as p
(According to Struve)

No 75 < 57

Laplace, star No 20 for which Struve gives the position $\Delta\alpha = +320".1$ $\Delta\delta = -184".0$
Variable? Little 0 next to E" G"

		Herschel's position	
		R - B,	Dec - $\theta' + 20'$
γ_1	H 51	-1' 40".5	19' 49".2
γ_2	57	-1' 9.0	19' 58.1
α ϕ	75	+0' 22.5	20' 42.1
β 74	88	+1' 13.5	19' 36.9
p = (2)5			



Orion

1863 Feb. 2

Full Moon Dist. 35° Clear. Definition not good
 Chart No. 27. has order of brightness

$R > M$ certain

	M	5.00	} Explained
Dist 19' in R fold M.	Star 9^{th}	6.40	
	11^{th} follows 9^{th} 5^{th}	7.42	

At times the small stars of the bright region clearly seen but only for a moment. It is remarkable how much more their visibility is affected by atmospheric disturbance than is that of others less bright situated in dark regions

Thus frequently every star will disappear in the bright triangle - excepting ~~five of the best~~ or - those of the trapezium but the moment the ~~visibility~~ becomes tranquil ~~they are~~ $\beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, \pi, \rho, \sigma, \tau, \upsilon, \phi, \chi, \psi, \omega$ will come in right distinctly. Three or four of the brightest are then far more intense than others stars constantly in sight in other quarters.

Found the star R not very different from M though a little brighter - It would be possible however to rank R after M without committing an improbable error of estimate

On first viewing the nebula at $5^{\text{h}} 50^{\text{m}}$ I found $C''C''$ far brighter than O' and even brighter than D' but later in the evening I was less positive that $C''C''$ was brighter, decidedly, than D' (near D') I suspect one of them of varying

There seems no doubt that $I''I''$ carefully observed Jan 17th 1862 has changed relatively to $C''C''$ with which it was carefully compared - then $I''I''$ was then certainly brighter than $C''C''$

Mar 17 1862 $I''I''$ was fainter than $C''C''$
 Feb 12 1858 $I''I''$ by careful estimate $I''I'' < P''$ nearly equal whereas on Jan 17 1863 it was far brighter Again Feb 12 1858 $I''I'' < C''C''$
 Feb 15 1863 $I''I'' < O''C''$

Orion

1863 Feb 7 7^h30 PM to 11^h

Finest possible definition

36^h after rapid fall of Bar. 2 1/2 days after it was at (30.928 to 30°)

Mars Zero 82° 22'

Assumed hour angle 0^h 15^m E

" Thr 32°

Zero Mars

60.99

61.00

40^p & t,

58.25

58.13

58.19

Zero 61.00

2 82

56

27.64

63.79

63.84

63.82

61.00

28.2 = 27.64

4 x 40^p & t,

67.09

55.34

2/ 11.75

2/ 5.875

2.937

59

28.78

This result by bringing star
midway between wires not
very good. given
1/2 wt.

28.78

55.28

55.28

139.34

27.87

Dij. De. p to t,

Line t, to p is directed to
a point 10^h fol. Rⁿ
carefully taken.

3^h 1^m is barely visible - Outline of Nebulosity prec. tr. just visible - unaided eyeOrder of Brightness at 236. 3^h 13^m
 $\beta \ \varphi \ \gamma_1 \ \rho \ \gamma_2 \ \psi \ \chi \ \pi \ \xi \ \sigma$
 γ
At 9^h PM order of brightness
 $\sigma \ \mu \ \tau \ \underline{\chi} \ \chi' \ \chi''$

r and v could not be seen.

2 & χ'' are new stars.3 & 7 the double star n p ψ'' pointing to tr.

Orion

New Stars & Nebula

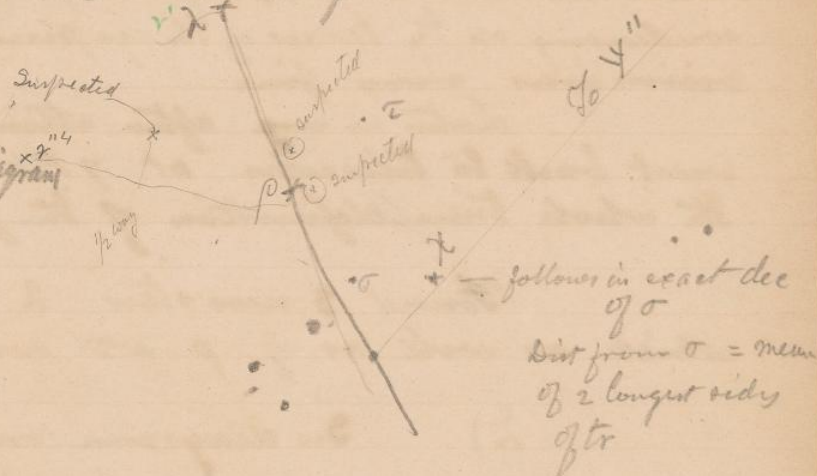
1863 Feb 7

τ certainly seen its dist. from ρ is a v. little ($1''$)
 less than dist. of Congest side of trap. ex. and line
 $\rho\tau$ makes an angle of 100° with $\rho\sigma$
 See tracing after Jan 30

New star & line from ρ as in diagram

is dist $\frac{6}{10}$ ρ to edge of nebula
 in that direction

Dist from ρ = its dist of ρ from
 furthest star of tr.



$2\frac{1}{2}$ fields for the bright stars 5^m & 3^m is a field without the
 slightest trace of a star under superb definition. not
 a trace on the meridian field $12'$ & much
 of the neighbourhood has but two or three stars. The area
 destitute of stars (contiguous) is probably at least 2 fields.
 No nebulosity in same area.

Is in H. $\frac{3}{4}$
 New Neb. 8 fields proc E' & F' & same dec - Diam
 $40''$ diam faint star or appendage on n.f. side
 Plane of nebula

H. Orion					
1863.0	5^h	28^m	33^s	-85°	$20' 59''$
4a	{	-6	6	43	0 0
$\frac{1}{2}(E+F)$		-0	30		+2 30
α	5	21	57	δ	-5 26 29

7.75 0.8893

5.2921 0.0020

0.8913

1.6721

366" = 2.5634 = $6^m 6^s$

More exactly measured in Aug 1863

Orion

1863 Feb 7 cont

Have rarely if ever before known such fine definition to continue uninterrupted for so long an interval. First viewed the nebula in strong twilight but was annoyed by moisture condensing on the lenses of the eyepiece which seldom happens. But vision was very fine.

Later in evg. after attempt at a zone had failed went back to telescope at 7 P.M. & stared till 11. during the whole time definition of the first quality.

Found 3 new stars λ , λ' and ω' the places of which as well as of ρ & τ were nicely determined.

λ) See diagram on tracing opposite Jan 20th

Line $\lambda\rho$ intersects fol. star of tr. $\rho\lambda = \frac{6}{10}$ ρ to edge of nebula
 $\rho\lambda = \rho(\text{d of tr.})$ - ~~in a quadrilateral~~ $\rho\lambda$ & r_4 form an equilateral triangle.

λ was seen distinctly & with perfect certainty - it may be a little more difficult than τ but it is easier than χ which is not easy to keep steadily in view.

τ) The position of τ should be as corrected - The angle $\tau\rho\sigma > 90^\circ = 100^\circ$. Line $\tau\rho$ is nearer horizontal than line θ_1 to prec. bright star of tr. Distance $\tau\rho$ is right and a v. little (1") less than the long side of trapez.

χ) is precisely in line of σ and is 1" prec. line γ'' to star fol. of tr. $\chi\sigma = \text{mean of two longest sides of tr.}$

σ) dist. from $\theta_1 < \theta_1$ to prec. bright ~~just perceptibly~~ star of tr. It also certainly precedes by a v. little the line of these stars. see prec. page

ν & ω (k star) Both frequently sought for but could not be seen. also the small star near π & ξ on W.C.B. chart.

λ') is difficult to discern from the bright nebulosity about it $\lambda'\rho$ passes a v. little on of γ'' $\lambda'\rho = \text{long side of tr.}$

Orion

1863 Feb. 7. cont.

w) Precedes γ " by $4/10$ (γ " to β " β "") and is 1" south of γ "
 clearly & certainly seen. as bright as π or ϵ brighter
 than σ

Two other stars or concentrations of neb. apparently
 stars however were seen. One in NE of γ " or 1" to 2"
 job. The other as in diagram of Jan 20
 1st was Dist from γ " by (γ ", β " β "")

Looked long between ρ & τ for one or two other
 stars which came & went fitfully without allowing the
 plans to be fixed. suspected at dots within
 circles.

Another between ρ and τ_4 a little
 S. of the line

(1) $\times \tau$

$\times \rho$

In the field following dec in Dec of L''' - bringing L''' to prec. edge
 of field are 50 stars large & small. - All this region
 a thence to $H''H''$ & between N''' & γ " is strewed thick with
 very small stars which could be kept steadily in view. There
 are hundreds & probably thousands visible not on charts.

North prec. T' are great quantities of stars - Evidently
 the map of stars is in line of NE of θ' - But notice that the fields following
 T' has many v. small stars.

The large starless areas, 2 or 3 fields following S''' are remarkable
 in contrast. I several times found fields destitute of the
 minutest star under the finest observation.

After Moon rose worked on revision of star chart

Clouded suddenly cirrus.

Orion

1863 Feb. 10 8 to 10 PM

No 25

Compared chart of engraved & containing all corrections
& additions known at date. all verified two new stars entered

 $13^{\text{h}} -25^{\circ} 45'.3 \quad \delta: 9^{\circ} 26'.7$
 $13^{\text{h}} 31' 45''.7 \quad \delta 28^{\circ} 57''.4$

Definition sufficient for purpose.

ϵ plainly seen when no star from of the bright neb. about
Trapezium could be seen from confusion with neb.

$\epsilon'' > C''C''$ also $> 2'$ and $> P''$ All without any room for doubt

10 PM Through finder as well as eye. ϵ'' is very decidedly $> C''C''$ about $\frac{1}{2}$ mag.

although $C''C''$ is $> 2'$ & P'' somewhat

 $Z < M$
 $\gamma = 8/9$
 Z is 12 or 11-12

R may be a little $> M$.

ρ was seen by glimpses

τ_4 excessively faint +6 30 37 50

|| N.B. That since Jan 17 the mag. of $\gamma''\gamma''$ relatively to $C''C''$, $2'$, P'' etc have been
noted with especial care - suspecting variability

Orion - Variable Star

1863 Feb. 12

The change of mag. of β'' first noticed Jan. 17th has led to the following collection of Or.

1857 Dec 4 Zone 49

 $\beta'' = 12^{\text{th}} = D', \beta'' < C'(14), \gamma'(14), \eta'(11), \gamma'(11-12)$

Zone 50

 $\beta'' = 12 = D' < \gamma'(11)$

Zone 51

 $\beta'' = 12 < D'(11-12), < \gamma'(11, 12) < \eta''(11) < \gamma'(11) < \gamma'(11, 12) < E''E'' = \eta' = 10$

Zone 52

 $\beta'' = 12 = \gamma' < D', \beta''(11-12) < C', C', \gamma'(11) \quad (9) \beta'' > \eta''(9-10), \eta'(10), E''E''(10)$

1857 Dec 7

Zone 59

 $\beta'' = 11 = C', C', C'' > A''A''(12), \beta''(12), D''(12-13)$

Dec 7

Zone 69

 $\beta'' = 11-12 > H''H''(12-13), > A''A'', K''K''(13) < R''(10-11)$

Zone 70

 $\beta'' = 12 > H''H''(12-13) > A''A'', K''K''(13) < R''(10-11)$

1857 Dec 10

Zone 71

 $\beta'' = 12 < N''N''(11-12), > D''O''(12), > H''H''(13-12) > A''A''(13) < R''(10)$

Zone 72

 $\beta'' = 12 = \gamma''\gamma'', O''O'', > P''P''(12-13) < M''(11), N''(10-11), R''(10)$

Zone 73

 $\beta'' = 12 = \gamma''\gamma'' = O''O'' = (R''?) > P''P''(12-13) < L''L''(10) < N''(10) < M''(10-11)$

Zone 74

 $\beta'' = 12 = \gamma''\gamma'', O''O'' (R''?) > P''P''(12-13) < M''(10-11) < L''L'', N''(10)$ Change of Mag M''

1858 Feb. 12

 β'' nearly = $C''C''$, $C''C'' > \beta''$ $\beta'' < P''$ nearly equal $\beta'' > P''P''$ $P''P'' = H''H''$ $O''O'' < C''C''$ $L''L'' = E''E''$ Change of Mag $\gamma''\gamma''$ and $O''O''$ [Feb 12 to Mar 4][$H''H''(13)$]

1858 Mar 4

 $\beta'' = M''M'', N''N'', O''O''(11-12) - < C''C''(11), \gamma''\gamma''(10, 11) > P''P''(12-13), A''A''(13)$ No. A change between Feb. 12 and Mar 4 in [$\beta'' = H''H''$ Feb 12] and [$\beta'' = 13$ $H''H''$ Mar 4]

1858 Mar 10

 $\gamma''\gamma'' > C''C''$ - Fully 11th mag.Change Mag $M''M'', N''N''$ Mar 4 1858 Mar 17/62

1861 Mar 20 F.H.S. obs for mag.

 $\beta'' = 10^{\text{th}}$ $H''H'' = 10^{\text{th}}/11^{\text{th}}$ $P'' = 9/10$ faint

1862 Mar 17

 $\beta'' < L'$ which is next brightest: $< P'', N''N'', O''O'', \gamma', \beta'' \rightarrow M''M'', U', E'$

order of br.

 $C''C'' > \gamma'$ Change between [$\gamma' < \gamma'$ Dec 4 1857] and [$\gamma' > L'$ Mar 27 1862] [$L' > \gamma'$ 1860 Feb. 2]

Orion Variable Star

1863 Feb 12

Reductions

1 grade = 0.12

1863 Jan 17

 $\overset{9}{\underset{10}{g''g''}} < \overset{7}{\underset{9}{\gamma''}}, \overset{2}{\underset{8}{L''L''}}, \overset{1}{\underset{7}{\eta''}}$
 $\overset{9}{\underset{10}{g''g''}} > \overset{11}{\underset{11}{N''N''}}, \overset{12}{\underset{12}{C''C''}}, \overset{13}{\underset{13}{O''O''}}, \overset{14}{\underset{14}{P''}}, \overset{15}{\underset{15}{L''}}, \overset{16}{\underset{16}{u''}}$
 $\overset{20-21}{\underset{21}{L''}} > \overset{21}{\underset{21}{A''A''}}$

Jan 18

 $\overset{9}{\underset{10}{g''g''}} \text{ --- } >$
 $\overset{14}{\underset{14}{P''}} \overset{15}{\underset{15}{L''}}$

,,

1863 Jan 25

(certain) $\overset{7}{\underset{9-10}{\gamma''\gamma''}} > \overset{11}{\underset{11}{M''}}$ but $< \overset{13}{\underset{13}{E''}} > \overset{14}{\underset{14}{S''S''}}$ Change of Mag $\overset{7}{\underset{9-10}{\gamma''\gamma''}}$ rel. to $\overset{11}{\underset{11}{M''}}$ in 1857-58

 $\overset{9}{\underset{10}{g''g''}} < \overset{11}{\underset{11}{M''}}$
 $\overset{9}{\underset{10}{g''g''}} < \overset{7}{\underset{9-10}{\gamma''\gamma''}}, \overset{9}{\underset{10}{g''g''}} > \overset{11}{\underset{11}{M''}}$
 $\overset{9}{\underset{10}{g''g''}} = \overset{11}{\underset{11}{C''C''}}, \overset{12}{\underset{12}{\gamma''}}$
 $\overset{9}{\underset{10}{g''g''}} > \overset{11}{\underset{11}{M''}}$

Order of mag.

