

KG  
11366  
v. 301



Reduction of photometric observations in this book, so far as previously made in the book (except for photometer M) checked by Miss Saunders, Dec., 1878. List of errata found by her pasted below.

No 48					
Changes made		Drill understand			
Page	by me			Page	
27	9 20	9. Eclips	Phot. R. 38	39 + 40	
28	23 53	Eclipse	Reductions	45 - 51	
31	5 46	Hydrat. K.	Phot. R. 54 + 55		
36	8 38	Hydrat. K.	transits	63 - 78	
104	6 48	Phot. K.	Reductions	82 - 87	
109	11 13	Eclipse	transits	114 - 118	
121	7 37	Zero K.	transits	123 - 126	
128	4 37	Hydrat. K.	transits	149 + 150	
"	4 41	Zero H.	transits	156 - 163	
"	4 50	Zero H.	transits	188 - 191	
122	8 21	Phot. K.	transits	204 - 208	
136	7 33	Phot. K.	Phot. M.	211 + 212	
142	21 39	Eclipse	transits	214	
143	47 2	Eclipse	transits		
145	9 18	Hydrat. K.			
172	6 54	Hydrat. K.			
179	8 44	Zero K.			
195	9 1	Phot. K.			
203	255 0	no correction			
57	no correction				

175	m	Nov. 15	$\beta$ Centauri
193	Le	Nov. 26	Pro. Eran
203-5	m	Nov. 30	$\beta$ Centauri
207-8	"	Dec 1	"
211	"	"	"





Oct 15, 1878.

Dome opened at 5<sup>30</sup>

F. 3451

19<sup>h</sup> 47<sup>m</sup> 2<sup>s</sup>.5

19<sup>h</sup> 48<sup>m</sup> 2<sup>s</sup>.5

B. 394

0

6

10

0

6

14

14.4

23

41.5

6

37

55.9

13

38

5

F. 3451

20

16

0

Predicted reappearance

Constant of photometer I.  
Jupiter; hole R 3.

6 30

1.80

l. obs.

1.53

1.28

1.16

1.42

1.438



2

Oct. 15, 1878

6 35

Limit of Visibility

S. obs. Jupiter

.64

.65

.56

.84

.53

---

.644

Set at .65

7.3457

Reappearance of Jupiter II

20 14 52

Suspected

S. obs.

15 3

Surely visible.

12

.55

24

.72

37

.64

57

.81

Delayed by dropping lantern

16 57

2.02

17 19

2.57

53

2.26

18 15

2.60

45

2.63

19 8

2.88

This is  
2.68 on the sheet.

29

3.02

52

3.21

20 17

2.79

38

2.78

1507

21 1

3.27

3014

22

3.02

47

2.77

22 23

2.50

44

3.27

1446

23 4

2.90

2892



F 3451  
B 3941

20 29 <sup>5</sup>9.5  
0

20<sup>L</sup> 33<sup>m</sup> 10<sup>S</sup>  
6 55 0

3

Oct. 15, 1878

Constant of photometry I. Jupiter & hole R3  
U. obs.

8 10

1.20

1.58

1.31

1.26

1.31

1.332

8 16

1.26

1.16

1.23

1.19

1.48

1.264

P. obs.

U. looked carefully for Minimas  
& Hyperion; neither was seen.  
Jupiter.

8 47

1.43

1.10

1.06

0.95

0.91

1.090

U. obs.



8 53

Japetus

Obs. 15, 1878  
S. obs.

2.01

1.44

1.76

1.20

1.50

1.582

9 0

9 m.

2.42

S. obs.

2.07

1.71

2.12

2.31

2.126

9 2

11 m.

S. obs.

1.06

0.95

1.01

1.00

0.93

0.990

9 5

11 m.

P. obs.

.85

.81

.77

1.07

1.02

0.904

Oct. 15, 1878

$\epsilon$  Ursa Majoris =  $\gamma$  Cygni S.  
 $\pi$  Herculis =  $\epsilon$  Herculis =  $\delta$  Cygni S.

9 8

Japetus

P. obs.

1.40.

1.44

1.44

1.76

1.52

1.512

P. looks for Hyperion, fails to see it.

9 18

11 magn. star

0.69 U. obs.

0.77

0.68

0.73

0.78

3.65

0.730



Oct. 15, 1878

$\gamma$  Andromeda      Phot. O.  
S. obs.

9 30

Coincidence of Spectra

302.4

302.4

279.5

278.7

295.0

---

 271.4 - limit on one side

306.3 - " " other side

---

 288.8

90

18.8

Set at 19

Red

S. obs.

9 40

116.2

26.9

143.1

294.2

29.5

323.7

877.2

56.4

438.60

28.20

21930

14.10

9 41

Yellow

S. obs.

117.1

26.2

143.3

293.5

30.5

324.0

• 877.9

56.7

438.95

28.35

219.47

14.17

Oct. 15, 1878

7

Green S. obs.  
 9 42  
 114.3 31.1  
 145.4  
 291.3 35.1  
 326.4  
 877.4 6.2  
 4387 33.1  
 219.35 16.55

Blue. S. obs.  
 9 43  
 110.4 41.3  
 151.7  
 288.4 37.8  
 326.2  
 876.7 79.1  
 43835 39.55  
 219.17 19.77 New focus.

Indigo. S. obs.  
 9 48  
 86.2 76.8  
 163.0  
 275.5 72.5  
 348.0  
 872.7 9.3  
 436.35 74.65  
 218.17 37.33

Transits to identify Pallas (2).  
 Comp. star

Magn.	Decl.	Time
9	0	0.0
9	-2.5	5.2
10	+20	38.0
11	0	51.7
Pallas	10	62.0
	21	91.8
	22	95.4



Oct. 15, 1878  
Transits, continued

	Asteroid	Star
24.4	24.4	0.0
24.7	32.7	8.0
<u>24.5</u>	40.8	16.3
24.50	8.3	—
	8.0	—
	8.1	—
	8.3	—
	8.20 = interval space = 5'	—

1 space = 8.17 on avg. = 135" 2.25

Seeing (L) 6, 6, 4,  
(P.) 6, 8, 6,

Oct 15, 1878

Opened dome at 3.30

Jupiter seen at 4.30 through alluvial clouds.  
At 4.40 satellites I & II seen, cloud partly off  
at 4.47 Jupiter seen with naked eye  
Satellites seen with Phot II and measures  
could have been obtained of the eclipse of III  
had it been clear.

Eclipse Jupiter III

16	7	46	10
		23	41
8	9	51	
		76"	

67 46 149



9 73

I			II		
16	7	46.2	16	7	46.2
15	12	39.7	15	2	7.5
17		6.5	1	5	38.7
		63"			142
		67"			149"

6 15

②  $\alpha = 22^h 45^m$   $\delta = 7^\circ 53'$   
 $\lambda$  Aquor.  $\alpha = 22 46$   $\delta = 8 13$   
 ② pr.  $\lambda$  Aquor.  $1^m$   $\delta$  is n. of it  $20'$



Oct. 16, 1878

constant Phot I and Hole R. 3 - Jupiter  
S. obs.

6 43

1.83

1.77

1.70

1.84

1.66

1.760

6 49

1.46

1.44

1.23

1.26

1.16

1.310

P. obs.

6 53

1.26

1.26

1.55

1.18

1.34

1.318

u. obs.

710

Jupiter

Oct. 16, 1878  
Urb.

1.90

1.69

1.58

1.72

1.62

351

1702

720  $\beta$  ~~Ursae~~ =  $\epsilon$  Cass.  $\beta$   
 2 ~~Ursae~~ ~~Mag~~ =  $\gamma$  Cass  $\beta$

720

$$\begin{array}{r} 112 \\ \hline [1.60] \end{array}$$

up.

too bright.

.95

1.25

1.01

1.00

1.32

1.106

728

9 mag.