 $\overset{9}{\underset{10}{g''g''}} < \overset{2}{\underset{2}{L''}}, \overset{7}{\underset{9-10}{\gamma''\gamma''}}$
 $\overset{9}{\underset{10}{g''g''}} = \overset{11}{\underset{11}{C''C''}}, \overset{12}{\underset{12}{\gamma''}}$
 $\overset{9}{\underset{10}{g''g''}} > \overset{11}{\underset{11}{M''}}, \overset{12}{\underset{12}{P''}}, \overset{13}{\underset{13}{I''}}, \overset{14}{\underset{14}{u''}}, \overset{15}{\underset{15}{O''}}, \overset{16}{\underset{16}{K''}}$

1863 Jan 30

 $\overset{11}{\underset{11}{C''C''}}$ perhaps a little $> \overset{2}{\underset{2}{L''}}$
 $[\text{Jan 25 } \overset{11}{\underset{11}{C''C''}} < \overset{2}{\underset{2}{L''}}] [\text{1862 Mar 17 } \overset{11}{\underset{11}{C''C''}} > \overset{2}{\underset{2}{L''}}]$

1863 Jan 31

 $\overset{9}{\underset{10}{g''g''}} = \overset{0}{\underset{0}{O''}} < \overset{2}{\underset{2}{L''}}, \overset{10}{\underset{10}{P''}}, \overset{8}{\underset{8}{\gamma''}}, \overset{9}{\underset{9}{\gamma''\gamma''}}, \overset{11}{\underset{11}{C''C''}}, \overset{12}{\underset{12}{L''L''}}, \overset{13}{\underset{13}{\eta''}}, \overset{14}{\underset{14}{R''}}, \overset{15}{\underset{15}{N''}} - \overset{16}{\underset{16}{g''g''}} > \overset{17}{\underset{17}{E''}}, \overset{18}{\underset{18}{M''}}, \overset{19}{\underset{19}{D''}}, \overset{20}{\underset{20}{K''}}$

Order of mag.

 $\overset{9-10}{\underset{9-10}{g''g''}}$
 $\overset{9-10}{\underset{9-10}{g''g''}}$
 $\overset{8}{\underset{8}{\gamma''}}$
 $\overset{9}{\underset{9}{\gamma''}}$
 $\overset{9}{\underset{9}{\gamma''}}$
 $\overset{8-9}{\underset{8-9}{\gamma''\gamma''}}$
 $\overset{8}{\underset{8}{\gamma''}}$
 $\overset{7}{\underset{7}{\gamma''}}$
 $\overset{6}{\underset{6}{\gamma''}}$
 $\overset{6}{\underset{6}{\gamma''}}$
 $\overset{6-7}{\underset{6-7}{\gamma''}}$
 $\overset{10}{\underset{10}{g''g''}}$
 $\overset{10}{\underset{10}{g''g''}}$
 $\overset{10}{\underset{10}{g''g''}}$
 $\overset{11}{\underset{11}{g''g''}}$
Change of Mag. [$\overset{11}{\underset{11}{R''}}, \overset{12}{\underset{12}{\eta''}}, \overset{13}{\underset{13}{L''L''}}$]

1863 Feb 2

 $\overset{11}{\underset{11}{C''C''}} > \overset{2}{\underset{2}{L''}}$ a little much $> \overset{0}{\underset{0}{O''}}$
 $\overset{9}{\underset{19}{g''g''}} < \overset{10}{\underset{18}{P''}}, \overset{11}{\underset{18}{C''}}, \overset{12}{\underset{17}{F''}}, \overset{13}{\underset{17}{M''}}, \overset{14}{\underset{16}{L''}}, \overset{15}{\underset{15}{C''C''}}, \overset{16}{\underset{14}{\gamma''\gamma''}}$
 $\overset{9}{\underset{19}{g''g''}} > \overset{0}{\underset{20}{O''}}$ (nearly equal) $\overset{21}{\underset{21}{E''}}, \overset{22}{\underset{23}{u''}}, \overset{23}{\underset{22}{I''}}, \overset{24}{\underset{23}{E''}}, \overset{25}{\underset{23}{H''H''}}$

Order of mag.

 $\overset{23}{\underset{23}{H''H''}}$
 $\overset{24}{\underset{24}{C''C''}}$
 $\overset{24}{\underset{24}{D''D''}}$
 $\overset{24}{\underset{24}{K''}}$

1863 Feb 10

 $\overset{9}{\underset{1}{g''g''}} > \overset{11}{\underset{2}{C''C''}}, \overset{12}{\underset{3}{L''}}, \overset{13}{\underset{4}{P''}}$
 $\overset{9}{\underset{1}{g''g''}}$ much $> \overset{11}{\underset{2}{C''C''}}$ by $\frac{1}{2}$ mag.

Orion Variable Stars - Reductions

From comp. with D' we have $\gamma\gamma'' < D'$ by $0.25''$

but by comp. Jan 20 1858 $D' = \epsilon' = 0'$ mean of several results hence

wt=1 1857 Dec 4. (computed) $\gamma\gamma'' < 0'$ by $0.25''$ $\gamma\gamma'' < \gamma'$ by $1.00''$ $\gamma\gamma'' < 2'$ by $1.25''$

wt=1 Dec 7 " $\gamma\gamma'' > P''$ nearly = $C''C''$ mag $\gamma\gamma'' = 11-12$

wt=1 Dec 10 " $\gamma\gamma'' = \gamma''\gamma''$, $0''0''$ (12) $< M''$ by $1.50''$

wt=4 1858 Feb 12 Observed $\gamma\gamma'' < C''C''$ by 0.10 mag. $\gamma\gamma'' < P''$ by 0.25 mag.

1858 Mar 4 " $\gamma\gamma'' < C''C''$ by $0.50''$ $\gamma\gamma'' < \gamma''\gamma''$ by 1.00 mag.

1862 Mar 17 " $\gamma\gamma'' < 2'$ by $0.10''$ $\gamma\gamma'' < C''C''$ by $1.00''$ $< P''$ by $0.25''$ $< M''$ by $0.50''$

1863 Jan 17 " $\gamma\gamma'' > 2'$ by $1.00''$ $\gamma\gamma'' > C''C''$ by $0.25''$ $> P''$ by $0.75''$

" 18 " $> 2'$ " $1.00''$ " $> P''$ " $0.75''$

" 25 " $< 2'$ " $0.25''$ " = $C''C''$ $> P''$ " $0.25''$ $> 0'$ $1.00''$

" 31 " $< 2'$ " $0.25''$ " $< C''C''$ $0.25''$ $< P''$ $0.10''$ = $0'$ $0.00''$
 $> M''$ $0.25''$

1863 Feb 2 " $< 2'$ $0.75''$ $< C''C''$ $1.00''$ $< P''$ $0.25''$ $> 0'$ by $0.25''$
 $< \gamma''\gamma''$ $1.25''$ $< M''$ $0.50''$
 $< \gamma'$ $0.50''$

" 10 " $> 2'$ $0.50''$ $> C''C''$ $0.25''$ $> P''$ $0.75''$

$\gamma\gamma'$

While observing clouded suddenly & saw the stars went out
 $2' = C''C''$ exactly $P'' < 2'$ $0.1''$ $\gamma''\gamma'' \pm \gamma''\gamma'' = 0'$ but

See 15th

Orion Mag. of Stars Reduction

Dif. of mag. Ist - star

	I st - 0'	7'	2'	M'''	7''7''	C''C''	P''	M'''M'
1857 Dec 4	-0.2	-1.2	-1.2	---	---	---	---	---
7	---	---	---	---	---	-0.2	+0.2	---
10	---	---	---	-1.5	0.0	---	---	---
1858 Feb 12	---	---	---	---	---	-0.1	-0.2	---
Mar 4	---	---	---	---	-1.0	-0.5	---	0.0
1862 Mar 17	---	---	-0.1	---	---	-0.6	-0.2	+0.1
1863 Jan 17	+0.60	0.0	+0.6	+0.2	0.2	+0.2	+0.5	---
25	+0.6	0.0	-0.2	+0.2	-0.2	0.0	+0.3	---
31	0.0	-0.1	-0.2	+0.1	-0.2	-0.2	-0.1	---
Feb 2	+0.1	-0.4	-0.7	-0.5	-1.2	-1.0	-0.3	---
10	---	---	+0.7	---	---	+0.5	+0.9	---
13	---	---	---	-0.5	---	---	-0.5	---

Bright Jan 17 - Feb 10 2 periods?

1863 Feb 13 Period 12? days Max predicted Feb. 21 Min Feb. 15

Crown - Variable Stars

1863 Feb. 13

Not As I have

Changes suspected with more or less probability in the following stars

[Computed]

G^gG^g (certain)

$F''F''$ comp. with M'''

7"7" > M^{III} 0.2^{0.2} 1862

1862

confirmed

" < " 1.5 1858

1858

6" 6"

10

P¹¹

$$C^m C^n = P^n$$

1858

$C''C'' > P''$ 0.1 to 0.7 1863 Jan 31, Feb 2

9 1 4 0 2

16-12

Doubtful that C"O" has changed rel. to P" - The latter is commonly $0.3 < C''C''$

$$0.3^{on} < c''c''$$

G'' comp. with E'' (doubtful)

$g'' > E''$ 1.^m 1858

1450

$\gamma'' \rightarrow E''$ 0.1 1863

1812

$G''G'' = H''H''$ in 1858

15"

$7' 2', 4'$ pretty certain

Perhaps $2'$ is the variable

44

$\gamma' < 2' < 7' > H''$ in 1858 nearly equal

14' 72' by 0.7 Jan 17th 1863

$2' \nabla P'' \quad 0.5 \quad " \quad 25 \quad "$

" 87P" 0.1 " 31 "

" $\frac{1}{4}$ " γP " 0.3 Feb 2 "

" $\angle P''$ 0.3 June 17 "

Handwritten musical notation on a five-line staff, featuring a treble clef, a key signature of one sharp (F#), and a 3/4 time signature. The notation includes a series of notes and rests, with a prominent 'P' and a double bar line visible.

M^m and Nⁿ 1858 Mar 4

$M''M'' < N''N''$ by 1.0 1862.

$R'' W' L'' L''$

Star Magnitudes

Note written March 16 1863

For notation see Eg. Book 1857-

// In the comparisons made subsequent to Feb. 13

0.1 , 0.2 ----- signify

1st) 0.1 = A perceptible gradation of light - as small as will constitute a difference of magnitudes certainly recognisable

0.2 = A strongly marked difference of magnitudes, which strikes the eye at once without special effort of attention

The higher numbers 0.3 , 0.4 indicate still larger differences but beyond 0.3 or perhaps even beyond 0.2 I have little confidence in the numbers. The distinction between 0.0 0.1 0.2 I think are to be depended on

Two stars differing by 0.2 I should regard as separated by an amount larger than any ordinary error of observation would account for. That is if the stars were between the 9th mag & the 12th and compared directly with each other.

Two stars really equal might - though rarely - be called thought to differ 0.1 = 1 grade

In the course of observations I soon became sensible of an inconsistency between my estimate of 1 grade and the 0.1 (one tenth mag.) with which notation I began recording the 1 grade.

But when the difference of compared stars exceeded 3 grades I found myself resorting to my previously formed habit of distinguishing 'magnitudes' as in my zones

Thus where the differences are stated as 0.1 0.2 0.3 I think they may be safely treated as quantities pretty clearly defined and consistent - above these not much reliance can be placed on them as to consistency of scale.

After some practice - say about March 1st - by 2 grades I should have designated the difference between my zone 11th & 12th mag. as $\frac{11}{12} = 1$ grade

In 1864 notation by grades was used not magnitudes

Orion Twilight Comp. for magnitude

1863 Feb 13

224 =

At 20 3 35

Bad definition

Comparison in twilight for magnitude

$$2'' = C''C'' + 0.1$$

 $2'' < P''$ decidedly - by 0.4

$$\text{Again } 2'' = C''C'' + 0.0$$

 $'' < O'$

0.2

certain

Twilight diminished $C''C''$ was bright when $2''$ could barely be seen

 $O' < P''$ sure

 $P'' < C''C''$ by 0.3

 M''' is 9, 10th

3 42

 $M''' > 7''7''$ by 1.0 mag

[M''' has certainly increased]
since

 $M''' < P''$ by 0.2

 $M''' = P''$
 $M''' = 7'$
 $M''' > 9''9''$ by 0.7

 $M''' > D'$ by 1.5

 $M''' < E'''$ by 0.5

[See Jan 23]

 $7''7''$ has greatly diminished

 $< O'$ by 1 mag.

 $7''7'' < 9''9''$ by 0.4

 $7''7''$ but little $> H''H''$
 $7''7'' > H''H''$ by 0.2

$9''9''$ is not to be compared with $C''C''$ when twilight was stronger later they were more nearly equal

$$E' = 9''9'' + 0.1$$

$$E' < O' \text{ by } 0.1$$

$$H''H'' < O' \text{ } 0.2$$

[In Finder $C''C'' > P'' + 0.2$ v. little]

$$424 \text{ } 4^h 6^m \quad 2' > C''C'' \text{ } 0.2$$

$$2' > A''A'' \text{ by } 0.1 \text{ mag}$$

$$9'' > E'' \text{ } 0.1$$

$$9''9'' < H''H'' \text{ by } 0.3 \text{ mag.}$$

$$D' > E' \text{ by } 0.3$$

$$K'' < D' \text{ by } 0.5$$

$$K'' < E' \text{ by } 1.0$$

 W' 8th at 4^h 41 of 424

 $W' > E''E''$ by 0.4 evidently brighter in finder

$$W' < 2''2'' \text{ by } 0.1$$

$$W' = F'$$

$$M''M'' < A''A'' \text{ by } 0.5$$

$$M''M'' < O''O'' \text{ by } 0.3$$

$$M''M'' > O''O'' \text{ } 0.2$$

 P'' is a v little $< W'$ in finder 0.2

Later in evg at 424 5^h 40^m $2''2'' = W''$

$9''9'' > O'$ by 0.5 A change is certain but due? is it owing to the

bad definition confusing light of O' with nebulosity It is singular that

$9''9''$ is now in Cpr. Ref = $C''C''$ But in finder $C''C'' > 9''9''$ by 0.5

See Feb 16

The above taken in twilight to avoid influence of nebula

Orion

1863 Feb 13 (cont.)

No doubt of a change of W' rel. to $E''E''$ since Jan 17 Chart

424 7 30 $L' = C''C''$ exactly
 In finder $L' < C''C''$ by $0''.2$

The small stars about the Trapezium generally not visible owing
 to atmospheric disturbance

Went to the telescope in early twilight 4²²³⁰ $C''C''$ and L' in sight & O'
 A few minutes later after careful searching & fixing the eye by reference
 to the Chart I could catch glimpses of $G''G''$ two magnitudes less than $C''C''$ but
 I did not record this difference as they were too unlike for comparison.
 It was compared carefully with O' & thought to be certainly fainter

Later in the evg. a remarkable change [of which I can give
 no explanation so likely as that $G''G''$ had actually varied] had taken place
 $G''G''$ was certainly much $> O'$ & at one time (9 P.M.) might have been called
 even $> C''C''$ but with attention & reference also to the finder in which $C''C'' > G''G''$
 I concluded that $G''G''$ had become at least almost $= C''C''$ in G.R.

Except it could possibly be owing to the effect of the very bad
 definitions acting differently on the stars from their different con-
 ditions as to background of sky - apparently quite improbable - there
 must have been a change in $G''G''$

Similar change Feb 16 very probably attrib-
 utable to maps of nebulosity near & bad definition

142
B

5

4⁵⁵
Or

Orion. Star Magnitudes

1863 Feb. 14

A fine clear ev'g - excellent definition - clouded suddenly after 7 P.M.

(424) 3^h 25^m $C''C'' > L'$ sure $E''E'' = R''$ $E''E'' > W'$ (corrected from recollection)

Broad Daylight

 $C''C'' > P''$ 0.3 $L' > P''$ by 0.1 sure3 29 O' in sight $G''G'' < O'$ sure by 0.23^h 31^m 30^s B in sight ^{mc.} of double pair, $< L''$ but $f = A''A'' = 13^h$ $F' < Q'$ by 0.5 E' certainly much less $F' = \frac{1}{2}(Q' + O')$ $O' = \frac{1}{2}(F' + E')$
 $E' < O'$ by 0.3 $G''G''$ is a little brighter than $H''H''$ say 0.1 $G''G'' < F''F''$ by 0.1 v. nearly equal3^h 43^m $G''G'' < O'$ decidedly 0.3. $F''F'' < O'$ 3 50 $r'' r'' p \sigma \phi \psi B \gamma \epsilon \pi m$ all in sight
5 3 52 of t_2 no sign till long after - when quite dark - New stars r' and π by glimpses they are $< \sigma$
Order of mag $B > \phi$ & a little barely perceptibly $\phi > r''$ or $\phi = r''_{41}$ $p < r''$ decidedly $p = r''_4$ $p > \psi$ decidedly $\gamma = \pi$ $\psi = \pi$ $\pi > \epsilon$ v. little $\sigma < \epsilon$ $m = \sigma$ or $m < \sigma$ Neither μ nor σ are difficult though requiring attention & effort $C' & D' = \frac{1}{2}(E' + F')$ M''' has rather a dull redish hue. 424 = 22 $M''' > D'$ 0.0 A''_4 10 $G''G'' < C''C''$ by 0.5 at least $M''' > E'''$ 0.2 certainly not $< E'''$ $M''' > C''$ 0.1(Order of mag $R''_1, E''_2, L''_3, W''_4, N''_5$ nearly equal $R'' > N''$ by 0.2 barely perceptibleWhile observing clouded up & saw plainly
4^h 55^m $L' = C''C''$ exactly $P'' < L'$ 0.1 $G''G''$ much $< C''C''$ 0.4
Order of br $F''F'' = G''G'' = O''$ almost exactly equal Dif 0.1 or 0.2
 $M''' = P''$ $M''' < P''$ 0.1 at 5^h

All notes by frequent repetitions

Orion Magnitudes

1863 Feb. 14 (Cont.)

As the sky became dark noticed particularly that C"E" seemed to lose relatively in brightness by 0.2 as though overpowered by the bright stars θ_2 & etc near. O' apparently suffered by same cause but L' did not and seemed quite = C"E" as proved to be the case when sky was clouding up. I feel quite sure of a change in L' or C"E" since sunset as both comparisons in twilight & by clouds were unquestionably correct.

Noticed that by putting all bright stars & nebes near C"E" out of field it was certainly brighter relatively to S"S" - without this precaution the inferiority of the latter as on 13th was not quite so great as in early twilight

Orion

1863 Feb 15

Observed through papery clouds of varying density sometimes obscuring stars completely. *Not good definition*

424 = 4 30

$\overset{3}{\gamma''\gamma''} < \overset{2}{\zeta''\zeta''} < \overset{2}{\lambda''\lambda''} < \overset{1}{\epsilon''\epsilon''} > \overset{1}{\rho''}$ order of Brightness - $\rho'' = \gamma''\gamma'' = 0.7$

4 41

$\zeta''\zeta'' = M'''$ or $\zeta''\zeta'' > M'''$ 0.1 perhaps but certainly not $< M'''$

compared many times as clouds passed over them could not decide which was brighter I suspect that $\zeta''\zeta''$ is getting brighter - & perhaps $\gamma''\gamma''$ too

4 43

$\lambda'' < \epsilon''\epsilon''$ 0.1 $\rho'' = \lambda''$ later in evg $\rho'' < \epsilon''\epsilon''$ as below 0.2

$\zeta''\zeta'' > \gamma''\gamma''$ certain 0.2

latter disappears in cloud when former is still clear - half an hour later could retain $\gamma''\gamma''$ in view almost if not quite as long as $\zeta''\zeta''$ - they seemed to have changed relatively

finder $\eta'' > \epsilon''\epsilon''$ 0.2

in G R $\eta'' = \epsilon''\epsilon''$

$\gamma''\gamma'' > \delta'$ 0.2

$M''' < \zeta'$ 0.2

$M''' < \epsilon'$ 0.1

$\zeta' < \epsilon'$ 0.1

$H''H'' > \gamma''\gamma''$ 0.1

δ' looks small tonight - it may be owing to confusion with neb.

$\gamma''\gamma'' > \delta'$ 0.3

$\eta' = \zeta' < \lambda'$

$\delta' < \epsilon'$ 0.2

5 2

5 stars of tr

$\lambda' = \lambda'$

$R'' = \epsilon''\epsilon'' > \eta' \lambda'' \lambda'' \eta''$

$\eta'' < R''$ 0.2

in finder

$\epsilon''\epsilon'' < \eta'$ sure

Obs. not altogether consistent to 0.1 but concluded as final results

$\lambda'' < R''$ 0.2

$\delta''\delta'' > \lambda'$ 0.1 $\epsilon''\epsilon'' > \rho''$ 0.2

$\zeta''\zeta'' > \gamma''\gamma''$ 0.1

$\gamma''\gamma''$ decidedly $< \epsilon''\epsilon''$

$M''' = \zeta''\zeta''$

8

34

3

4

4

4

4

Orion

1863 Feb 16

424 3 34 ^{Daylight} Order of br $R'' E'' E'' N'' 2'' 2'' = W'$ perhaps $E'' E'' = R''$
 $R - W' = 0.5$
 W' appreciably less than N''

3 40 $F'' F'' < M''' 0.2$ $M''' < P'' 0.1$

$P'' < 2'$ by 0.5 very evident $C'' C'' > 2'$ by 0.3

$P'' < C'' C'' 0.7$ $G'' G'' > P'' 0.2$

3 44 $C'' C'' > G'' G'' 0.6$

The star P'' seems to be fainter
 $2'$ brighter
 $C'' C''$ much brighter than last evg

3 58 $F' < P'' 0.2$

B r' & ϕ nearly equal

r_4'' a v. little $> p$

[bad definition
 ψ & γ not vis-

4 2 $M''' > F'' F'' 0.4$

$M''' > C' 0.2$

4 7 $M''' > E''' 0.1$ certainly not $<$
 $Y' < F' 0.3$ $Y' = 0'$

$F'' F'' > P' 0.1$
 $Y' < 2' 1.0$

4 15 $2' > P'' 0.3$

$G'' G'' > O' 0.3$

M''' is about $= E''$ & certainly much much $> F'' F''$

$M''' = P''$

4 25 $F'' F'' > O' 0.2$

$G'' G'' < H'' H'' 0.2$

$G'' > E'' 0.2$

$D' < E' 0.1$

G

4 45 $G'' G'' = O'' O''$

4 51 $G'' G'' > O' 0.5$

$N'' N'' > O'' O'' 0.2$

5 02 $G'' G''$ certainly $> F'' F''$ by 0.3

So also in finder plainly

Orion

1863 Feb. 16 cont.

Began observing as usual shortly after twilight
 vision rather disturbed & it clouded up after 7 P.M.

Comparisons in strong twilight seem to be the most decisive
 as it gets dark the disturbing effect of neighbouring stars - or
 of the masses of nebulosity is very apparent

Took particular pains to scrutinize each star by
 bringing it to the centre of the field a very necessary precau-
 tion & one which I have not always been sufficiently
 careful to exercise - although I have very commonly
 used the method - still in previous dates some of the com-
 parisons were made by placing the stars side by side

As have gathered compared the finished drawing
 of (1859) with nebula about the trapezium & found it
 unexpectedly exact. The only corrections were

1st Bridge of Zinnus magnus should incline
 more to lower circle

2 The Promontory (in parallel of 2^d) is
 rather too bright. - general color -

To examine Annular neb. $1^{\circ} 19'$ S. of θ , $1^m 8^s$ following θ ,
 Double star $0 40$ " $1 15.7$

Near ϵ Orionis

In Feb 23

Neb. fol $1^m 2^s$ and is $48'$ S.

See Feb. 23

Exam. Star N''' $\left\{ \begin{array}{l} 14^{\text{th}} 1858 \\ 12 1863 \end{array} \right. \alpha -1' 15.9 \quad \delta +4' 46.0$ for change of mag
 11-12 Jan 19

$N''' = 11-12$
 \times
 $\times \times \times 11$
 \times
 12

[Feb 26 1863] Star δ for change of mag
 $0' \quad 2'$

1863 Jan 18
 δ and η difficult
 ϵ " ϵ easier

ϵ is brightest of ϵ
 η faintest.

δ .
 $\epsilon \times \times \epsilon \quad \times \eta$

Feb 17.

424 3 35 Bad definition Obs as usual begin in daylight
 $E'' > R''$ 0.1 $N'' < R''$ 0.3 $N' < N''$ 0.1

$N' > L''$ 0.1 by 0.1 is meant ~~the~~ a perceptible gradation of light

3 40 $L' < C''$ 0.1 $P'' < L'$ 0.3 $O' < P''$ 0.2

3 5-1 $g'' < P''$ 0.1 or $g'' = P''$

$g'' = f''$

$H'' > g''$ 0.2

$M''' = f''$

$M''' < E'''$ 0.1

$E''' = P''$

4 2 $L'' > A''$ 0.5

$B = A''$

$y' = \frac{1}{2}(O' + E')$

$y' < f'$ 0.5

$y' < O'$ 0.3

$y' > E'$ 0.1 or 0.2

$f'' > H''$ 1.2 m

$f'' > O'$ 0.3

4 18

t_2 just comes in view

$H'' < O'$ 0.0

O' looks brighter than last night

y' looks fainter than usual

f''

"

"

"

g''

"

"

So E''' fainter than it used to be =

When quite dark every star in bright neb. about trapezium [excepting 4 of tr. itself] was visible only by glimpsing & commonly undistinguishable although sky was quite clear & no moon. This light is very easily confounded with turbidity by atmospheric disturbances - Yet the very faint star t_2 was always conspicuous & seen as well as ever - (compare Feb 14)

The most perplexing effect is the relative change of mag. of neighbouring

See also March 12

Orion

1863 Feb 17 (cont)

stars - which is so decided in some instances that it is difficult in some cases to persuade one's self that the stars have not really altered

For instance this evg. in early twilight I found as usual $C''C''$ visible long before $\gamma''\gamma''$ & unquestionably $> R''$ & $2'$ but at 6^h sid. $\times 8^h$ $\gamma''\gamma''$ was as I should have said without a moment's hesitation $> C''C''$ by $\frac{1}{2}$ mag. and it was impossible to get rid of the impression - Even in the finder the superiority of $\gamma''\gamma''$ was clear.

δ' $\gamma''\gamma''$ was then also $> F''F''$ while δ' was out of all comparison fainter.

$\gamma''\gamma''$ is barely separated from nebula of Horn where it is pretty bright - but on its fl. side is an ample dark region.

Note added March 4 - This evg. under bad definition as on Feb 17 but moon-misty sky - It was just as impossible to rank $\gamma''\gamma'' > C''C''$ as the contrary on Feb 17 It was always plainly $1^m < C''C''$

Orion

1969 Feb 18

$\delta^h 25^m (4m)$ about $\beta\beta'' < \alpha\alpha'' 0.4$ $2' < \alpha\alpha'' 0.1$ $P'' < 2' 0.3$
 $\gamma''\gamma'' > \zeta''\zeta'' 0.2$ sure $M''' > \zeta''\zeta'' 0.5$ $M''' = E''' M'' < E'' 0.1$
 $M''' > \zeta' 0.1$ $\gamma' < \zeta' 0.3$ $\gamma' > E' 0.2$ $\gamma' = N''N''$
 $F''F'' = 0'$ $\zeta''\zeta'' < P'' 0.4$

Observed in late twilight & dense haze -

$\zeta''\zeta''$ looks fainter -

Orion New Star

1869 Feb 20

In Twilight & thin haze found stars as on 18th

$$\begin{array}{llll}
 C'' > 2' & 0.1 & G'' < P'' & 0.1 & & C'' < 2' \\
 2'' > 7'' & 0.2 & & & M'' > 7'' & 0.1 & E'' > M'' & 0.1 \text{ or } 0.2
 \end{array}$$

* New star is brighter than
the small star s. of H^h.
[By this I think p was meant*
marked 15th on chart]
* Probably 15th

H^h x x S^h
new star 14th
easily seen cannot
think it has been always
so bright & overlooked

Order of br

$$B > r, \text{ very little } r_1 > \varphi \quad \varphi > p \quad p = r_4 \quad p > \xi \text{ & } \pi \text{ decidedly}$$

$$\text{As clouds gathered } R'' = E'' \quad N'' < R'' \quad 0.3 \quad N'' < r' \quad 0.1 \quad W' = L'' L''$$

All four br. stars of tr are brighter than E''E''

$$y' < \varphi' \text{ but } > H'' \text{ slightly}$$

* This star certainly variable see trace of it Jan 3 1864 under definition showing comp. of
H^h brighter Dec March 2 1863 Not visible Feb 3 1864 under fine definition
not visible in 1864 up to March 17.