4.02

4.52

6.33

3.78

4.76

4.282

733

 $\alpha$  ~~Boris~~ =  $\alpha$  Cephei  $\beta$  ~~dos~~



12

7 35

9 mag.

2.73

2.96

3.39

3.26

3.00

3.068

Oct. 16, 1878

P. obs.

7 37

11 mag.

1.08

1.13

1.27

1.23

1.17

1.176

P. obs.

7 41

Japetus

1.38

1.62

1.43

1.47

1.26

1.432

P. obs.

7 41  
7 442 Bootis =  $\alpha^2$  Cygni

S. obs.

2 Can. Ven. = 51 Cephhei

P. obs.

Oct. 16, 1878  
 Looked at (3) (3) (3)  
 and (3)

### Reappearance of Jupiter III.

394		3451	
7 55 0	=	21 37 18	
		∴ 3451 was. 0 <sup>m</sup> 59.9 <sup>m</sup> fast.	
7 46 10		Wash. time of Reappearance of 43	
23 41		Red	
8 9 51		Count. " " "	
14 51			
21 37 20			
21 52 11	=	3451	" " "

Reappearance occurs at 76" foll 4  
 Sat I = 36"



Oct. 16, 1898

## III compared with I.

21<sup>h</sup>49<sup>m</sup>30<sup>s</sup> ± 2

seen

inspected 2<sup>s</sup> before

P. obs.

39 154.7 25.1

48 129.6 30.2

58 159.8 32.7

50 11 127.1 too faint

22 164.7 37.6

34 122.3 42.4

48 166.6 44.3

48 166.6 45.8

51 2 120.7 55.0

18 175.7 61.4

31 114.3 62.0

41 176.3 64.6

53 111.7 67.6

52 5 179.3 71.3

20 108.0 78.6

32 186.6 80.0

46 106.6 82.3

53 0 188.9 88.6

15 100.3

53 ~ 22<sup>m</sup> 31 189.6 89.3

40 101.1 88.5

49 188.6 87.5

54 7 99.8 88.8

54 ~ 12<sup>m</sup> 18 192.6 92.8

32 99.6 93.0

43 196.3 96.7

54 91.6 104.7

55 6 189.6 98.0

17 97.3 92.3

97.0

sketches before this the  
cellular was inspected, but  
sketches suspected that it was  
impossible that it could be seen so  
early.

changed position of lantern illuminat-  
ing the graduated circle.

$$\frac{4177.1}{24.55} + 0.1$$

$$\frac{4121.4}{90.90} 0.0$$

$$\frac{4197.0}{90.50} - 0.3$$

Oct. 16, 1878

55	30	194.3	98.7	✓
	17	95.6		
55 <sup>m</sup> 52 <sup>s</sup>	58	194.0	99.7	✓
56	12	94.3	2194.4	
			99.20	-0.4
	23	196.3	106.9	✓
56 <sup>m</sup> 49 <sup>s</sup>	40	89.4		✓
	54	197.0	109.0	✓
		88.0	4215.9	
57	20		107.75	-0.7
	38	199.7	107.9	✓
57 <sup>m</sup> 59 <sup>s</sup>	52	91.8		
58	4	199.8	109.9	✓
	23	89.9	17.8	
		54.45	108.9	
		144.3	108.9	

Mean time  
8<sup>h</sup> 18<sup>m</sup>

Limit of visibility of I.

133.8	19.9	✓
153.7		
135.3	19.7	✓
155.0	19.20	+3.2
5778	396	
2889	198	
144.45	9.9	

8 20

Limit of visibility of III.

47.6	14.8	✓
62.4		
46.4	16.0	✓
62.4	15.40	+4.3
2188	30.8	
109.4	15.40	
54.70	7.70	



16

III &amp; I

Oct. 16, 1878

8 23

89.0  
201.2 112.2

90.3  
200.0 109.7  
580.5 221.9  
290.25 110.95  
145.12 55.48

a.

③ ?  
b

(3) Jms and star preceding north.  
a h 4.6 48 = 4.5  
4.4

Constant of Photometer K on  
East Equatorial, by  $\lambda$  Aquarii.  
P. obs.

9 26

52.8 4.1  
56.9  
232.8 3.5  
236.3  
578.8 7.6  
289.4 3.8  
144.70 1.9

Pallas (2) compared with  $\lambda$  Aquarii, Photometer K.  
P. obs.

9 34

28.0 47.1  
75.1  
211.4 43.2  
254.6  
569.1 90.3  
284.55 45.15  
142.27 22.57

Oct. 16, 1878

to the right of (2) in the photometer 17

Star just preceding (2), compared with  $\lambda$  Aquarii.

9 36

26.3

78.3

52.0

P. obs.

clouds; reject.

9 39

34.6

74.8

213.3

257.0

579.7

289.85

144.92

40.2

43.7

83.9

41.95

20.98

P. obs.

Star just following (2) (to the left of (2) in the photometer)

9 41

26.1

76.2

206.3

262.9

571.5

285.75

142.87

50.1

56.6

106.7

53.35

26.68

compared with  $\lambda$  Aquarii.

In this set, the dome may have interfered.

Order of brightness of  
the three objects by estimate:  
cannot say which is brightest;  
objects faint when reduced to equality with comp. stars

 $\lambda$  Aquarii for constant

9 45

52.8

57.4

232.6

236.2

579.0

289.5

144.75

4.6

3.6

8.2

4.1

2.05

P. obs.



Oct. 16, 1878

Neptune's Satellite &amp; Arctis.

P. obs.

10 7

1.11

1.29

1.21

1.23

1.20

1.208

Achrom. Eyepiece.

S 788  
 U 786  
 J 777

7.3451

0<sup>h</sup>12<sup>m</sup>43.5<sup>s</sup>

0 13

43.5

B 394

10

30

0

10 31

0

∴ 3451 was 1<sup>m</sup> 0.1<sup>s</sup> fast.

Oct 17, 1878

553

97.1  
196.4  
274.7  
15.3

93.3

100.6

577.5  
288.5  
144.37

193.9  
96.95  
48.47

Photometer K.

Jupiter III compared with Jupiter  
P. obs.

Time Transit & Cap = 34.9  $\therefore$  Dia Jld = 9'

Photometer K

2 Aquilae - 2 Aquilae (for constant).

50.6

54.7

4.1

P. obs.

} rejected because the whole pencil  
was not received by the eye

6 16

50.6

4.1

P. obs.

54.7

231.1

234.5

3.4

570.9

7.5

285.45

375

142.72

1.88

6 19

51.5

2.7

5 obs

54.2

230.1

234.1

4.0

569.9

6.7

284.95

3.35

142.47

1.68



Oct. 17, 1878

Position of Jovio (3)

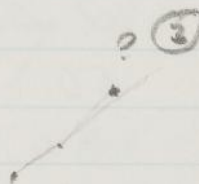
$\alpha$  22<sup>h</sup> 1<sup>m</sup> 18<sup>s</sup>       $\delta$  11° 43'  
 $\epsilon^2$  22 4 9      12 10

Transits of stars near Jovio

Mean Decl. Time

~~12~~ 12      0.0  
 9      4.2  
 12.0

(3)



Photometer I

Jupiter &amp; hole R 3, for constant

6 50

1.95

1.415

1.76

1.30

1.54

---

 1.600

6 52

1.76

1.65

1.64

1.56

1.28

---

 1.548

u. obs.

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S.ots.

6 56

1.98

1.79

1.88

1.85

1.88

---

1.876

Japetus.

S.ots.

7 15

2.81

2.59

2.27

2.33

1.93

---

2.386

7 24

1.21

1.48

1.48

1.23

1.28

---

1.336

Uds. through haze

7 28

11 mg.

Uds.

.92

.81

.95

.98

.90

---

.912



22

Oct. 17, 1878

7 32

11 mag.

1.13

P. obs.

1.18

.96

.85

.91

1.006

7 37

Japetus.