Orion

New? Nebulae

ε Orionis

1863 Feb 21

Strong Twilight

Bad. Vision

 $M''' > F'F'' 0.3$ $M''' > P'' 0.1$ $Q'Q'' > L' 0.1$ $S'S'' > T'T'' 0.1$ $S'S'' > O' 0.1$ $L' > P'' 0.3$ $S'S'' < T'T'' 0.1$ $E''' > M''' 0.2$ $M''' > T'T'' 0.1$ $F'E'' > R'' 0.1$ $R'' > T'T' = M'' = L''L''$

Star in Cam. > a of tr.

Looked in Comet seeker at the 3 stars of 'sword handle' of Orion. The clustering of small & large stars about each is indubitable - & as evident as is the aggregation of nebulosity about the same centres -

Looked at 3 stars of 'Belt' ε (the fol. of the 3) has a finely diversified field of bright nebulous masses attached to it on the n.f. quadrant.

Near ε & (south?) of it dist 10' or 15' is a bright strongly nebulous star -

The middle star of belt has nebulosity. Could not decide for other.

Herschels Cat. diffuse nebulosity? ε Orionis

Orion

1863 Feb 25

in view Strong twilight outline of brightest nebulosity just coming
 6^h 15^m about pretty good definition

$\zeta''\zeta''$ is undoubtedly brighter while $\gamma''\gamma''$ looks fainter than usual

$$\zeta''\zeta'' > M''' \quad 0.2 \quad \text{no question}$$

$$\zeta''\zeta'' > \gamma''\gamma'' \quad 0.4$$

$$\zeta''\zeta'' = E''' \quad \text{or} > E''' \quad 0.1$$

$$= P''$$

$$\gamma''\gamma'' = O'$$

$$\gamma''\gamma'' = \frac{1}{2}(E' + \zeta')$$

$$O'C' \quad 2' \quad P'' \text{ as usual}$$

$$\gamma' < N''N'' \quad 0.1$$

$$M''' = C'$$

$$M''' < E''' \quad 0.2$$

[Saw in 1864]

β & γ_1'' are so nearly equal that without noticeable error their succession in brightness might be reversed

$$\beta > \gamma \quad \gamma = \gamma_1'' \quad \rho < \gamma_1'' \quad 0.1 \quad \rho > \gamma_4'' \quad 0.1$$

I have perceived no evident change since Jan. excepting such as vision accounted for.

γ and γ are plainer than usual, considering the vision which is not particularly good. They are usually as difficult as $\zeta < \pi$

Later at 6^h of εC

$$\zeta''\zeta'' > M''' \quad 0.2$$

$$\zeta''\zeta'' > E''' \quad 0.1 \text{ to } 0.2$$

Light of Nebula strong

$$\zeta''\zeta'' > P'' \quad 0.2$$

good definition. Moon (4) near comparisons certain & unquestionable

$$\zeta''\zeta'' > \gamma''\gamma'' \quad 0.4$$

$$\gamma''\gamma'' = O'$$

$$M''' = P''$$

$$M''' > C' \quad 0.1$$

$$\gamma''\gamma'' = N''N''$$

$$\gamma' < N''N'' \quad 0.1$$

I always discern σ when atmosphere is not very bad also $\pi < \zeta$.

Zeros of Position

63 Feb 25 23
195 W.
W. L. Harris (Copy)

Before removing Micrometer

Mires - 40 Eridani

T

$\alpha = 81^{\circ} 9'$
At angle $\alpha = 81^{\circ} 9'$ $R = 49.355$
 $R' = 48.894$

Chro 236 $\tau = 39.31$ 9.664 1.389 8.094 $81^{\circ} 52'$
 $\tau' = 58.5$

$R = 49.348$
 $R' = 48.582$

$\tau = 41.13$ 9.884 1.462 8.241 $82^{\circ} 9'$
 $\tau' = 52$

$R = 49.199$
 $R' = 48.610$

$\tau = 42.22$ 9.762 1.498 8.083 $81^{\circ} 57'$
 $\tau' = 53.5$

$R = 49.200$
 $R' = 48.643$

$\tau = 43.31$ 9.746 1.477 8.088 $81^{\circ} 57'$
 $\tau' = 46.6$

$\alpha = 83^{\circ} 29'$ $R = 47.724$
 $R' = 47.233$

$\tau = 45.55$ 0.179 1.574 8.424 $81^{\circ} 58'$
 $\tau' = 41.32.5$

$R = 47.768$
 $R' = 47.021$

$\tau = 48.7.5$ 0.099 1.477 8.441 $81^{\circ} 54'$
 $\tau' = 37.5$

$$\log \frac{(T - R)}{R} = \frac{\pm (R' - R) 9''}{(T' - T) 15 \text{ sec } \alpha}$$

$81^{\circ} 56'$
 $\pm 2'$

Where the telescope is left unmoved between the times τ and τ' ; the screw is moved between these times; and the transits across the wire are taken, the wire being set at an angle of $1''$ after the parallel

$$\log \frac{9''}{15} = 9.815$$

$$\log \text{ind} = \frac{9.996}{9.819}$$

Zeros of Parallax

663 Feb 25 ind. 23.

JMS.

Scale - 40 Endian

In this case A, A' are the scale-readings corresponding to the limits of transit across the ϕ horn-lens of the scale placed nearly perpendicular to their usual position.

~~4-52-0's~~ A

α	R	R'	A	A'	$\log R - R$	$\log A' - A$	T'
83 0	67.138	66.646	3.0	9.5	9.692	0.813	83 43.5
	67.130	66.594	2.4	10.2	9.729	0.919	36
	67.220	66.694	2.0	9.4	9.721	0.869	60
84 22	67.229	67.659	2.4	9.7	9.633	0.863	49
	67.629	67.596	1.5	10.3	9.760	0.944	45
	67.020	67.376	3.6	9.5	9.551	0.871	68
							83° 43'

$$\log(T - \alpha) = \pm \frac{(R' - R) 0.1633}{(A' - A)}$$

$$\log 0.1633 \quad 9.213$$

After these observations the micrometer was taken off by Prof. Brown to observe Orion. When replaced the zero was found to be increased about 1".

Comparison Stars

863 Feb 25th
 J.H.S. at
 Hill rec.

Star 8 for Calypso (1862) compared with δ', c, δ''

Scale - Zero of Position ($T+270^\circ$) = $354^\circ 45'$ by observation.

Obs. 236.

(Then comp. specially in decl. were quite hurried)

		δ'	δ''	δ'''		Temp. (25) δ''
δ'	4' 44"	36	43.9	46.0	$\delta - \delta'$	+2 50.68
δ	8 5.5	39	—	38.5	$\delta - c$	-1 11.50 + 3 20.5 - 0.9
c	—	40	—	50.2	$\delta - \delta''$	-3 11.98 + 3 57.5 - 1.0
δ''	4 9.5	42	46.6	50.6		
δ'	3 54	8	44	53.7	57.8	
δ	7 20	47	44.4	46.5		
c	3 58.5	48	55.9	60.0		
δ''	3 20	50	56.4	60.7		
δ'	4 5	53	27.5	31.7		
δ	7 28	56	16.3	22.4		
c	4 8.5	57	29.7	33.8		
δ''	3 33	59	30.1	34.2		

Star a for Echo (1862) compared with a', a''

~~etc~~

C.B. (Lith. 2nd throughput)

	Before trans.	After trans.			
a	2 46.5	2 41"	10	4 0.1	4.0
a'	8 37	8 39.5	5	36.4	42.3
				1 38.30	+ 5 57.5
a	3 5	3 6	7	42.1	46.1
a'	9 3	9 5	9	20.4	24.3
				1 36.25	- 5 56.5
a	3 57.5	3 54	9	53.7	57.8
a'	9 50.0	9 57	11	32.0	36.0
				1 36.25	+ 5 57.8
a	4 10.5	4 13.0	12	58.0	62.0
a''	6 30.0	6 31.0	8	22.8	26.8
				- 5 24.60	- 2 18.4
a	5 5	5 7	20	35.5	39.4
a''	7 20.5	7 26.0	10	26 0.4	4.3
					- 2 19.6

$a' a''$ for Extr

$$11\ 47\ 48 - 13\frac{1}{2} = W. 11.813$$

$$11\ 54\ 51 - 129 = 11.938$$

1863.5

(to below)

$$\begin{array}{rcl}
 a' & 11\ 45\ 57.23 + 3.068 & 0.002 - 1\ 24\ 1.9 - 20.02 - 0.014 \\
 & + 1\ 58.54 & - 12\ 21.0 \\
 a'' & 11\ 53\ 0.26 & 3.069 0.002 - 1\ 15\ 46.0 20.05 0.001 \\
 & + 1\ 58.58 & - 12\ 21.8
 \end{array}$$

LL

18620

$$\begin{array}{rcl}
 a' & 11\ 47\ 50.77 & - 0.02 - 1\ 30\ 22.9 + 0.9 \\
 a-a' & + 1\ 38.27 & + 5\ 57.9 \\
 a'' & 54\ 58.84 & - 0.02 - 1\ 24\ 7.8 + 0.9 \\
 a-a'' & - 5\ 24.85 & - 2\ 19.2
 \end{array}$$

$$a \quad 11\ 49\ 29.00 \quad - 1\ 30\ 26.0$$

$$\begin{array}{rcl}
 8^\circ & -1^\circ 30'.20 & -1^\circ 21'.95 \\
 4^\circ & +1^\circ 47' 58.8 & +11\ 54\ 58.8
 \end{array}$$

$$4^\circ 8.41903 \quad 8.377\ 36$$

$$4^\circ 8.72431 \quad 8.367\ 64$$

$$a\ 126.4$$

$$1.30223$$

$$4^\circ 20\ 9.999\ 37 \quad 9.999\ 89$$

$$3.0705 \quad 3.0705$$

$$-0.0019 \quad -0.0007$$

$$Apt \quad 3.0686 \quad 3.0698$$

$$-20''.027 \quad -20''.058$$

corr. for Per. Abs. Nat.
Per. (year) 1862-3 invisible

$$\frac{1}{2}(a' + a'') \quad a$$

$$11\ 51\ 23 \quad 11\ 49\ 29$$

$$-1^\circ 32'.3 \quad -1\ 30.4$$

$$\Delta \quad + 26'.5 \quad 4^\circ 20\ 7.919$$

$$-8'' \quad \Delta \quad 0.00$$

$$+2'' \quad \Delta \quad 0.0$$

$$-2'' \quad \Delta \quad 0.0$$

Orion

1863 Feb 27

Began observing as soon as brighter stars were visible

C.P.B.

236 = 4^h 29^m $R'' = E''E''$

Definition bad but comparisons carefully made

brighter 4 31 30

 $C''C''$ comes in sight1^m before L' is a little5th star of Trap. also in sight

4 34

 $P'' < L' 0.2$ decided $F''F'' > M''' 0.2$

4 36

 $F''F'' > P'' 0.2$ $M''' = P''$ $F''F'' > M''' 0.5$ When $S''S''$ came in sight its faintness was striking.

4 38 30

 $S''S''$ barely visible $< F''F'' 1.0$ $S''S'' < O' 0.3$ $S''S'' = E'$ $F''F'' > E''' 0.2$ sure $F''F'' > M''' 0.6$ $E''' > M''' 0.1$ $F''F'' > P'' 0.3$ $S''S''$ looks quite faint and $F''F''$ as decidedly brighter than near $F''F''$ is not quite so bright as L' perhaps but might be so observed without noticeable errorEven after the nebula has become bright at 4^h 55 $S''S'' < O' 0.3$ $S''S'' < A''A'' 0.2$ $< O''O'' 0.1$ $\gamma' = A''A'' 5^{h} 11^{m}$

Order of br.

 $B \phi r_1 r_2 p$ as usual but p is more affected by the bad atmosphere $A''A''$ brighter when in flurries of disturbed vision all these stars disappear. Even $b''b''$ continues easily seenOf stars in Orion Minor δ is now quite as bright as ϵ possibly a little brighter $\delta = \epsilon$ $\epsilon > \zeta 0.1$

$$\begin{array}{c}
 O' \quad L' \\
 \times \quad \times \\
 \times \quad \times \\
 \times \quad \times \\
 \times \quad \times \\
 \times \quad \times
 \end{array}$$

Orion

1863 Feb. 28

sid Bright twilight - ~~Dense~~ haze & Moonlight - good definition
 4^h 35 \angle of γ is $> E''E''$ by 0.2 when latter is just easily seen

$$R'' = E''E''$$

$$5^{\text{th}} \text{ star of } \gamma = C''C''$$

4 39

$$N' = L''L''$$

6th star " visible at same time with L'

$$L' < C''C'' \quad 0.1$$

$$N'' = N'$$

$$N'' < R'' \quad 0.3$$

$$L''L'' = N'$$

$$\gamma''\gamma'' > M''' \quad 0.1$$

$$\gamma''\gamma'' > P'' \quad 0.1$$

Can see no trace of $\gamma''\gamma''$

$$\gamma''\gamma'' > M''' \quad 0.2$$

$$E' < O' \quad 0.3$$

$$F' > O' \quad 0.1$$

$$\gamma''\gamma'' < O' \quad 0.2$$

$$E''' < \gamma''\gamma'' \quad 0.2$$

$$E''' > M''' \quad 0.1$$

$$\gamma''\gamma'' > P'' \quad 0.1$$

$$\gamma''\gamma'' < \gamma''\gamma'' \quad 1.2$$

$$\gamma' > N''N'' \quad 0.1$$

5 15

$$\gamma''\gamma'' > E''' \quad 0.2$$

$$\gamma''\gamma'' < O' \quad 0.2$$

$$> E' \quad 0.1$$

Later in Evg.

sid 6^h 5^m $\gamma''\gamma''$ comp. with O' , $\gamma''\gamma''$, do not change

$$\gamma''\gamma'' < N''N'' \quad 0.1$$

$$> O''O'' \quad 0.1$$

$$E''' = M'''$$

 $\gamma''\gamma'' < C''C''$ decided but not much $< L'$

Telescope set as usual in early twilight a few minutes after sunset
 say 15^m & before any but brightest stars are visible

Each comparison (as always since Feb 16) incl. by bringing each star to
 center of field & frequently interchanging from one to the other.

$\gamma''\gamma''$ looks faint tonight It is very decidedly fainter than O' under all
 circumstances

Noticed that the sweep of nebula in M.C.B.'s engraving in region n p γ -
 represented as a gulf. may have been intended to
 express the rather sudden falling off of brighter light from
 the Hygieum Region to which it bears considerable
 resemblance.