P. obs.

1.96

2.16

2.24 rather bright

1.61

2.01

1.996

7 43

<sup>Bortus</sup>  
 $\epsilon$  ~~Lygni~~ =  $\delta$  Lygni  
 $\beta$  ~~Alcedon~~ =  $\gamma$  "

U.

U.

7 55

$\beta$  Lygni. Phot. O. P.  
 coincidence of Spectra.

74°

75

Oct. 17, 1878

23

7 57

Red-

112.7  
145.6 32.9

292.1 36.6

328.7

879.1 69.5

439.55 34.75

219.77 17.38

P. obs.

8 0

Yellow-

112.1 33.2

145.3

287.8 42.8

330.6

875.8 76.0

437.90 38.0

218.95 19.0

P. obs.

8 2

Green-

289.6 45.0

334.6

100.6 55.0

155.6

880.4 100.0

440.20

220.10 25.00

P. obs.

8 7~~8~~

Blue-

98.8 63.2

162.0

278.0 63.1

341.1

879.9 .3

439.95 63.15

219.98 31.58

P. obs.



24

Oct. 17, 1878

 $\beta$  bygni-

Indigo-

P. obs.

8 10

100.1  
157.8 57.7

280.1 65.2

345.3

8833 122.9

441.65 61.45

220.82 30.72

Violet

P. obs.

8 13

90.6 81.2

171.8

276.1 71.2

347.3

885.8 152.4

442.90 76.2

221.45 38.1

different part of

Transits of spectrum of  $\alpha$  Lyrae Plt. 0

St. watch

St. watch

P. obs.

Red first seen

2.8

Red

2

2.0

0.0

0.0

0.0

3.2

Yellow

4

4.0

2.0

2.0

2.0

5.0

Green

6

6.0

4.0

3.8

4.0

Blue

/

6.8

6.6

7.0

Indigo

10.8

10.2

9.8

Violet

17.

16.2

16.0

Violet last seen

23.0

23.4

24.4

Oct. 17, 1878  
 Coincid of Spectra U obs  
 $136^{\circ}.8$   
 $127.0$   
 $239.$   
 $60^{\circ}$   
 $59$

8 40  $\beta$  Ursa Maj =  $\delta$  Cass. Obs.  
 " " " " " " " "

Coincidence of Spectra P. obs.  
 $60.$   $5-$

Red U obs  $\gamma$  Andromeda  
 8 57.  $22.5$   $30.1$   
 $52.6$   
 $208.2$   $242$   
 $232.4$   
 $51.57$   $54.3$   
 $257.85$   $27.15$   
 $1289.2$   $13.57$

Yellow out of focus  
 8 53  $29.5$   $220$   
 $51.5$   
 $208.5$   $23.3$   
 $231.8$   
 $521.3$   $45.3$   
 $260.65$   $22.65$   
 $130.33$   $11.33$



Oct. 17, 1878

8 55

Green

Refracted

U. ob.

24.0

29.1

53.1

205.7

28.4

234.1

516.9

57.5

258.45

28.75

1 29.23

14.38

8 57

Blue

26.8

28.6

53.4

204.8

28.9

233.7

520.7

57.5

260.35

28.75

130.17

14.38

9 00

Indigo

Violet

Refracted

187.8

53.4

241.2

13.3

55.8

69.1

9.2

511.4

54.60

255.70

27.30

127.55

Refracted

9 04

1935

241.1

252

64.9

522.7

261.35

130.68

47.6 Indigo

41.7

9.3

44.65

22.33

Feb. 17/1878

27

o beti' and

Phot II.

9 13

51.3

P. obs.

130° 30°

56.0 4.7

Images in line o out of field.

227.7 7.1

234.8

569.8 11.5

2849 2.95

142.45

130° 30°

P. obs.

9 15

320.7

Images reversed.

325.8 5.1

139.6

144.8 5.2

930.9 10.3

465.45 5.15

232.73 2.57

9 18

140.8

U obs

130 30

146.7

318.9

325.6

932.0 12.6

466.0 3.15

233.0 3.15

9 20

48.7

Images reversed 130° 30°

55.0

230.3

236.3

570.3

285.15

142.57

7.3

6.0

13.3

6.75

3.33

3.07

9 34

 $\beta$  Urs. Major =  $\eta$  Pegasi S. obs.



Oct. 17, 1878

$$\begin{array}{r}
 7.3451 \quad 23^h \quad 26^m \quad 33^s \\
 13 \quad 394 \quad 9 \quad \frac{32}{40} \quad \frac{44.5}{0} \\
 \hline
 13 \quad 46 \quad 44.5 \checkmark
 \end{array}$$

$$\begin{array}{r}
 9 \quad 36 \quad 3 \quad 19 \quad 47 \\
 23 \quad 41 \quad 26 \quad 33 \\
 9 \quad 59 \quad 44 \quad 23 \quad 46 \quad 20 \\
 40 \quad 0 \\
 19 \quad 44
 \end{array}$$

Reappearance of Jupiter I. S. obs.  
 Suspected. False alarm.  
 Seen

23 <sup>h</sup>	44 <sup>m</sup>	4 <sup>s</sup>	
46	56.5		
47	4	0.58	
	35	.86	
	54	1.08	
48	12	1.35	
	32	1.55	
	49	1.98	
49	6	1.78	
	28	3.39	
	50	2.85	
50	10	3.22	
	29	3.54	
	47	3.15	
51	10	3.39	1645
	30	3.15	3290
	46	3.00	
52	27	2.81	
	52	3.25	
53	12	3.50	
	29	3.06	1562

324

Oct. 17, 1898

29

7.3451	23 <sup>h</sup>	56 <sup>m</sup>	38 <sup>s</sup>
13.394	10	10	0

Seeing (P) 7, 5, 5.



Oct 18, 1878.

555 Jupiter

I last contact, shadow very distinct



Photometer I

6 43

Constant; Jupiter; hole R 3

2.00

U. obs.

1.48

1.51

1.78

1.78

1.730

S. obs.

clouds

Oct 19, 1878.  
 Eclipse of I missed in account of clouds

Photometer H.  $\odot$  I  $\dot{\text{III}}$  II

5 40  $\dot{\text{II}}$   $\dot{\text{III}}$   
 7.9  
 108.0 82.6 < II dis.  
 190.6 S. obs. 180°.5"  
 287.1 80.8 II from III.

5 46 15.6 81.5 < III dis.  
 97.1  
 193.0  
 282.2 89.2  
 5879 10.7  
 29395 80.35  
 14697 40.18  
 42.67  
 S. obs. 10°.5"

5 48 21.5 79.5  
 101.0  
 122.5 Clouds.  
 61.25 39.75  
 P. obs. 30° 8"

Oct 20, 1888

Conclaves of I by R.3. Subs Jupiter

6 10

196

174

160

164

150

1.688

IV

III

I

O

II

Photometer H

Jupiter III &amp; IV

6 25

29.7

85.4

55.7

P. obs.

120° 5"

211.2

265.7

54.5

5920

10.2

2960

5541

1480

27.55

6 27

119.6

178.3

58.7

P. obs.

250° 5"

296.2

359.7

63.5

9538

22

4769

611

238.45

30.55



Oct. 20, 1878

33

6 28 115.6 63.1 260° 54  
 178.7  
 293.1 62.1  
 357.2  
 944.6 5.2  
 472.3 62.60  
 236.15 31.30

6 31 28.4 58.4 Subs 110° 54  
 86.8  
 207.6 61.1  
 268.7  
 591.5 119.5  
 295.75 59.75  
 147.88 29.87

6 36 Jupiter I & III. Symmetrically placed as regards IV.  
 108.6 P. obs. 100° 54  
 184.8 76.2  
 288.4  
 366.9 78.5 - III disappears  
 948.7 154.7

6 39 474.35 77.35 P. obs. 100° 54  
 237.18 38.67 - III disappears  
 16.4 82.3  
 98.7  
 197.1 82.6  
 279.7  
 591.9 .9  
 295.95 82.45  
 147.98 41.22

Oct 29, 1878

Jupiter I. IV. Schs Photometer H.

IV from I 2000 7"

Symmetrical each way 5000

6 45

111.7  
175.5 63.8288.1  
353.9 65.8929.2  
4646 64.8

232.3 32.4

6 51

16.0  
91.0 75.0195.0  
273.2 78.2

575.2 13.2

2876 76.6

143.8<sub>m</sub> 38.3

③

22 24 0 12° 3'

u u 12 9

③ & e<sup>r</sup> = 2<sup>m</sup> 4<sup>o</sup>  
u 7<sup>5</sup>11<sup>1/2</sup> ③

22

②

22 44 11

8 32.9

22 40

147

2

22 46 19

8 17.7





36

Oct. 20, 1878

Japetus

P. obs.

8 24

1.59  
 1.85  
 1.68  
 2.09  
 1.68  


---

 1.778

8 35

2.47  
 2.76  
 2.39  
 2.49  
 3.03  


---

 2.628

9 m star Schs

8 38

2.53  
 2.89  
 2.99  
 3.49  
 3.49  


---

 3.078

P. obs.

8 43

11<sup>m</sup> star (at times exceedingly faint)~~0.75~~

P. obs.

reject

cloudy

~~9 40 Looked for Minus but too hazy~~

Photometer H

37

Oct. 20, 1878

City Sch 120° 30"

9 43

141.5 5.8

147.3

319.4 5.6

325.0

9 33 2

4666 5.7

233.3 2.85

9 48

50.7 4.8

55.5

231.2 4.0

235.2

572.6

286.3 4.4

143.15 2.2

9 55

50.4

55.4 5.0

230.6 5.1

235.7

572.1

286.05 5.05

143.03 2.52

9 57

140.7 5.7

146.4

318.4 6.2

324.6

930.1 11.9

465.05 5.95

232.52 2.98

S. Sch. 120° 30"

P. Sch.

P. Sch. 120° 30"

Seeing

4, 6, 3, (P)

4, 7, 5, (S)

20 (astr. mean time)  
Oct. 20, 1878.

Oct. 20, 1878

21.45 Diameter of R.3

Readings of Scale

79.9  
80.1

79.7  
80.2

79.8  
" 7

79.94

1.798

9.85

7.86 turns = 1 div.

Dia R.3

88

10.8

9.4

51.7

50.8

50.9

50.8

8.6

42.0

40.1

41.4

43.1

40.1

41.4

43.1

16

41.6 | 786

3930 | 053 div.

2300

7358

.126

$\frac{1}{75}$

75 | 100

3 .0133 ins.

$\frac{1}{10.67} =$

1 div. =

diam hole = .053 divs

1 div = .7994 turns of screw

= 7.86 " " complete turn

=  $\frac{1}{50}$ "



$$1 \text{ inch} = 25.4 \text{ mm}$$

$$\frac{1}{80} \text{ in} = .3175 \text{ mm}$$

$$\begin{array}{r} .053 \\ 9525 \\ 15875 \\ \hline 168275 \end{array}$$

Oct. 20, 1878

$$\begin{array}{rcccl} e^2 & 22 & 4 & 9 & 12 & 9.5 \\ & 22 & 2 & 21 & 12 & 15.7 \end{array}$$

$$1 \text{ div} = .01 \text{ ins} = .0254 \text{ cm}$$

$$\begin{array}{r} .053 \\ 762 \\ 1270 \\ \hline .001346 \text{ cm} = \text{diam hole} \end{array}$$

Oct 21 1878

Stars near Juv

h = ③

a  
7°11.5  
12° c11.5  
d+9.5  
e

6 15

h c e<sup>2</sup> = 7 42 1423

f

h c c 55

h c f = 23.

8.

6.5 7.5

1.2

29.27

27.77

1°

8.5

u

h

227

7

6 26

 $\beta$  Aurigae =  $\kappa$  Cassiopeiae, U. obs.

6 30

 $\alpha$  Can. Ven. =  $\xi$  Draconis, L. obs. $\beta$  Urs. Maj. =  $\delta$  Cygni, L. obs.

Photometer I. Constant, Jupiter, Hole R 3.

6 42

1.49

1.419

1.29

1.50

1.72

1.498

Oct. 21, 1878

41

Transit Japetus 26, 3 sec.

6	58	$\alpha$ Bootis = $\beta$ Ursae Minoris	U. obs.
	59	" $\delta$ Cassiopeiae	P. obs.
7	0	$\beta$ Ursae Maj. = $\alpha$ "	P. obs.
	0	$\alpha$ Canum Ven. = $\delta$ Ursae Minoris	P. obs.

Japetus

6	58	2.46	S. obs.
		1.98	
		1.94	
		1.86	
		1.85	
		<hr/> 2.018	

9 mag.

7	5	[4.95] ref. artificial star	S. obs.
		3.29	Observed
		2.13	
		1.70	
		1.67	
		2.50	
		<hr/> 2.258	

penits divergent

7	12	$\alpha$ Bootis = $\delta$ Cephei	
		U. obs. renders penits coincident.	
7	15	3.15	9 mag.
		3.30	
		3.58	
		3.37	
		3.53	
		<hr/> 3.386	



42

Oct. 21, 1878

7 19

Jupiter

U. obs.

1.46

1.49

1.55

1.47

1.42

1.478

7 25

Hypocri

U. obs.

Usual eyepiece

0.45

.48

.45

.47

.48

.466

7 35

Minimas

U. obs.

Usual eyepiece

.8

.85

.84

.76

.84

.814

Not seen as well as <sup>at</sup> other settings

8 0

Minimas

P. obs.

Ach. eyepiece

0.95

.88

.79

.98

.85

.890

second look finds it too bright

less satisfactory than preceding. Better

Artificial star when Saturn moved  
away found quite bright

Oct. 21, 1898

43

8 17 Hyperion  
 .50  
 .50  
 .49  
 .46  
 .46  
 .482

sch. eyepiece  
 P. obs.

Artif. star seen at .22

8 20 Japetus  
 2.35  
 1.54  
 1.79  
 1.95  
 2.03  
 1.932

P. obs.  
 Usual eyepiece

8 23 9 mag.  
 4.42  
 3.85  
 4.43  
 3.13  
 3.17  
 3.800

P. obs.

8 22 Hyperion Schs  
 0.40  
 .37  
 .36  
 .39  
 .45  
 .47  
 .454

Dec. 21, 1898

Zone 15' wide near stationary point of Saturn -  
 marked by U - Chronograph.

gth  
 0  
 4  
 18  
 19

lost part of zone between ' $\angle$ ' and ' $\gamma$ '

12'	13	
10	14	
11	14	
3 )	14	one lost
8 )	14	
1		
6		
5	13	
7.5	14	

1. Between 0 and 10 knocked tel. with hand
2. Repeated
3. Between 5 and 15
4. Repeated

2. In second set rattle after 9<sup>th</sup> magn. star  
 Rattle indicates preceding tap too late
  3. In third set rattle indicates no tap for 9<sup>th</sup> magn. star
  4. " fourth " " " 9<sup>th</sup> magn. star has passed.
- Seeing (1) 8, 7, 6. (2) 8, 8, 8.



Transits of Hyperion, a faint star  
south preceding and Saturn (centre of ball)

Star   
Hyp.

Star	Hyperion	Saturn	Hyp. - *	Sat. - Hyp.
—	<sup>s</sup> 0.1	<sup>s</sup> 17.2	—	<sup>s</sup> 17.1
—	0.2	16.5	—	<sup>+</sup> 16.3

Star <sup>scarcely</sup> ~~not~~ visible with Saturn in the field,  
and transit of Hyperion taken with difficulty.  
A bar placed in field to hide Saturn till after  
the transit of Hyperion. Measures repeated,  
but star seen with difficulty.