Gulf

Orion

1863 March 2

Began in Early twilight - Clear

236 β_1'' 45^m $C''C'' > 2'$ 0.1 $2' > P''$ 0.3 5^{th} Star = $2'$ 6th Star ^{slightly} ~~about~~ as low as 5th4 55 M''' looks brighter $\approx P''$ $F''F'' > E'''$ 0.2 $F''F'' > M'''$ 0.2 $F''F'' > P''$ 0.3 $P'' < M'''$ 0.1 $g''g'' < 0'$ 0.15^h 5^m ρ is quite as bright as $\delta''\delta''$ $\beta > A''A''$ a v. little $\beta > \varphi$ just perceptibly $\varphi = \gamma''$ $\gamma'' > \gamma''_4$ decidedly $\rho > \gamma''_4$ or $\rho = \gamma''_4$ $\gamma = \psi$ $\zeta \approx \pi < \psi$ $\sigma = \mu$ both rather difficult δ is plainly $> \zeta$ and ε $\delta = \beta$ δ is a good half mag. brighter than the other small stars ζ ε and π of Jan 19 $\gamma' < A''A'' > \delta''\delta''$ - midway between

[F.H.S. Scale of mag. in Argelander's]

F.H.S. estimate $g''g'' < F''F''$ 0.4 $F''F'' > M'''$ 0.2G.P.B. " $g''g'' < F''F''$ 0.8[F.H.S.] $\delta = \varepsilon$ or $\delta < \varepsilon$ 0.3 $\delta > \zeta$ 0.3 $\delta = \frac{1}{2}(\zeta + \varepsilon)$ β is situated in a dark area - γ is a little less favourably placed for visibility φ is just outside of S edge of a brilliant map of nebulosity extending to $\frac{1}{2}$ way to point $\frac{1}{2}(2' - 0')$ γ'' just outside of pretty bright neb. μ is decided dark γ''_4 immersed in dense neb. unfavourable for visibility a very σ in dark ρ if not actually immersed is ^{near} the centre

A brighter district with very bright spots surrounding it especially S.p.

Orion

New star of Feb 20

March 2. cont

The new star prec $\theta''\theta''$ is 15^{th} \propto much $>$ ~~star~~ comp of $\theta''\theta''$
 and is nearly as bright as $\rho > 0$ almost = $N''h''$ at cusp of neb.

$$\theta''\theta'' = \frac{1}{2}(F' + F'')$$

F.H.S. estimates $\theta''\theta'' < N''N''$ 0.2

$N''N'' > \theta''\theta''$ 0.3

Orion

1863 March 4

236 4^h 56^m Broad daylight Thin cum. str clouds passing
Very bad definition - Bright moon $E''E'' > R'' \sim 0.1$ 4 58 $T' <$ free star of T_2 0.14 53 L' is but a little $< C''C''$ scarcely 0.15 15 $g''g'' < O'$ 0.35 27 $E''' > M'''$ 0.1 $F''F'' > M''' \sim 0.5$ $F''F'' > E'''$ 0.2 $F''F'' = g$ M''' 9-10 good5 32 $Z''Z'' > g''g''$ 0.8 $g''g'' > O''O''$ 0.1 $g''g'' < N''N''$ 0.2 $Y' > N''N''$ 0.1 $F''F''$ is nearly as bright as L' & $C''C''$

Cleared off

 O''' (far s of L') is brighter 11-12 N''' 12-13 N''' $O''' = H''H''$ $N''' < Z''$ 0.2 $x \times O'''$ $F''F'' > P''$ 0.4

Vision very bad. At 5 45 $A''A''$ (a b''b'', even) seen without difficulty while no trace of any star in bright neb. from B downward can be seen even by a glimpse after long watching

Later at 9^h 00^m m.st. definition still bad

Have no doubt of the comparison

 $g''g'' < P''$ 0.4 $g''g'' < M'''$ 0.4 $g''g'' < N''N''$ 0.3 $g''g'' < F''F''$ 0.5 $N''N'' < P''$ 0.3 $M''' > P''$ 0.1 $g''g'' = O''O''$ or $g''g'' > O''O''$ 0.1 $F''F''$ L' , M''' , P'' , F' visible in finder but $g''g''$ cannot be made out $M''' > C''$ by 0.1 $M''M'' < O''O''$ 0.2 g''

Orion

1863 March 4 (cont.)

Was rather surprised considering badness of definition going to view the nebula at 9 P.M. at the contrast in rel. mag. of θ'' & θ'' with θ'' contrasted with description Feb. 17. It was tonight (strong moonlight) quite as faint ^{relatively to other stars} late as in early twilight.

θ'' was relatively brighter comp. with ρ'' & θ' about Feb. 17. when it was nearly = ρ'' & θ' ≈ 0.2

To night the relations of magnitudes seem quite the same as in early twilight.

Orion

1863 March 5

Clear. Bad definition - In Daylight as usual

236 4^h 55^m γ' is $<$ prec star of γ by 0.2.
 $d > E'E''$ 0.35 1 $R'' = E'E''$ W' barely visible $< R''$ 0.35 4 $C''C'' > L'$ 0.1 just visible5 7 $W' > L'L''$ 0.25 16 $F''F'' = P'' = E''' > M'''$ 0.1 $O' < P''$ 0.2 $P'' < L'$ 0.3 $g''g'' < O'$ 0.1 $g''g'' < P''$ 0.3 $g''g'' = N''N''$ $g''g'' > O'O''$ 0.3 $F''F'' > g''g''$ 0.45 30 $F''F'' < E'''$ 0.1 $F''F'' > M'''$ 0.1 $g''g''$ is brighter tonight
 $F''F''$ " fainter $\gamma' = N''N''$ $N''N'' > O'O''$ 0.2
 $\gamma' < F'$ 0.4Viewed again at 7^h Sid. r. $g''g'' = N''N''$ carefully compared $F''F'' > g''g''$ 0.4Moon nearly full - clear -
definition not good $F''F'' > M'''$ 0.1 $F''F'' < E'''$ 0.1At 7^h 30 Sid. [T.H.S.] $g''g'' > N''N''$

0.15

 $F''F'' > g''g''$

0.30

 $F''F'' > M'''$

0.25

} Made without knowledge
of G.P.B.'s resultsThe change of $g''g''$ relative to $N''N''$ since March 2nd & 4th seems unques-
tionableFrom recollection of circumstances & feel sure that $g''g''$ was carefully
compared with $N''N''$ & $O'O''$ March 4

7"Z" with H^{III}

	Jan 23	7"Z"	9-10			
	25		9-10	$> M''' 0.3$	$> P'' 0.5$	$< E'''$
	31			$> M''' 0.2$	$> P'' 0.1$	$> S''S'' 0.3$
May	Feb 2			$> M''' 0.4$	$> P'' 0.5$	" 1.0
	13 Chart			$< M''' 0.6$	$< P'' 0.6$	$< " 0.1$
Min.	13 Est.			$< M''' 1.0$		$< " 0.4$
	14 "					$< O' 0.1$
	15			$= M'''$		$> O' 0.2$
	16			$< M''' 0.3$		
	17			$= M'''$		$> O' 0.3$
	18			$< M''' 0.5$		$> S''S'' 0.2$
	20			$< M''' 0.1$		
	21			$< M''' 0.2$		$> S''S'' 0.2$
	23			$< M''' 0.1$	$= P''P''$	$> S''S'' 0.4$
	25			$> M''' 0.2$	$> P''P'' 0.2$	$> S''S'' 1.0$
	27			$> M''' 0.4$	$> P'' 0.3$	$> S''S'' 1.2$
	28			$> M''' 0.2$	$> P'' 0.1$	

Mar 2	$> M''' 0.2$	$> P'' 0.3$	
4	$> M''' 0.2 [HS]$	$> P'' 0.4$	$> S''S'' 0.8$
5	$> M''' 0.5$	$= P''$	
5	> 0.1		
5	$> 0.25 [HS]$		

Orion

New Star of Feb (20)

1863 March 6

Bad definition

236 5^h 24^m 9"9" > N"N" 0.1 nearly

7"7" > E''' 0.2

7"7" > M''' 0.3

5 31 7"7" > P" 0.2

P" > E''' 0.05

P" < E''' 0.05

5 35 9"9" < O' 0.2

9"9" = N"N"

M''' = P" M''' < E''' 0.1

7"7" > E''' 0.25

7"7" > M''' 0.3

5 46 9"9" < P" 0.4

9"9" < N"N" 0.05

γ' < N"N" 0.1

(9 Feb 20)

The new star near 9"9" n.p. is apparently fainter than it was. It is now in ~~moonlight~~ not good definition as hard to see as the companions of 9"9". & much fainter than the brightest of those in a line with ^{it} E"E". This may be owing however to confusion with light of nebula in which it is deeply immersed.

E'' < star D''' 0.1

9"9" < 7"7" 0.6

The vision disturbed as it has been for several nights past -

7"7" appeared as soon as seen - brighter than on last night 9"9" about the same.

J.H.D. Observed as follows 10^h 40^m n.p. - Sky hazy - Nebula low -

9"9" = N"N" M''' < 7"7" 0.3

9"9" < 7"7" 0.5

E''' > M''' 0.1

7"7" > E''' 0.25

9"9" > N"N" 0.1

M''' < 7"7" 0.25

E''' > M''' 0.2

7"7" > E''' 0.15

7"7" > P" 0.15

M''' < P" 0.1

Orion

1863 March 9

Strong twilight, Clear - definition at first tolerably good - bad as it grew darker

236-5" 27 $O'' > L'$ 0.2 $L' > P''$ 0.2
 $N' > L''$ 0.1 $N'' > N'$ 0.1 $R'' = E''$ $R > N''$ 0.4

In broad daylight 5^h 25 to 5^h 30 sid. 5th Star of Tr is not as bright as L' but I think would be if similarly situated. The 6th may be 0.2 fainter but this

may be only from being 20 near θ'
 θ'' looks faint & when first in sight only a little brighter than $H''H''$

5 39 $\theta''\theta'' = O''O''$ $\theta''\theta'' < O''O''$ 0.1
 42 $\theta''\theta'' > M'''$ 0.3 $\theta''\theta'' > E'''$ 0.15

47 $M''' < E'''$ 0.1 $P'' > M'''$ 0.1 $P'' = E'''$ $P'' < E'''$ 0.05

52 $\theta''\theta'' < O''O''$ 0.1 $\theta''\theta'' < N''N''$ 0.3 $\theta''\theta'' < P''$ 1 magnitude
 $\theta''\theta'' > H''H''$ 0.3 $H''H'' > \text{Comp. of } \theta''\theta'' \text{ by } 8.3$

Later quite dark - clear no moon - Bad vision

7^h 14 $\theta''\theta'' > M'''$ 0.15 $\theta''\theta'' = E'''$
 $P'' = M'''$ $\theta''\theta'' < N''N''$ 0.3 $\theta''\theta'' < O''O''$ 0.2

N.B. All the stars near bright nebulae are probably affected by bad definition

$N''N'' > O''O''$ 0.05 - sometimes $N''N'' = O''O''$

$\gamma' > N''N''$ 0.1 $\gamma' < \theta'$ 0.2

7.25 $\theta''\theta'' > N''N''$ 0.2

After dark it seemed as if $O''O''$ must have grown brighter 0.2 relating to $N''N''$ which it at times seemed even to surpass but I concluded $N''N'' > O''O''$ 0.05 as final result.

T.H.S. Obsd as follows:-

236 6^h 30 to 7^h 05 T.H.S. compared as follows Clear - no moon

Bad definition.

$\theta''\theta'' < N''N''$ 0.3 $O''O'' > \theta''\theta''$ 0.3 $O''O'' > N''N''$ 0.1 $\theta''\theta'' > \theta''\theta''$ 0.3
 $\theta''\theta'' < N''N''$ 0.1 $\theta''\theta'' > M'''$ 0.1 $E''' > M'''$ 0.1 $E''' > \theta''\theta''$ 0.2
 $\theta'' > P''$ 0.2 $\theta''\theta'' > P''$ 0.05 $N''N'' > \theta''\theta''$ 0.2 $O''O'' > N''N''$ 0.05
 $N''N'' < \gamma'$ 0.2 $\gamma' > O''O''$ 0.15 $E''' > M'''$ 0.15 $P'' < M'''$ 0.2
 $E''' > \theta''\theta''$ 0.2

Orion

1863 March 9

As usual observed in broad twilight
Later in evg. I think the bad definition with the dark
clear sky affected the estimates

δ is scarcely so bright as ϵ . Though vision is too bad
to certainly decide -

As $\phi \approx \alpha_1''$ now and then in sight of usual relative
magnitudes As barely $> \phi \approx \alpha_1''$ $\phi = \alpha_1''$





Pyramus

18" S of H'.



2'

236 At 620 sketched the above showing position of what at first were thought bright masses which had suddenly appeared in the Nebula. But it proved to be only the effect of water which had fallen on the Object-glass.

Orion

[Feb 1863]

The two sketches below were made Feb. 23 and Feb 25? or near the 25th. They were taken with intention of fixing the position of the bright & darker regions near the trapezium.

The sketching in ink is mostly a copy from previous drawings. The pencilling indicates the observed features.

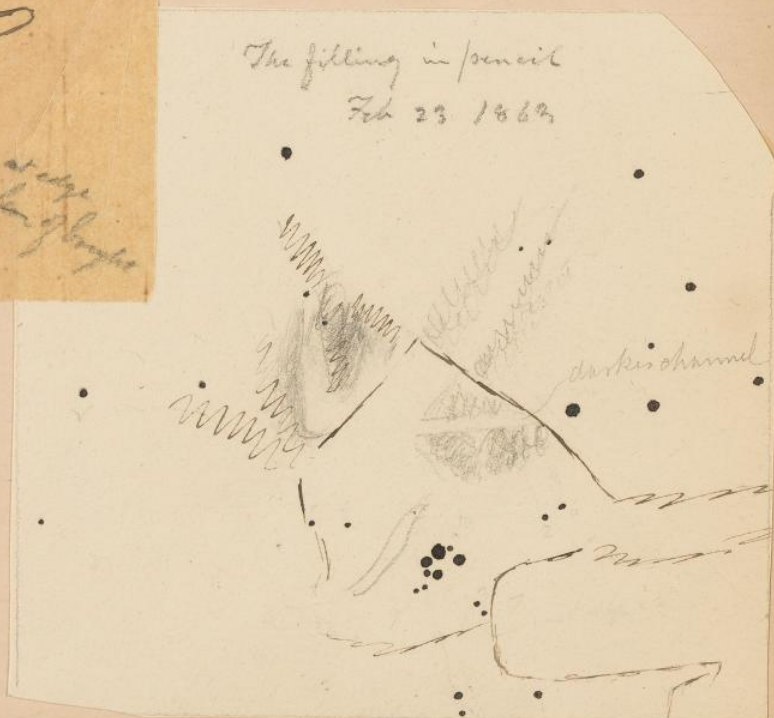
The drawing of 1859 in details was compared with nebula in end of Feb. 1863 & no change of any prominent feature could be recognized.



20 April 1866
Chert. at 10.

Mr Watts copy for Nebula
was corrected in a few details
I think @ Feb. 23 - not later
than 25th

The filling in pencil
Feb 23 1863



Removal of Object Glass.

1863 March 10

Last evg found moisture (frozen) between lenses of Object-glass of G. R. This P.M. 3 30 to 4 15 took it out & separated lenses. Found a few spots of efflorescence on the inner surface of concave (next eyepiece) but much more on the surface next the crown lens. None were noticed on the crown.

By as hard rubbing with linen as was considered safe the lighter spots were removed but there are many which remain unchanged.

Notwithstanding the efflorescence I do not think that the general performance of the telescope is perceptibly affected.