<sup>h</sup>  
23 <sup>m</sup>  
15 1327

-4

	Star	Hyperion	Saturn	Hyp. - *	Sat. - Hyp.
23 11	<sup>s</sup> —	<sup>s</sup> 0.5	<sup>s</sup> 16.5	<sup>s</sup> —	<sup>s</sup> 16.0
14 0	0.7	2.1	18.6	1.4	16.5
9 11	0.9	2.3	18.7	1.4	16.4
-1	0.3	2.0	18.0	1.7	16.0
9 <sup>h</sup> 10 <sup>m</sup> = Mean time of obs.				1.5	16.4

Transits of Stars in zone  $15' \pm 4.3^m$  near the  
stationary point of Saturn. v. chart.

Star A placed at  $12'$

$0' - 5'$        $5' - 10'$        $10' - 15'$   
s                      s                      s      s ~~at~~ A

$0^m$

2.0

11.3

13.0

20.6

21.1

22.8

28.0

33.0

35.4

37.4

39.0

50.7

53.7

56.7

0.0

$1^m$

4.1

18.1

42.6

44.9

49.1

52.0

53.0

B

$2^m$

13.0

17.3

31.0

32.2

46.2

	$0'-5'$ s	$5'-10'$ s	$10'-15'$ s
3 <sup>m</sup>			59.0
		7.3	
		8.3	
		9.8	
			10.5
23.7			
		37.1	
		38.3	
	Some here omitted		
4 <sup>m</sup>		19.4	
		27.3	
		32.3	
41.3			
	58.2		

The division into three sets according to declination as given above is not reliable. It is probable that some of the stars placed in the column  $10'-15'$  belong in the preceding column as there is confusion in the length of the break on the chron. record. Some faint stars were omitted and in repeating the observations, only 10' were observed.



Zone begins with star A as before - A at 12' dec.

0' - 5'      5' - 10'      0.3? 0.5 A

0<sup>m</sup>

2.3      1.8

9.9      7.7

22.0      20.2      22.6

22.6      20.7

29.3      27.7

34.4      32.1

37.1      35.2

41.0      38.5

55.3      53.4

58.4      56.2

1<sup>m</sup>

1.3      59.3

5.7      4.2  
-      11.9

19.6      17.7

46.4      44.4

53.3      51.4      B

2<sup>m</sup>

14.6      12.6

18.6      16.8

21.9      22.8 late

32.2      30.0

3

0.8      58.9

10.0      8.0

11.5      9.6

12.0      10.3

22.0      20.3

24.5      23.2

35.4      -

56.8      54.9

4

3.8      1.8

	$0' - 5'$	$5' - 10'$
$4^m$	s s	s s
	12.0	11.4
	15.2	—
	19.3	17.3
	20.8	— d

Zone begins with A as before - A at 12'.

0 <sup>m</sup>	5' - 10'		10' - 15'		A
	s	s	s	s	
			0.3	0.8	
			1.6	1.5	
	3.7	3.9			
	7.2	7.4			
			11.1	11.3	
			12.0	12.2	
	19.9	20.1			
	—	22.4			
			26.9	27.0	
	32.3	32.4			
	34.8	34.6			
	38.3	39.0		38.1	
			50.1	50.9	
	53.0			53.3	
	56.0	56.3			
	59.1	59.2			
1 <sup>m</sup>	16.9	17.4			
			42.0	42.0	
	43.9	43.9			
			48.5	49.0	
			51.8	51.8	
			53 ±		B [probably transits just before 51.8]
2 <sup>m</sup>	19.8	20.5	—	26.4	
			31.5	32.0	
			45.9	45.4	
	53.0	52.9			
	58.1	58.2			
3 <sup>m</sup>			6.7	7.0	
	7.8	8.0			
	9.4	9.5			
	10.0	10.2			



	$5' - 10'$	$10' - 15'$
$3^m$	$\begin{array}{c} s \\ 15.8 \end{array}$	$\begin{array}{c} s \\ 36.8 \end{array} \quad \begin{array}{c} s \\ 37.0 \end{array}$
	$\begin{array}{c} 50.9 \\ 53.8 \end{array} \quad \begin{array}{c} 54.4 \end{array}$	

59.2 59.6  
9.2 10.1

4 10.2 11.0  
13.5 13.6  
16.8 17.0

18.6 18.6 d

52

1878 Oct. 22  
Photometer 9  
 Japetus

6 5

1.68 P. obs.

1.51

1.66

1.79

1.79

---

 4.686

6 8

9<sup>m</sup> star

3.12

P. obs.

3.50

3.96

3.20

3.01

---

 3.358

6 12

2.70

9<sup>m</sup> Subs

2.62

2.30

2.86

2.79

---

 2.654

6 17

1.76

Japetus Subs

2.31

1.58

1.55

1.52

---

 1.744

Oct. 22, 1878

53

6 17 2 Mrs. May = 2 Mrs. Min P

Must	Star	Lat.	Lat.
0	12.1	40.0	

6 27 *Japetus* ~~U. obs.~~ U. obs.  
 2.02  
 1.65  
 1.39  
 1.510  
 1.68  


---

 1.648

6 33 11 mag. star U. obs.  
 0.99  
 1.12  
 1.12  
 0.84  
 0.97  


---

 1.008

6 40  $\beta$  Urs. Maj. = K Cygni S. obs.

Constant Photometer I. Jupiter. Hole R3.

6 48  
 1.64  
 1.53  
 1.53  
 1.37  
 1.47  


---

 1.508



Oct. 22, 1878

$\lambda$ Aquar.	22 <sup>h</sup> 46 <sup>m</sup> 19 <sup>s</sup>	$-8^{\circ} 17.7'$	13.3
Pallas (2)	22 43 45	$-8^{\circ} 51.0'$	
Pallas	<del>2</del> precedes 2 34	$33.3'$	
		37.7	

$\lambda$ Aquar 1825	22 43 29	$-8^{\circ} 30.5'$	
W. 22 <sup>h</sup> 855	22 39 13	$-9^{\circ} 2.1'$	
	4 16		31.5

W. 22 <sup>h</sup> 912	42 6	9 13	
	1 23		42.5

W. 22 <sup>h</sup> 902	41 31	$-8^{\circ} 52.9'$	
	1 <sup>m</sup> 58		22.1

$x^1$  12' S of  $\lambda$  47.5<sup>s</sup> prec.  
 $x^2$  10' S of 1<sup>m</sup> 13<sup>s</sup> of  $x^1$  = W 902

W 902 - Pallas =  $+36^s$  and  $+16'$

There is a star 34.5<sup>s</sup> prec and 6' S of W 902  
Pallas ? another 41.2<sup>s</sup> and 16' S " "

Ad of Star prec. 2' S of Pallas and Pallas.

1.2  
 1.0  
 1.0  
 1.1

Oct. 22, 1878

55

Stars in vicinity of Pallas.

0.0	-1	P. obs.
18.6	+2	
28.0	+12	
39.0	+11	also another 15' south of this, same L.
61.2	0	Pallas?
1 <sup>m</sup> 23.0	+7	
1 30.0	+10	

7 45

Phot. O.

P. obs.

Transits of Polaris

	0.0	Extreme Red
	34.0	Red
	46.0	Yellowish Red About correct reading
1	31.8	Yellow
	39.	Better yellow
2	30	Green
3	4	Greenish blue
	39.5	Good blue

56

Oct. 22, 1878

Phot. 0

Transits of  $\beta$  Ursae Min.