Orion (New Star of Feb. 20)

1853 March 11 (Wed.)

Clear - definition not good but passable. Obs. began in strong daylight.
 236 = δ 40 $P'' > M'''$ 0.05 $\mathcal{F}''\mathcal{F}''' = P''$ $\mathcal{F}\mathcal{F}'' > M'''$ 0.05

$$47 \quad M''' = E''' \quad \mathcal{F}''\mathcal{F}''' = P''$$

$$50 \quad \mathcal{F}\mathcal{F}'' < O''O'' 0.15 \quad \mathcal{F}\mathcal{F}'' < N''N'' 0.4$$

$$\mathcal{F}\mathcal{F}'' > H''H'' 0.2 \quad \mathcal{F}\mathcal{F}'' > H''H'' 0.1$$

$$N''N'' > O''O'' 0.2 \quad E''' < D'' 0.15$$

$\mathcal{F}\mathcal{F}''$ looks very faint. $\mathcal{F}\mathcal{F}''$ & $\mathcal{F}\mathcal{F}'''$ is nearer equality with $H''H''$ than $N''N''$ to $O''O''$. might without much error call them about same mag.

$$5 \quad 57 \quad N''N'' > \gamma' 0.1 \quad \mathcal{F}\mathcal{F}'' < E' 0.15$$

$$6 \quad 12 \quad P'' = \mathcal{F}\mathcal{F}'' \quad P'' > \mathcal{F}\mathcal{F}'' \text{ a full magnitude of my scale}$$

Afterwards thought the diff. $P'' - \mathcal{F}\mathcal{F}'' = 0.6$.

By trial on ill. mica scale $\mathcal{F}\mathcal{F}'' = 11^{\text{th}}$ mag? Scaling of Lenz

$$P'' = 10-11^{\text{th}}$$

$$\mathcal{F}\mathcal{F}'' > M''' 0.1 \quad M''' = E''' \quad \mathcal{F}\mathcal{F}'' > E''' 0.1$$

$$6 \quad 18 \quad \mathcal{F}\mathcal{F}'' = P''$$

$$\text{Still later about } 9^{\text{h}} 50^{\text{m}} \text{ net} \quad N''N'' > O''O'' 0.1 \quad \mathcal{F}\mathcal{F}'' < O''O'' 0.2$$

$$\mathcal{F}\mathcal{F}'' > \mathcal{F}\mathcal{F}''' 0.6 \quad \mathcal{F}\mathcal{F}'' > H''H'' 0.2 \quad \mathcal{F}\mathcal{F}'' > E'' 0.05 \text{ but } < \mathcal{F}'' 0.1$$

The new star near $\mathcal{F}\mathcal{F}''$ is difficult to see when the Comp of $\mathcal{F}\mathcal{F}''$ & σ & ρ are seen is much fainter than $k''k''$.

Under not good definition, saw the stars of the nebula as follows:-

$$B > \varphi \text{ just perceptibly} \quad \varphi = r_1 \quad r_2 < r_1 \text{ very decidedly say } 0.4 \quad r_1 > \rho 0.1$$

$$\sigma < \rho 0.2 \quad \psi \text{ \& } \gamma \text{ about as faint as } \sigma$$

Orion

1863 March 11 (cont.)

After dark T.H.S. compared magnitudes as follows

236	6" 25"	$\theta'' < \lambda''$	0.25	$\lambda'' > \theta''$	0.1		
		$\theta'' < \theta''$	0.1	$\theta'' > \theta''$	0.15	$\theta'' > \lambda'''$	0.1
7	50	$\theta'' > \rho''$	0.1	disturbed by nebula light		$\theta'' = \lambda'''$	
		$\theta'' > \lambda'''$	0.1	$\theta'' > \theta''$	0.05	$\theta'' > \theta''$	0.1

Orion

1863 March 12

Thick haze - Twilight & very bad definition

236	5 52	$R'' < E''E''$ 0.1		
	5 58	$C''O'' > 2'$ 0.1	$N'' = N'$	$N'' < R''$ 0.3
		$P'' < 2'$ 0.2	$P'' > O'$ 0.2	
6	4	$F''F'' < M'''$ 0.05	$F''F'' < E''$ 0.1	
	8	" $< M'''$ 0.05	$M''' = E'''$	
	14	$G''G'' < O''O''$ 0.2	$G''G'' < N''N''$ 0.4	
	16	$F''F'' > N''N''$ 0.1	$E''' > N''N''$ 0.2	
		$G''G'' < E''$ 0.05	$G''G'' < I''$ 0.2	$G''G'' > H''H''$ 0.2
6	23	Nearly dark	$F''F'' < M'''$ 0.05	$F''F'' < E'''$ 0.1
			$Y' > N''N''$ 0.05	$Y' > N''N''$ 0.1
			$O''O'' < N''N''$ 0.15	
		$Y' < F'$ 0.2	Vision excessively bad	

No star visible in bright regions except Trapezium
 yet $A''A''$ is plain & $b''b''$ distinguished without
 difficulty - δ & ϵ are all invisible. The effect of the
 bad vision is to fill up the dark regions with bluish-
 diffused light.

Orion

1863 March 13

Clear - $\text{Th.} + 10^\circ$ (0° at Sunrise) - Although the dome has been open since last night - the definition is as bad as it well could be

In strong twilight

236 = 6 6 $C''C'' > 2'$ 0.1 excruciating vision - comp. thought certain

 $N' = 2''L''$ $R'' = E''E''$ $N'' < N'$ 0.1 $P'' < 2'$ 0.2 $P'' < C''C''$ 0.25 $P'' > M'''$ 0.056 18 $P'' > F''F''$ 0.16 32 $P'' > M'''$ 0.1 $E''' = M''$ $F''F'' = M'''$ $F''F'' = E'''$ $G''G'' < O''O''$ 0.15 $N''N'' > O''O''$ 0.2 $Y' > N''N''$ 0.05 $G''G'' < E'$ 0.15 $G'' < E''$ 0.16 42 $F''F'' < M'''$ 0.05

In a perfectly clear sky, quite dark can barely discern $G''G''$ in finder - E''' M''' P'' $N''N''$ E' $O''O''$ are all comparatively easy

 $N''N'' < M'''$ 0.15

Orion

1863 March 14 (Sat.)

Cold - with thin haze -

236 5 59 No part of nebula visible - $P'' \approx \frac{1}{2}(O' + L')$

$O' < L' \quad 0.4$ $P'' < L' \quad 0.2$
 6 2 $M''' > P'' \quad 0.05$ $F''F'' > M''' \quad 0.1$ $M''' > E''' \quad 0.1$
 $F''F'' > E''' \quad 0.15$ $F''F'' > P'' \quad 0.05$

6 25 Haze thickening $F''F'' > E''' \quad 0.15$ $F''F'' > M''' \quad 0.1$
 $M''' > E''' \quad 0.05$
 $E''' > N''N'' \quad 0.05$

 $G''G''$ is very faint.

$G''G'' < M''M'' \quad 0.2$ $G''G'' < O''O'' \quad 0.3$ $G''G'' < E' \quad 0.3$
 $G''G'' > H''H'' \quad 0.1$ There is very little difference but

 $G''G''$ is the brightest

$G''G''$ is too faint to be compared with $F''F''$ or P''
 or even with $N''N''$

 $G''G'' < E'' \quad 0.2$ $N''N'' > O''O'' \quad 0.15$

Definition pretty good but it clouded gradually by the
 haze thickening until 6^h 40^m Sid when it became too dense
 to observe.

The comparisons I think are good.

$F''F''$ looks brighter tonight
 $G''G''$ " fainter

When by clouds $F''F''$ is reduced to 10^h/11^h mag. as I usually estimate.
 $G''G''$ " 13^h " "

Orion

1863 March 15

Pretty good definition but hazy.

6 40 $\gamma''\gamma'' > M''' 0.15$ $\gamma''\gamma'' > E''' 0.1$ $E''' > M''' 0.05$
 $\gamma'' > P'' 0.1$ $\gamma''\gamma'' < O''O'' 0.2$
 $O''O'' < N''N'' 0.1$ $\gamma''\gamma'' < E'' 0.15$ $E'' < O''O'' 0.1$
 $\gamma' > N''N'' 0.05$ $E' = O''O''$ $E'' < E' 0.1$
 $E'' < D''$ (not fol. dist 3') 0.15

 $\gamma''\gamma'' > H''H'' 0.15$

57

 $H''H''$ is = Z'' a comp of $\gamma''\gamma''$

6 00 $\gamma''\gamma'' < O''O'' 0.3$ clearer than at 6 40 to 6 57

" too faint to compare with P'' or $\gamma''\gamma''$ When best seen $O''O'' < N''N'' 0.05$

$\gamma''\gamma''$ is scarcely brighter than either of the stars in triangle near $\gamma''\gamma''$ of which its comp is the apex

 $\gamma''\gamma''$ was decidedly less than E'' $\gamma''\gamma'' = D''$

Orion

1863 March 16

Haze - Observed through open spaces - fainter stars as $\gamma^{\prime\prime}\delta^{\prime\prime}$ are
are at times bright enough for good comparisons but never clear of haze
Good time $\gamma^{\prime\prime} 30$

$$\gamma^{\prime\prime}\delta^{\prime\prime} = \mu^{\prime\prime}\mu^{\prime\prime} (good) \quad \gamma^{\prime\prime}\delta^{\prime\prime} < \theta^{\prime\prime}\theta^{\prime\prime} \quad 0.1 \quad \gamma^{\prime\prime}\delta^{\prime\prime} = \epsilon^{\prime\prime}$$

$$\gamma^{\prime\prime}\delta^{\prime\prime} < \epsilon^{\prime\prime} \quad 0.15 \quad \epsilon^{\prime\prime} < \epsilon^{\prime} \quad 0.1 \quad \epsilon^{\prime} > \theta^{\prime\prime}\theta^{\prime\prime} \quad 0.1$$

$$\epsilon^{\prime} < \mu^{\prime\prime}\mu^{\prime\prime} \quad 0.15 \quad \mu^{\prime\prime}\mu^{\prime\prime} > \theta^{\prime\prime}\theta^{\prime\prime} \quad 0.15$$

$$\zeta^{\prime\prime}\zeta^{\prime\prime} > \mu^{\prime\prime\prime} \quad 0.2 \quad \zeta^{\prime\prime}\zeta^{\prime\prime} > \epsilon^{\prime\prime\prime} \quad 0.1 \quad \mu^{\prime\prime\prime} = \epsilon^{\prime\prime\prime}$$

$$\zeta^{\prime\prime}\zeta^{\prime\prime} > \rho^{\prime\prime} \quad 0.05 \quad " > \epsilon^{\prime\prime\prime} \quad 0.1 \quad \zeta^{\prime\prime}\zeta^{\prime\prime} > \mu^{\prime\prime\prime} \quad 0.1$$

6 20

$$\mu^{\prime\prime}\mu^{\prime\prime} < \mu^{\prime\prime\prime} \quad 0.05$$

$$\gamma^{\prime\prime}\delta^{\prime\prime} < \epsilon^{\prime\prime} \quad 0.05$$

$$\gamma^{\prime\prime}\delta^{\prime\prime} > \delta^{\prime\prime} \quad 0.1$$

$\gamma^{\prime\prime}\delta^{\prime\prime}$ is certainly brighter than on last evg. relatively to $\mu^{\prime\prime}\mu^{\prime\prime}$ by
1 grade = or 0.1 but it is too faint to be compared with
 $\mu^{\prime\prime}\mu^{\prime\prime}$ $\rho^{\prime\prime}$ or $\mu^{\prime\prime\prime}$.

I should call $\gamma^{\prime\prime}\delta^{\prime\prime} < \mu^{\prime\prime}\mu^{\prime\prime} \quad 0.4$ diff is too great for good comparison
Seen in haze. $\zeta^{\prime\prime}\zeta^{\prime\prime}$: $\gamma^{\prime\prime}\delta^{\prime\prime} = 10-11 \text{ mag} : 13 \text{ mag.}$ of my usual zone scale.
(NB This comparison was made without thought of that of March 14)

Small stars of Nebula

$$\beta > \phi \quad 0.1$$

$$\gamma_1^{\prime\prime} < \phi \quad 0.1$$

This comparison made in haze
& not to be relied upon
visions not suitable for the faint
stars

Orion

1863 March 17

Good definition - not quite clear - Observed through opening in heavy clouds.

EC 5^h 50^m

$$g''g'' < \theta\theta'' 0.05$$

$$f''f'' > M''' 0.1$$

$$f''f'' > E''' 0.1$$

$$E'' > M''' 0.05$$

$$g''g'' > E'' 0.1$$

$$g''g'' = \theta\theta''$$

$$g''g'' < I'' 0.15$$

$$N''N'' > \theta\theta'' 0.1$$

$$Y' = N''N'' \text{ hardly comp.}$$

$$g''g'' < M''' 0.3$$

$$I'' > E'' 0.2$$

$$E''' < D''' 0.15$$

I think $f''f''$ rather fainter - $g''g''$ unquestionably brighter tonight

Looked at faint stars near trapezium. β seems as usual a very little brighter than ϕ or γ_1 . I do not see that the latter has changed certainly though I fancied it a little fainter than usual with reference to γ_4 .

New star of Feb. 20

Looked carefully for the 'new star' ϕ . $H''H''$ thought but was not quite sure that I saw it. $i''i''$, p and o were all visible & must be brighter than the 'new star', unless, as the latter is in a map of nebula centrally placed - the haze in the sky may be more detrimental to its brightness than to that of the others.

Clouded suddenly -

Orion

1863 March 18

G. P. B. St.

Perfectly clear sky

236 6" 12 Broad daylight Stars of Belt barely visible to
naked eye - definition not very good -

$\theta''\theta'' > 2' 0.1$ $\rho'' > \theta' 0.15$ $\rho'' < 2' 0.4$ too large for comp.

6 18 $\gamma''\gamma'' > M''' 0.1$ $M''' = E'''$

6 20 $\gamma''\gamma''$ barely visible $< \theta' 0.2$ $< \rho'' 0.4$

$\gamma''\gamma'' < \theta' 0.1$

$E' < \theta' 0.15$

$E' > \gamma''\gamma'' 0.1$ certain

$\gamma''\gamma'' < \theta' 0.2$

$\theta' = N''N''$

$N''N'' > \theta''\theta'' 0.2$

$\gamma''\gamma'' < \theta''\theta'' 0.1$

$N''N'' > \gamma' 0.05$

$\gamma''\gamma'' = E''$

$N''N'' < \gamma''\gamma'' 0.3$ or 0.4

$N''N'' < M''' 0.2$

Comparisons with θ' were made before the light of nebula had become strong though it may have been at the last a little enfeebled.

Later in evg. when nearly dark looked for 'new' star but no trace could be seen - Comp. of $\gamma''\gamma''$ readily seen also $\rho < \theta$

δ is $< \gamma$ $\alpha < \epsilon$ = faint star ϵ of Jan 9 -
all easily seen.