P. obs.

0.0

6.0 Yellow

13.0 Green

Handmed.

o beti Phot H

S. obs.

135° 30"

8 40

49.8

4.2

54.0

230.0

3.5

233.5

567.3

7.7

283.65

3.85

1418.3

1.92

8 45

140.4

5.0

145.4

318.5

5.3

323.8

928.1

3

464.05

5.15

232.03

2.58

130° 30"

S. obs.



Oct. 22, 1878

57

Reappearance of II

Phot J

394 = 3451  
 9 100 23 7 15.5 (S. obs)  
 14 33  
 8 51 52 2  
 23 41 23 21 50 = 3451 time of  
 9 15 33 reappearance

Limit of visibility

P. obs.

[ ] .26

[ ] .37

1.00

1.18

1.40

$$\begin{array}{r} 1.72 \\ \hline 242 \end{array}$$

Set at 1.0

58

Oct. 22, 1878

3451

23<sup>h</sup>Reappearance of Jupiter II ~~compared~~  
Set at 1.87 P. 10. ~~h~~

m	s	
21	27	Suspected not verified

22	3	Suspected	Sky around Jupiter very bright.
	10	Seen	

	19	2.19
--	----	------

	32	2.57
--	----	------

	42	2.74
--	----	------

	53	2.74
--	----	------

23	5	3.04
----	---	------

	18	2.97
--	----	------

	29	2.88
--	----	------

	40	2.89
--	----	------

	52	2.85
--	----	------

24	3	3.07
----	---	------

	12	3.32
--	----	------

	26	3.43
--	----	------

	39	2.97
--	----	------

	55	3.51
--	----	------

25	10	3.09
----	----	------

	29	3.34
--	----	------

	45	2.83
--	----	------

26	0	3.32
----	---	------

	22	3.40
--	----	------

	37	3.37
--	----	------

27	4	3.04
----	---	------

	22	3.33
--	----	------

574

3148

146

3292

Jupiter low and satellite faint  
found 1.00 too faint to distinguish  
Image set at 1.87 Satellite  
very faint when first measured,  
not seen between 22 3 and 22 10  
that is glimpsed at 22 3

Oct. 22, 1878

59

9 23 Jupiter II  
 3.33  
 3.35  
 3.42  
 3.48  
3.35  
 3.386

Prob.

A 3661

= B. 394

23 35 20.0  
 23 36 20.0

= 9 29 0  
 = 9 30 0

9 37 Hyperion  
 0.52  
 0.52  
 0.55  
 0.43  
 0.39  
241  
 482

U. obs.

Achromatic spectrum

9 48  $\beta$  Aurigae =  $\epsilon$  Cassiopeiae P. obs.

Interrupted by haze  
 seeing

5.7, 8. P.  
 4.7, 6. S.  
 4.7, 7. U.



Oct 21, 1878.

Chron. 7.3451 Transit Jupiter Saturn 3410

Int

Set at 40.0

Photo. 46.13 Chron. 7.3451 c.m.d. 24 16 S. obs.

J. F. Mc C.  
Recorder

8 42 36.3  
8 45 52 63.0  
43 \* 247.8  
244.4  
5 6 7 5 26.6  
2 8 0 5 26.6  
1 40.38 13.32

\* J. F. M. says that  
8.45 52 (= 20 45 52)  
is the time of the signal  
for the reappearance  
of the 43 under  
it has no meaning

64.2	23	26°
38.0	35	38°
73.5	45	48°
32.4	54	57°
73.0	47 5	25 08°
26.3	14	17°
79.0	24	27°
21.2	32	35°
87.0	43	46°
40.3	53	56°
90.8	48 3	26 06°
13.3	15	18°
93.9	32	35°
7.5	50	53°
270.5	49 12	27 15°
10.4	25	28°
99.3	43	46°
11.0	55	58°
99.8	50 8	28 11°
11.2	21	24
96.0	21	24

Reappearance  
of Jupiter I.  
Object compared  
with that  
believed to  
be Jupiter III.  
J. F. M. recorded  
till 20<sup>h</sup> 50<sup>m</sup> 8<sup>s</sup>;  
then F. Waldo,  
who thought  
that J. F. M. had  
missed a line, so  
that the reading  
1.2 answered  
to the time 50<sup>m</sup> 8<sup>s</sup>;  
but J. F. M. is sure  
this was not the case.

87.1 87.1 29

197.8 52 71.6 30  
269.4 158.7  
571.1 79.35  
285.55 39.68  
142.78

Oct 26 1878

61

Jupiter I

5.3	94.7	94.7	1
100.0			
196.6	53	97.1	
273.7		171.8	
575.6		85.90	
287.8		42.95	
143.9			

Comparison of time-pieces before observation

103946	10	0
7.3451	31	39

After observation 21 9 45 = 3451

6 48 00 = 394

Photometer I.

Sappetus - P. Observer

Y. 24

154  
169  
154  
134  
146  
762  
1524

Y. 29

11 pm 123

P obs.

117 The star looks unusually bright.

115

119

107

581

1162



60

Oct. 26 1878

8 15  $\alpha$  Tauri =  $\alpha$  Cynos S. obs.8 18  $\beta$  Tauri =  $\alpha$  Cephei S. obs.Photometer I.  
Satellite of Neptune;  $\alpha$  Arietis

8 24 0.65 P. obs. - Achromatic eye-piece

.64

.56

71

63

---

198  
.6388 30  $\beta$  Ursa Maj =  $\beta$  Cephei P. obs.8 30  $\alpha$  " " =  $\alpha$  Ursa Maj P. obs.8 32 " " " =  $\gamma$  Cass. P. obs.

8 50 0.69 S. obs.

0.59

0.66

0.60

0.53

307

0.614

Night very clear  
Neptune seen by P.  
with naked eye!

limit of visib. 0.50



Oct. 26 1878  
Stars near Saturn  
Decl. ~~Here~~

0	33	
1	34.5	
3	—	—
7	35	8
11	—	3
12	—	
20 c	36.5	37
21	41	41
22		
27		43
28		
32	<del>37</del>	
35 c		39
38		
38		
50		
53 c		36
53		
56		
57		38
1 <sup>m</sup> 5		43
17 c		38
42		31
44 c 11 mag.		38
49		<del>39.5</del>
51 9 mag. = B		39.5
51		

Time Stars Oct. 26 1878  
Decl. 30-35

	0.0	33
		34.5
	9.0	35
	<del>4.0</del>	33
	12.0	33.5 }
	27	30
	36	31
	50	30.5
	53	36 c
1 m.	42	32
	48.5	31.5
	52	34
2	25	33.5
	31.4	31.5
	45	30
	58	35
3	6.8	34
	37	{ 32
		{ 29
	43.3	
	48.2	29
	59.4	31.5
4	18.5	32
	32.7	32

Oct. 26 1878  
 Time Decl. 35-40

0,0

33

19.2

37

21.

37

31.7

37

34.0

37

37.8

37

32.3

36

55.0

39

59.2

38

17.0

38

43.5

11 mag.

38

50.8

9 mag.

40

11.7

40.5

16.2

43

51.8

37

7

38

8

37.5

38.5

19.5

41

21.5

41

51

38.5

54

37.5

9.7

35.5

16

37

18

32 c



Oct. 26, 1878.

Time

Decl.

0.0

33

19.4

41

27.0

43

56.0

39.5

58.0

37.5

1<sup>m</sup>

3.0

{ 43.5  
45

44

11 mag

38

46

39

50.5

9 mag

39.5

Oct. 26 1878

67

zone 5' north of  $\alpha$  Aquilae

Declin. in half minutes

0	
4	7
6	6
13	9
19.5	7
28	24
<del>29</del>	6
34	7
41	6
44	6
50	2
57	6.7
1 2	9
8	
11	5
18	56
.	7
27	
30	6
37	7
49	8
53	9
55	9
1	8
5	4
11	4
17	2
23	

group

Oct 26 1878

Zone 5' south of  $\alpha$  Aquilae  
Time Decl. in half minutes

0 2 Aquil 10

5 1

11 10

24 8

32 3

36 5

38 8

43 1

49 9

53 6

55 3

2 2

6

11 6

16 5

17.5 6

24 1

29 3

3

37 3.5

45 7

49 5

54 1

0 6

18 9



Oct. 26 1878

Zone 5' north of 2 Loysne  
0.0 2 Loysne Dec. 0.027 3  
21 1

28.5 3

33 11

47 4

49.5 9

56 10

1 2 2

6.5 — 2

19.5 { 4  
3

27 6

34 { 7  
443.7 { 6  
950.8 { 3  
6

.1075

$$\begin{array}{r} 128 \\ 5 \\ \hline 572 \end{array}$$

Oct. 26 1878  
 Zone 5' south of 2 Lyræ  
 Time Decline

	0 2 Lyræ	10
	1	9
	5	11
	32	3
	42	9
	49	10
1 <sup>m</sup>	1	6
	4	4
	7.5	8 <del>double</del> triple
	20.5	4
	31	4
	36	4 double
	43	2
	53	10
	58.5	1
2 <sup>m</sup>	5	2

Seeing 9, 7, 8 (P.)

Oct. 28 1878

71

Positions of stars near the pole,  
beginning with a group; bright star of  
this group called A; afterwards changed to B.  
Reading called 20 at the lower part of the field  
A —  $13^h 38^m$  — 10 declination

Stars near pole  
a  
b c

7 45 A

8 48

5

"

13

14 15

14

10<sup>m</sup>

"

7

11<sup>m</sup>

14 10

9

12 13

13 58

5.5

13

12 45

11

14

12 19

5

11

11 51

5

13

11 ~~40~~

10

14

11 12

15

10

11 2

8

12

10 54

9

12

10 35

7.5

14

10 17

11.5

13

11

8.5

13

10 12

11.5

12

10 7

8.5

12

1

7 59



72

Oct. 28 1878

Hour circle Dec. Magn.

8 0 9 12 2 = A starting point.

9 3 9.5 12

8 53 8 13

8 40 1 11

8 21 6 14

8 0 12 13

7 32 3 14

8 5 6 44 12 10 ~~B?~~ D?

6 6 45 12 10

6 32 0 12

6 4 12 13

6 2 9.5 10 C?

5 42 8 14

" 2.5 12

" 3.5 12

5 31 3 12

10 5 8 1.5 13

4 48 13 12

4 34 8 12

" 9.5 12

4 25 8 12

4 22 14 10

8 13 " 5 10

3 46 13 13

3 40 13 13

3 32 15 12

3 22 10 11

3 15 3 13

3 14 15 10

3 2 13 12

Oct. 28 1878

73

Hour circle Dec. Magn.

		2	26	10.5	11	
8	17	2	22	14	10	
		2	19	0.5	10	2y. B { double with the 3rd star in line
		2	18	7	12	
		2	0	4.5	13	
		1	57	5	11	
8	20	1	20	11	11	
		1	17	11.5	10	
		1	7	7	12	
		0	53	5	13	
		0	43	15	12	
		0	24	6	12	
8	22	23	46	10	12	Fridtim roller moved
		23	29	3.5	12	
		22	53	7	13	
		22	35	12	10	
8	24	22	15	11.5	11	

---

		22	36	12	11	
		0	39	8.5	12	
		2	27	6.5	10	2y B
8	28	4	38	11	10	2y C
		9	6	7.5	11	
		9	41	8	10	A
		12	55	11.5	11	
8	31	9	46	7	10	A

74

Oct 28 1878

Zone with chronograph  
 5' south of  $\alpha$  Lyrae & following  
 that star. U. S. S.

8 47

	Decl.	Magn.
$\alpha$ Lyrae	0	
	1	
Very doubtful	4	13
for first	3	13
line	1	13

4

1

3

1

3

4

0

3

5

2.5

2

3

1

1

0.5

2.5

2

2.5

2

4

4

4.5

— False trip between these two



Oct. 28, 1878.

75

Decl.

Magn.

4

0

3.5-

5-

Repeated

0

1

4

3

1

4

1

3

1

0

4

2.5

2,

3

1

1

0.5

2.5

2.5

2

3.5 should be 4 two stars

4. should be 5

3

0.5

10

12

Faint

Oct. 28 1878

Zone 5' north of 2 Lyrae

Decl. Mayne  
2 Lyrae

2

3

2

1

2

3

2

3

2

5 mt

5

2

2.5

2

3

4

2.5

3.5

2.5

3.5

light

reject last four trips

Oct. 28 1878

77

Decl. Repeat Magn.

2' Lyrae

2

2.5

3.5

3.5

2

2.5

3

2

2.5

0

5

5

5

2

2.5

2

3

2.5

3.5

2.5

3

5

3.5

4.5

bright

bright



Oct. 28, 1878

Lines inclined  $45^\circ$  from S f to n p  
 that is southern stars come early  
 5' north & 5' south of  $\alpha$  Lyrae

9 10  $\beta$  U. Mij =  $\delta$  Cas Probe  
 $\alpha$  Orionis =  $\gamma$  Cas. Probe

Inclined  $45^\circ$  attempted to take 10' last half.  
 South set. North set. North set. North set

9 12  $\delta$  Orionis =  $\delta$  Cephei Probe Alt  $\approx 2^\circ$

It is almost impossible to tell whether  
 the stars taken with the line inclined  $45^\circ$   
 are identical with those taken <sup>before</sup>  $\uparrow$  Many  
 were omitted and possibly some stars outside  
 the limits were included.

Photometer I

9 35 Satellite of Neptune;  $\alpha$  Arietis Achromatic eyepiece  
 1.34 Probe Not  $\alpha$  Arietis  
 Probably  $\gamma$  Arietis  
 Reset prism

0.53

0.58

0.62

0.58

$$\begin{array}{r} .62 \\ 0.586 \end{array}$$

Oct. 28 1878

79

9 47 Aug of a still seen at 38 P.  
Schs. Sal. Neph.

57  
53  
56  
51  
.49  
0.532

Limit west 47

Aug 58

0.48

U. obs.

149

56

53

150

0.512

Limit of visibility .39

at class not in chart.

Minimas not seen.

Seeing

7, 3, 6 (S.)  
8, 4, 4 (U.)

Saturni	0.0	0.0
First opid	6.0	7.5
Second "	16.0	16.2
Third "	26.0	25.6

80

Oct. 28, 1878

10 38

Transit Jupiter 353 Obs.

Jupiter Obs.

1.49

1.28

1.40

1.52

1.46

7.15

1.430

10 44

Hazy \* Obs.

.91

.87

.75

.81

.54

418

.836

Prophesied mean dist. etc. - 52

10 50

Hyacin

P obs.

50

54

51

50

.75

.79

.73

.63

50

rejection

Proved not coincident

3 .505



Oct. 28, 1878

81

fruit Sub Hgt

6.0

6.5

8.0

milled

⊖

Transits of stars following  $\alpha$  Lyra in zone 5' south of  $\alpha$

m	s		$\alpha$ Lyra	Decl. approx. p.m. 74	
0	0.9	0.2		0	0
	2.6	2.0		1	1
	5.4	5.1		4	4
	14.6	14.9		3	3
	15.6	15.4		1	1
	32.0	31.3		4	4
	32.6	31.6		1	1
	35.1	34.5		3	3
	42.4	41.9		1	1
	44.0			3	
	48.5	<del>48.5</del>		4	
	49.7	48.5		0	0
	53.0	52.0		3	4
	54.5			5	
	58.2	58.0		2.5	2.5
	59.8	59.7		2	2
1	4.2	3.8		3	3
	7.3	6.6		1	1
	8.0	7.3		1	1
	8.5	8.2		0.5	0.5
	19.5	19.5		2.5	2.5
	28.1	<del>29.9</del>		2	
	30.3	<del>29.9</del> <del>31.6</del>		2.5	2.5
	32.0	31.6		2	2
	34.3			4	4
	34.6	34.7		4	4
	<del>35.0</del>				
	36.2			4.5	5
	42.5	42.0		4	3

<sup>s</sup> 51.7	<sup>s</sup> 51.6	<sup>'</sup> 0	<sup>'</sup> 0.5
54.8		3.5	
58.0	57.5	5	4.5

m.  
2



Transit of stars following  $\alpha$  Lyrae in zone  
5' north of  $\alpha$ . Decl. copied from p. 76-77

$m$	$\alpha$	$\delta$	$\alpha$ Lyrae.	$\delta$	$\delta$
	8.1	7.7		2	2
	13.6	13.5		3	2.5
	21.5	20.9		2	3.5
	22.1	21.7		1	3.5
	30.4	29.4		2	2
	39.5	39.6		3	2.5
	41.0	40.8		2	3
	47.6	47.3		3	2
	49.5	48.6		2	2.5
		50.3			0
		53.1			5
	56.5	56.1		5	5
$m$	1	2.6	2.7	2	2
	19.1	19.3		2.5	2.5
	21.1	20.8		2	2
	28.2	28.8		3	3
	29.7			4	
	34.8	34.3		2.5	2.5
	36.3	35.8		3.5	3.5
		43.9			
	44.4	44.1		2.5	2.5
	44.7	44.5		3.5	3
		45.2			5
		49.5			3.5
		50.2			4.5

Possibly two stars.