Nearly dark - $\gamma''\gamma'' = E''$ $\gamma''\gamma'' = M''M''$ $M''M'' < \theta''\theta'' 0.1$

$N''N'' > \gamma' 0.05$

$E' < \theta''\theta'' 0.05$

$I'' > E' 0.1$

$I'' > \theta''\theta'' 0.05$

$\gamma''\gamma'' > H''H'' 0.2$

$\gamma''\gamma'' > M''' 0.15$

$M''' = E'''$

β, ϕ etc well seen of usual rel. brightness

$\beta > \phi$ just perceptibly

$\phi = \alpha_1$

$\alpha_1 > \alpha_2$ or

α_1 maybe a little $> \rho$ say 0.05

I cannot make $\gamma''\gamma''$ as faint as $H''H''$. but T. H. S. makes $\gamma''\gamma'' = H''H''$

Orion

1853 March 18

J. H. S. observes

sky nearly dark.

$$\theta''\theta'' = H''H''$$

$$\theta''\theta'' < N''N'' 0.3$$

$$\theta''\theta'' < O''O'' 0.15$$

$$N''N'' > O''O'' 0.2$$

Is sure that $\theta''\theta''$ has not been est. too faint

$$\theta''\theta'' > M''' 0.15$$

$$\theta''\theta'' > E''' 0.15$$

$$\theta''\theta'' = A''H''$$

Zero of Position (copy)

1863 March 2
1850.

See Feb 23 for notation

The micrometer has been taken off.

Star - 1101 Aug 1st 11 30 - 4°

α	R	R'	θ	θ'	T'
26529	66.106	66.780	1.5	9.2	264 40
"	66.281	66.698	2.3	9.2	47
"	66.250	66.896	2.2	9.2	57
263 25.5	67.088	66.288	2.1	9.0	44
"	67.080	66.582	2.5	6.3	59
"	67.100	66.443	2.3	9.0	41

Wires - 1101 Aug 0.3 20 - 8° Lynd 7.996 2011.1721 $\frac{15}{25.1}$ and 0.181
9.819

α	R	R'	$T-T'$	$\Delta R-T-T'$	$\Delta R-R'$	T'
263 17	66.066	66.768	25.5	1398	9350	2625 58.6
"	66.080	66.283	24	1380	9307	55.0
"	66.050	66.202	31.5	1498	9546	57.7
262 18.5	66.486	66.024	30	1477	9663	263 2.3
"	66.500	65.040	32	1505	9663	51.3
"	67.215	66.900	19	1279	9512	262 57.2
						262 55.7

Orion

1862 March 19

Sky clear - definition not good -

236	6	23	$M''' = F'$	$O''E'' > 2' 0.1$	$2' > P'' 0.25$
			$M''' < P'' 0.05$	$F''F'' > P'' 0.1$	$F''F'' > M''' 0.15$
			$g''g'' > H''H'' 0.05$		
6		30	$g''g'' < E' 0.15$	$F''F'' > F' 0.2$	$F''F'' > E''' 0.15$
			$E''' = M'''$	$P'' > E''' 0.05$	$g''g'' = E''$
6		39	$g''g'' < O''O'' 0.2$	$O''O'' < N''N'' 0.2$	
			$g''g'' = H''H''$	$g''g'' > M''M'' 0.05$	
			$Y' < N''N'' 0.05$		
6		43	$F''F'' > M''' 0.2$	$F''F'' > F' 0.15$	$N''N'' < M''' 0.2$

On my ordinary zone scale $F''F'' = 9-10$ to 10

			$g''g'' = 11-12$ to 11		
6		54	$g''g'' > H''H'' 0.1$	$g''g'' < O''O'' 0.1$	$g''g'' > E'' 0.05$
			$E''' < D''' 0.1$		

From atmospheric disturbance

Is not always visible but $b''b''$ always easily seen

Orion

1863 March 20

Rather low. Hazy.

236 = 8 55

$$g''g'' < o''o'' 0.05$$

$$n''n'' < o''o'' 0.1$$

$$y' > n''n'' 0.05$$

$$E'' < I'' 0.15$$

$$g''g'' > E'' 0.05$$

$$o''o'' < n''n'' 0.2$$

$$F''F'' > n''' 0.1$$

$$g''g'' > H''H'' 0.2$$

$$g''g'' > m''m'' 0.05$$

$$F''F'' > E''' 0.05$$

$$g''g'' < n''n'' 0.3$$

Nebula is too low in haze for very satisfactory comparison.

G. H. S. Obs

$$g''g'' > H''H'' 0.3$$

$$> H''H'' 0.2$$

$$g''g'' < \left(\frac{1}{2}(H''H'' + n''n'') \right) 0.05,$$

$$g''g'' < F''F'' 0.3$$

$$F''F'' > n''' + 0.1,$$

$$F''F'' = E'''$$

$$g''g'' < o''o'' 0.3$$

End at 9^h 20 m ±

$$o''o'' = n''n''$$

$$o''o'' < n''n'' 0.05$$

Orion (New Star of Feb 20)

1863 March 22

Clear Fine night - definition not very good

δ ϕ γ , γ_1 and ρ as usual γ_1 nearly as bright as δ
 Latin ξ π ψ γ general order of brightness
 ξ ϵ γ 25 $g''g'' < O''O''$ 0.05 $g''g'' < E'$ 0.05 $O''O'' > E'$ 0.05
 $g''g'' > E''$ 0.05 $E'' < O''O''$ 0.1 $E'' < E'$ 0.1
 $E'' < I''$ 0.15 $E'' > g''g''$ 0.15
 $N''N'' > O''O''$ 0.05 $Y' > N''N''$ 0.05 $g''g'' < N''N''$ 0.15
 $F''F''$ is small
 $F''F'' < M'''$ 0.05 $F''F'' < E'''$ 0.1 $F''F'' = N''N''$
 $F''F'' > N''N''$ 0.05 $E''' > M'''$ 0.1 $E''' > g''g''$ 0.1
 $M''' > g''g''$ 0.05 $g''g'' > H''H''$ 0.25

Ended at 8^h m.s.t. $F''F''$ has certainly diminished

New star to night certainly seen - not as easily as comp of $g''g''$ & just as easily as small star nearest to $H''H''$ in same R 3 of it 40" I should have no doubt at all of its having become much fainter since Mar. 2 if it were not for its situation in the dense neb. of deep branch. & that we have had no really good vision for a week or two past

 $\delta < \xi 2 \epsilon$ decidedly 0.1 $\delta = \eta$

The small star towards L''' from O''' is surrounded by ^{noticably} conspicuous brightening of nebulaosity.

g'' always of late & perhaps this whole season has been 16th or 17th mag

Orion

1863 March 23

Have - strong twilight
 EC 7^h 00 $\theta''\theta''$ decidedly brighter $\gamma''\gamma''$ faint

$$\theta''\theta'' > \theta''\theta'' 0.1 \quad \theta''\theta'' = \eta''\eta'' \quad \eta''\eta'' > \theta''\theta'' 0.15$$

$$\theta''\theta'' < \gamma''\gamma'' 0.05 \quad \gamma''\gamma'' < \eta''\eta'' 0.1 \quad \gamma''\gamma'' < \epsilon''\epsilon'' 0.15$$

$$\gamma''\gamma'' > \iota'' 0.05 \quad \theta''\theta'' > \iota'' 0.05 \quad \theta''\theta'' < \gamma''\gamma'' 0.05$$

$$\theta''\theta'' > \epsilon'' 0.1 \quad \epsilon'' < \iota'' 0.15$$

As $\theta''\theta''$ & $\gamma''\gamma''$ grew faint by passing clouds
 watched them closely & found $\theta''\theta'' = \gamma''\gamma''$
 7. 25

Comparisons were considered reliable although sky was
 not at all clear. occasionally stars of 14th or 15th were in sight
 however.

Orion

1863 March 26 Ths

286 6 50 6th star visible < 5th 0.1 5th = 2' 6th > 0'

C'' > 2' 0.1

55

g''g'' = 0'

g''g'' = N''N''

g''g'' > E' 0.2

g''g'' < P'' 0.1

g''g'' < F''F'' 0.05

F''F'' < M''' 0.1

E''' < M''' 0.05

P'' = M'''

F''F'' < P'' 0.1

7 10

g''g'' > N''N'' 0.1

g''g'' > N''N'' 0.2

g''g'' > I'' 0.2

g''g'' much increased
 of g''g'' to N''N'' was very evident

As sky grew darker the superiority

7 15

7 15 50 g''g'' > N''N'' 0.25

F''F'' < M''' 0.1

Orion

1863 March 27

236 = $7^h 5^m$ Clear good definition Strong twilight
 6^{th} Star = $0'$ nearly or quite

$$g''g'' < \gamma''\gamma'' 0.1$$

$$\gamma''\gamma'' < M''' 0.3$$

7 9 was surprised to see $\beta, \phi, \gamma, \rho, \alpha, \gamma_4$ all easily
 Before the form of bright triangle of Nebulosity
 could be clearly made out

7 15 σ is easily seen as bright as ϵ
 $\rho = 6''6''$

$$7 \quad 18 \quad g''g'' = 0' \quad g''g'' > N''N'' 0.15 \quad N''N'' > \gamma' 0.05$$

$$N''N'' > O''O'' 0.15 \quad \gamma' < g''g'' 0.2$$

$$7 \quad 22 \quad g''g'' = \gamma''\gamma'' \quad E''' < M''' 0.1$$

$$7 \quad 28 \quad g''g'' > I'' 0.2 \quad I'' < N''N'' 0.05$$

T.H.S. obsd

$$g''g'' > N''N'' 0.15$$

$$g''g'' < \gamma''\gamma'' 0.05 \quad \gamma''\gamma'' < M''' 0.2$$

$$E''' > M''' 0.45$$

$$E''' < D''' 0.2$$

$$E''' > \gamma''\gamma'' 0.25$$

$$\gamma''\gamma'' < N''N'' 0.2$$

$$\gamma''\gamma'' > O''O'' 0.1$$

G.P.B. 7 40 $E''' < D''' 0.2$ $E''' < M''' 0.1$ cannot make
 it = much less $> M'''$ as Mr Safford has
 $\gamma''\gamma'' < E''' 0.1$ barely $E''' > g''g'' 0.1$

δ looks brighter $\delta > \epsilon 0.2$ δ is as bright as
 either β or ϵ

Order of mag $\beta, \phi, \alpha, \gamma_4$ nearly equal - β a little the largest
 ρ may be $> \gamma_4 0.05$ σ fainter than γ_4
 τ is at times seen

Under pretty good definition no trace of new star near $H''H''$ although
 comp. of $g''g''$ was easily seen as well as $\rho = 0$ - the star near $R\delta$
 $H''H''$ south of it $40''$ barely by glimpy. If new star were not situated
 in nebulosity should be certain of its change

Orion

1863 March 29

EC 7^h 40^m Clear - not good definition - bright moonlight
 $N''N'' < Y' 0.05$ $N''N'' > O''O'' 0.15$ $N''N'' < S''S'' 0.1$
 $S''S'' = Y'$ $S''S'' > I'' 0.1$ $S''S'' > E' 0.15$

$F''F''$ very much diminished

$F''F'' < M'''$ too small to be compared
 $F''F'' < M''M'' 0.1$ $F''F'' < E''$ (not E''') 0.15
 $F''F'' > H''H'' 0.15$ $F''F'' < O''O'' 0.3$ $F''F'' > H''H'' 0.1$

$E'' < M''' 0.15$ $E'' < O''O'' 0.05$ $I'' < N''N'' 0.05$
 $I'' > E' 0.05$ $F''F'' < E' 0.2$ $M''' < P'' 0.1$

$M''M'' < O''O'' 0.1$ $F''F'' < M''M'' 0.15$

$M''' = C^A$ $E''' < D'' 0.15$ $M''' < D''' 0.1$
 $M''' > E''' 0.1$

EC 8 15

The diminution of $E''F''$ is very striking it is now only 11th 12th mag of my zone scale & far too faint to be compared with M''' by grades or even with $S''S''$ safely

Orion

1863 March 30

236 7^h 30^m

$\delta''\delta'' < \lambda''\lambda'' \quad 0.1$

$\delta''\delta'' > \theta''\theta'' \quad 0.1$

$\zeta''\zeta'' < \theta''\theta'' \quad 0.1$

$\lambda''\lambda'' = \gamma'$

$\delta''\delta'' = \iota''$

$\zeta''\zeta'' < \delta''\delta'' \quad 0.2$

$\lambda''\lambda'' > \theta''\theta'' \quad 0.15$

$\delta''\delta'' > \epsilon' \quad 0.1$

$\epsilon''' < \lambda''' \quad 0.1$

$\delta''\delta'' < \iota'' \quad 0.05$

$\zeta''\zeta'' < \delta''\delta'' \quad 0.2$

$\zeta''\zeta'' > \eta''\eta'' \quad 0.15$

$\zeta''\zeta'' < \epsilon'' \quad 0.05$

$\zeta''\zeta'' < \theta''\theta'' \quad 0.15$

$\epsilon''' < \delta''' \quad 0.15$

$\delta''\delta'' < \lambda''\lambda'' \quad 0.1$

$\zeta''\zeta'' < \lambda''\lambda'' \quad 0.1$

$\delta''\delta''$ evidently fainter tonight

The difference between $\zeta''\zeta''$ and λ''' is now about that between 10^{th} & 12^{th} mag of my zone scale

As to ρ as usual for brightness

Have looked for new star near $\eta''\eta''$ on every opportunity but it cannot be seen though comp of $\delta''\delta''$ or ι'' are not difficult - However - we have had no dark skies - clear & of good definition -

Orion

1863 April 1st

Some Birrus - Not good definition Bright Moonlight

JHS. Obs

Sid. 7 45

$\beta^{\circ}\beta^{\circ} < \lambda^{\circ}\lambda^{\circ} .15$

$\beta^{\circ}\beta^{\circ} > \theta^{\circ}\theta^{\circ} .1$

$\beta^{\circ}\beta^{\circ} < \gamma^{\circ}\gamma^{\circ} .2$

$\gamma^{\circ}\gamma^{\circ} < \mu^{\circ}\mu^{\circ} .3$

$E^{\circ} = \mu^{\circ}$

$E^{\circ} < D^{\circ} .2$

$\gamma^{\circ}\gamma^{\circ} < E^{\circ} .2$

$\beta^{\circ}\beta^{\circ} < \gamma^{\circ}\gamma^{\circ} .1$

$\gamma^{\circ}\gamma^{\circ} < \lambda^{\circ}\lambda^{\circ} .1$

C.P.B. Obs.

8 10

$\beta^{\circ}\beta^{\circ} > \gamma^{\circ}\gamma^{\circ} .05$

$\beta^{\circ}\beta^{\circ} < \lambda^{\circ}\lambda^{\circ} .15$

$\beta^{\circ}\beta^{\circ} > \theta^{\circ}\theta^{\circ} .1$

$\lambda^{\circ}\lambda^{\circ} > \theta^{\circ}\theta^{\circ} .2$

$\lambda^{\circ}\lambda^{\circ} = \gamma^{\circ}$

$\gamma^{\circ}\gamma^{\circ} > \theta^{\circ}\theta^{\circ} .05$

$\gamma^{\circ}\gamma^{\circ} < \lambda^{\circ}\lambda^{\circ} .2$

$\beta^{\circ}\beta^{\circ} < I^{\circ} .15$

$\beta^{\circ}\beta^{\circ} > E^{\circ} .2$

8 30

$I^{\circ} > E^{\circ} .2$

$\gamma^{\circ}\gamma^{\circ} < \beta^{\circ}\beta^{\circ} .1$

$E^{\circ} < D^{\circ} .2$

$\gamma^{\circ}\gamma^{\circ}$ too small for Comparison with μ° - Though it is perhaps brighter than on 30th

 $\beta \phi \rho$ as usual

I think that E° is fainter than it used to be. it is now certainly much $< \mu^{\circ}$ See Feb. 20

Orion

1863 April 2

Observed through clouds

δ to (about) $\gamma''\gamma'' > \theta''\theta''$ 0.05 $\gamma''\gamma'' < \eta''\eta''$ 0.15 $\gamma''\gamma'' < \zeta''\zeta''$ 0.05
 $\gamma''\gamma'' < \iota''$ 0.05 $\zeta''\zeta'' = \theta''\theta''$ $\gamma''\gamma'' > \zeta''\zeta''$ 0.05
 $\mu''' < \epsilon'''$ 0.05 $\epsilon''' < \delta'''$ 0.05 $\rho'' > \mu'''$ 0.1
 $\rho'' > \epsilon'''$ 0.1 $\gamma''\gamma'' = \epsilon'$

 ϵ''' looks brighter - $\zeta''\zeta''$ is much too faint to be compared with ϵ'''

Orion

1863 April 3 (Friday)

20 7 50

$$\theta''\theta'' < 0' \ 0.1$$

$$\theta''\theta'' < \eta''\eta'' \ 0.1$$

$$\theta''\theta'' > 0''0'' \ 0.1$$

$$2' < \theta''\theta'' \ 0.1$$

$$E'' < \eta'' \ 0.05$$

$$F''F'' = \theta''\theta''$$

$$2' > P'' \ 0.2$$

$$\eta''\eta'' > 0''0'' \ 0.15$$

$$\eta'' < P'' \ 0.1$$

Comparison - Stars

163.14h11
1915.

Confusion in original record

a	2.6	2.8	10	10	20.9	25.0
b	2.36	2.38	13	13.8	17.7	
c	1.30	1.31	14	3.2	7.2	
d	10.1	1	16	13.5	17.7	
e	10.1	1	17	46.4	52.74	
			18	55.8	62.8	

17	46.4	52.4
18	55.8	62.8
20	10.9	14.9
21	0.3	4.3

a	1.46	1.48	10	20	10.9	14.9
b	1.9	1.11	21	0.3	4.3	
c	9.39	9.40	24	42.6	47.5	
d	8.545	8.585	25	49.2	53.2	
e	9.18	9.19	27	1.2	5.2	

Stars for Lytic

Wife
Wife.
B.
H.C.
Obs. at Bonn

a	1.355	1.37	10	30	15.6	22.6
b	0.59	1.0	31	5.0	12.0	
c	9.28	9.28	34	57.1	55.3	
d	8.43	8.12.5	35	56.8	0.8	
e	9.4	9.25	10	37	8.9	12.8

a	8.50	8.52	11	9	21.0	25.1
b	5.52.5	5.58.5	11	33.7	37.7	
c	1.49	1.51	14	36.2	40.2	
d	10.12.5		11	16	39.1	43.1
e	7.45.5	7.20	18	52.2	55.8	

Star c

" d

B.A.

d-e	+2	12.88	-2	55.0	21.2
Sum				+0.7	
d-b	-3	2.50	+4	5.0	41.1
				-1.0	

2-2	32.65	+7	54.0	2-1	-1	12.40	47
	32.65		62.5			12.00	010.5
	32.60		57.8			12.05	21.5
2-3	3	43.20	+6	80.5	-1	12.15	001.0
	43.25		28.5			1	5.65
	43.20		28.5			5.60	44.6
							0 43.9

(250)	1	32.63	+7	52.8
		Temperature		-2.0
	3	43.23	+8	29.2
		Temperature		-2.1

Mars II 516

11 28 21.03

1 53.93

II 534

29 10.73

1 53.92

1862.0 c'

11 30 14.96

+ 4 32.13

c''

31 4.65

+ 3 43.23

2

35 53.61

- 1 0.62

c'c'' & wt. each

11 34 47.85

+ 2 54 19.8

- 12 65.4

53 42.5

- 12 15.7

-0.02 +2 42 4.4 +0.9

+ 7 50.8

-0.02 41 26.8 -0.9

+ 8 27.1

49 12.1

+ 0 43.4

+2 49 55.0

1862.5

5°

+2° 46.20 +2° 47.58

20

11 29 18.0 11 30 47

50°

8.68990 8.68829

100°

9.12566 9.11385

1.69424

2.87043

100°

9.99609 9.99602

9.50990 9.49668

113.61

0.32

0.31

$$-0 + \frac{c'c''}{2} = 1.02 + 8.1$$

~~parallel~~ = 0.

~~parallel~~
~~parallel~~

The reduction of c-c', c-c''
 etc. to 1862.0 is utterly
 impossible.

Sirius - Orion Auroral arch

1863 April 9

Clear & fine
Saw companions of Sirius distinctly

8^h 15^m Sid
Taken with difficulty
bad obs.

Dist
62.34
Zero 61.36
 $9.8 - 0.2 = 9.6$

Ang. pos readings
90° 28'
88 52
91 12
32
90 10.7
82 59

Zero Wires

55"

8^h 20^m Sid
about

$\gamma''\gamma'' < \eta''\eta''$ 0.2	$\eta''\eta'' = \theta''\theta''$	$\eta''\eta'' < \nu''\nu''$ 0.15
$\gamma' > \theta''\theta''$ 0.2	$\gamma' > \nu''\nu''$ 0.05	
$\gamma''\gamma'' > \mu''\mu''$ 0.05	$\gamma''\gamma'' < \theta''\theta''$ 0.1	$\eta''\eta'' < \delta''$ 0.05
$\eta''\eta'' > \epsilon''$ 0.1	$\eta'' > \epsilon''$ 0.2	$\epsilon'' < \mu''\mu''$ 0.05
$\epsilon'' < \epsilon'$ 0.1	$\gamma''\gamma'' > \epsilon''$ 0.1	
$\epsilon''' > \mu'''$ 0.05	ϵ''' White	μ''' golden or orange $\gamma''\gamma''$ yellow

8 45 "

Nebula

Could not see new star

R & γ'' as usual

April 9 At 9 to 10 P.M. Remarkable auroral display -

At 9^h 00^m (just as bells were ringing) I found that the very bright band stretching from E to W horizon nearly passed centrally through our zenith & 4° S. of Arcturus. It was 4" dist from Arcturus but I cannot recall on which side. The zenith obs is certain. An hour later it was much fainter & had passed to south.

By Dr Perkins obs its dec. on merid. at 9^h 00^m Newburyport was +23°
By Camb. obs " 9 00 Camb. +47

Di.

24°

NP This arch was precisely in Zenith at Cambridge at 9^h 00^m very distinct Bell was ringing for time at the moment. G.P.B.

AN AURORAL ARCH of intense brightness spanned the heavens last evening as the bell was ringing for 9 o'clock, equalled only during our remembrance by that of Aug. 1827. Starting from a point just above the horizon not far from due East, it enveloped the star in the right knee of Bootes, passed amid the stars in the Sickle, or the head and neck of Leo, thence enveloping Castor and Pollux, covering the space between the feet of the Twins, swerving thence a little to the northwest between the heads of Orion and Taurus, until it faded from view.

The arch was about 8° in width, remarkably well defined, though not so sharply so as that in 1827. It gradually moved to the South at the rate of about 8° or 10° in 20 minutes, when it broke up into wisps of light strikingly resembling those seen in the tail of Donati's comet, and so beautifully and truly represented in Prof. Rond's drawing of that body. P.

These stars Dr. P. afterwards explained to me as northern stars comprising blades of sickle. Dec +23°

Dimensions of Dome

1863 April 11

Found by trial, bringing the 23rd (22.5) into various positions, that leaving all the machinery precisely in its present condition no considerable increase of focal length could be made without increasing the chances of the object or eye end coming within range of some obstacle.

The present d.t.

section of p
section to
end now
by 4ⁱⁿ in
would clear
all parts of
machinery
certainly me

B^oD

Prof. Winlock.

Observatory.

the line is below it just touches the lower chains & barely clears the uprights holding the crank. so that no considerable lengthening would be desirable without altering machinery.

The following changes are practicable & all could be carried out on an emergency viz.

Frame for chains set back to clear roller guides	0.1	
Possible change of roller-guides (expansion)	0.4	0.5
Frame for chains bent to give room for chain		0.6
Chain rails moved out nearer frame clearing crank		0.4
Raising front wheels of chain 4/10 ft canting tops back	0.5	
Possible extension of eye end from Dec axis	2.0	eye end
Object end by removing crank frame & roller guards as above could be brought up to chain roller frames.	0.5	Object end
Upper part of dome say 4 ⁱⁿ & by putting chains in box outside of dome could be brought to eye	2.5	Total

Dimensions of Dome

1863 April 11

Found by trial, bringing the 23rd (22.5) into various positions, that leaving all the machinery precisely in its present condition no considerable increase of focal length could be made without increasing the chances of the object or eye end coming within range of some obstacle.

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ms for chains by
near horizon

Tab line 2 below it just touches the lower chains & barely clears the uprights holding the crank. so that no considerable lengthening would be desirable without altering machinery.

The following changes are practicable & all could be carried out on an emergency viz.

Frame for chains set back to clear roller guides	3 ^{ft} 0.1	
Possible change of roller-guides (expansion)	0.4	0.5
Frame for chains bent to give room for chain		0.6
Chain rails moved out nearer frame clearing crank		0.4
Raising front wheels of chain 4/10 ft canting top back		0.5
Possible extension of eye end from Dec axis		2.0 eye end
Object end by removing crank frame & roller guards as above could be brought up to chain roller frames	0.5	
Upper part of dome say 4 ⁱⁿ & by putting chains in box outside of dome could be brought to eye	2.5	
		Total

Dimensions of Dome

1863 April 11

Found by trial, bringing the 23rd (22.5) into various positions, that leaving all the machinery precisely in its present condition no considerable increase of focal length could be made without increasing the chances of the object or eye end coming within range of some obstacle.

The present distance of front of object-glass to intersection of polar & dec. axis is 13^{ft} 7ⁱⁿ & from this intersection to focus 8^{ft} 11ⁱⁿ.

The front of cell of object end now clears, the roller-guides for checking oscillations by 4ⁱⁿ in all positions tried. & if these were removed would clear the cog-work by 2 inches more. It clears all parts other obstructions by more than 6ⁱⁿ excepting the machinery for shutters - i.e. the roller frames for chains by certainly more than 4ⁱⁿ but at depressions near horizon the line & below it just touches the lower chains & barely clears the uprights holding the crank. so that no considerable lengthening would be desirable without altering machinery.

The following changes are practicable & all could be carried out on an emergency viz.

Frame for chains set back to clear roller guides	8 ⁱⁿ 0.1	
Possible change of roller-guides (expansion)	0.4	0.5
Frame for chains bent to give room for chain		0.6
Chain rails moved out nearer frame clearing crank		0.4
Raising front wheels of chain $\frac{4}{10}$ ft canting tops back		0.5
Possible extension of eye end from Dec axis.		2.0 eye end
Object end by removing crank frame & roller guards as above could be brought up to chain roller frames.	} 0.5 Object end	
Upper part of dome say 4 ⁱⁿ & by putting chains in box outside of dome could be brought to cog		
		2.5 Total

Dimensions of Dome (Cont.)

It would therefore be possible to get into the dome & use with safety a glass of $2\frac{1}{2}$ ft focal length - of this say $\frac{9}{10}$ of a foot might be possible effected at eye-end at cost less than \$100 by canting back top of chair and setting rails back close to shutter-crank-screw. The other changes would cost \$1000 at least & probably more.

I think $\frac{2}{10}$ foot - might safely be added to object end or in all 1 foot to focal length for alterations of less than \$100 cost. The other $1\frac{1}{2}$ ft would require \$1000 at least for alterations.

By proper adjustment of tube additional weight of counterpoises might be avoided

Dome - Diameter of 30 ft interior of wood work

30 ft

Deduct for cog-work

$$2 \times 4'' = 8''$$

" roller guards (each) 2×2

$$4''$$

$$\frac{1}{29}$$

Effective diam.

The center of Tube is $1\frac{8}{10}$ feet from center of polar axis.

Total length including eyepieces 23 ft.

$$\frac{1}{f} = \text{Ratio of Aperture to focal length} = \frac{14.95}{22.5 \times 12} = \frac{10}{181} \quad \text{Same as Poulkova}$$

Pleyst's dialytic	$\frac{1}{f}$	$\mu = 10.4$	} From Dr. O'Brien Poulk. Obs p. 126
Small diaphragm	$\frac{1}{f}$	$\mu = 10.5 - 12$	
Vertical circle Poulkova	$d = 5.9$	$\mu = 13.1$	
Prime vertical "	$d = 6.25$	$\mu = 14.2$	
Dorpat Eq	9.6	$\mu = 17.1$	
Great Eq Poulkova	14.95	$\mu = 18.1$	

Orion

1863 April 13th, 14th

Clear & Fine

Orion Nebula

δ 55 + 1^m Sid - $g''g'' = M'''$ $g''g'' > N''N''$ 0.2 $N''N'' \sim \gamma'$
 $N''N'' > O''O''$ 0. $g''g'' > F''F''$ 0.25 $g''g'' < P''$ 0.05
 $g''g'' > F'$ 0.05 $g''g'' > F'$ 0.1 $F''F'' < M'''$ 0.15
 $E''' > D'''$ 0.05

$g''g''$ has become quite bright I do not doubt that E''' has
 become brighter - its light is white

C.P.B.

April 14th

Clear & Fine

$g''g'' > P''$ 0.05 $g''g'' > P''$ 0.1 $g''g'' > M'''$ 0.05
 $g''g'' > N''N''$ 0.3 $g''g'' > F'$ 0.15 $F''F'' < N''N''$ 0.05
 $E''' = D'''$ $E''' > P''$ $E''' > M'''$ 0.1 $M''' = P''$
 $N''N'' > \gamma'$ 0.05 $F''F'' < M'''$ 0.2
 $g''g'' > P''$ 0.1 $g''g'' < L'$ 0.1

$\beta > \phi > \gamma_1$ just perceptibly but probably owing to confusion of
 images nebula being low

$$g''g'' = E'' \quad g''g'' = M''M''$$

$$M''M'' < 0''0'' \quad 0.1$$

$$M''M'' > X' \quad 0.05$$

$$E' < 0''0'' \quad 0.05$$

$$I'' > E' \quad 0.01 \quad I'' > 0''0'' \quad 0.05$$

1862phae.proj...203B