Transits of stars over line inclined  $45^\circ$  from up to sf.  
Stars in whole zone  $10'$  wide

<sup>m</sup>  
0      0.0       $\alpha$  Lyra

17.0

26.6

27.4

30.0

37.7

40.1

49.1

53.9

57.9

<sup>m</sup>  
1      2.5

2.9

6.2

7.0

9.5

15.9

20.9

28.5

30.5

43.0

51.5



Transits over line inclined  $45^\circ$   
 Zone 5' south of  $\alpha$  Lyra

0 <sup>m</sup>	0.4	0.3	No. 3 on page 82
	16.3	16.6	" 2 " " "
	18.0	18.0	$\alpha$ Lyra
	44.2	38.0	
	45.9	45.6	
		54.3	
	55.6	55.5	
		4.4	
1	6.1	5.4	
		6.3	
	7.0		
	19.9	20.0	
		20.5	
	24.3	23.4	
		24.0	
	33.8		
	39.0		
	43.4		
		0.6	
2	9.2		
	13.9		



87

Transits over line inclined  $45^\circ$   
Zone 5' north of  $\alpha$  Lyra

- 0	0.9	0.9	$\alpha$ Lyra
-	17.1	17.4	
-		23.7	
-	26.7	27.2	
	30.9	31.0	
	33.5		
-	40.6	41.0	
		54.0	
-	58.9	59.0	
- 1	9.6	9.6	
-	29.5	29.2	
-	29.8	30.0	
-	43.4	43.4	
-	45.4	44.6	
		49.5	
-	53.5	52.6	
-	56.5	55.7	
- 2	0.9	0.9	
-	3.0	3.7	
-		6.7	



June ③ Oct 29, 1878

e<sup>2</sup> - star. 22'S full. 21480  
21 S 249.

6 23  $\beta$  Aurigae =  $\xi$  Cygni  
 $\gamma$  Tauri =  $\xi$  Draconis } S. obs.

Photometer K

6 28 June ③  $\delta$  Capricorni  
14.0 63.2 P. obs.

77.2  
199.7 61.6  
261.3

5 5 2 2 4.8

2 7 6 1 6 2.40

1 3 8.05 31.20

6 29 20.7 61.8 P. obs.  
82.5

203.2 69.6  
272.8

5 8 9 2 11.4

2 8 9 6 6 5.70

1 4 4.80 32.85

6 41 24.8 50.6

75.4

207.2 49.1  
256.3

5 6 3 7 99.7

2 8 1 85 49.85

1 4 0.93 24.92

U. obs. Reflected  
images in worse focus  
than other. Could  
not improve it as the  
eyepiece was already  
as far in as it could go.



90

Oct. 29, 1878  
Juno (3) and  $\delta$  Capricorni

6 46

25.2 52.0

77.2

209.0 42.1

251.1

56 2.5 94.1

281 2.5 47.05

140.62 23.53

S. obs.

Reject

Discovered that prism  
image has been partially  
obscured by the dome.

6 52

19.2 56.3

75.5

201.0 55.5

256.5

55 2.2 11.8

276.1 55.90

138.05 27.95

S. obs.

 $\delta$  Capricorni &  $\delta$  Capricorni

7 2

48.0

56.7 8.7

228.6

233.0 4.3

2.9

56 6.2 13.0

28 3.1 6.5

141.55 3.25

S. obs.

U. obs.

7 9

48.4

51.7 3.3

229.3 3.3

232.6

56 2.0

28 1.0 3.3

140.50 1.65

Oct. 29, 1878-

91

7 46

11 mag. \*

Photometer I.

U. obs.

1.01

0.82

1.96

1.73

1.11

0.926

8 05

Japetus.

U. obs.

1.60

1.56

1.67

1.68

1.68

1.638

8 7

Japetus

P. obs.

2.16

1.59

1.61

1.50

1.77

1.726

8 9

11 mag. \*

P. obs.

0.93

1.00

0.92

0.81

0.96

0.924

92

Oct. 29, 1878.

Hyperion-

Usual eyepiece.  
P. obs.

8 13

0.52

.50

.46

.39

.46

.466Achr. eyepiece.  
P. obs.

8 18

 $\beta$  Ursa Maj =  $\gamma$  Ursa Minoris S. obs.

18

"

=  $\delta$  Cassiopeiae S. obs.

8 33

"

=  $\gamma$  Cygni S. obs.

Size increasing somewhat between 8 18 &amp; 8 33

Sat. of Neptune &amp; Arietis

8 35

.94

.79

.72

.63

.77

385

.770

P. obs.

&lt; refocused

Poor.

8 42

 $\beta$  Ursa Maj =  $\delta$  Cass $\alpha$ 

"

"

=  $\beta$  Ursa Min

P. obs.

P. obs.



Oct. 29, 1878

Satellite of Neptune; 2 trials  
U. obs.

8 47

0.63  
 .64  
 .65  
 .56  
 .63  
311  
 .622

Photometer K

\*  $\beta - \beta$  Persei

S. obs.

9 14

48.6  
 51.4 2.8  
 230.6 1.6

232.2 .4  
 5628 2.20  
 2814 1.10  
 140.70

Photometer  
Japetus

S. obs.

9 38

1.67  
 1.57  
 1.90  
 1.75  
 1.85

8.74

1.748

9 43

9 mg.  
 4.62  
 4.46

5.94  
 5.45  
 5.47

54

5.108

my haze.

Seeing 5, 5, 7 (f)

89870  
 477

877  
 3-7

Nov. 1, 1878

Transits by stopwatch to find Junc ③

0.0	0.	P. obs.
33.0	13	
36.0	16	
62.3	11.5	Junc?
65.3	12	

\* Q's. near same L as Junc  
Star pr. Junc. about 1<sup>s</sup>

6 18  $\beta$  Antiqua =  $\gamma$  Ursa Min Robs

Miracis not seen.

Photometer I.

Hy/urion (faint object, following Saturn <sup>approx</sup> 14.2)

6 27

0.28  
35  
131  
33  
134  
322

unusually faint

6 38

31  
26

U R

33

← cloud passes

6 48

33  
29  
1304

6 57

Nov. 1, 1878.  
Hyperion -

S. obs

.24

.28

.24

.27

.22

---

1.250

Limit of visibility .21

7 5

Japetus

S. obs.

1.35

1.17

1.15

1.27

1.20

---

1.228

7 9

11 may -

S. obs.

0.83

.72

.81

.81

.95

---

.824

7 11

P. obs

.76

.72

.76

.66

.74

---

.728



96

Nov. 1, 1878.

7 13

Japetus

P. obs.

1.36

1.37

1.20

1.13

1.18

1.248

7 20

1.52

1.26

1.48

1.32

1.42

1.400

Uds Japetus

7 27

.71

.72

.74

.69

.79

.730

11 my. Uds.

11<sup>m</sup>  
Amge shell & Chap.

St. water 0.50

3.6 a

23.0 b

33.2 c

37.0 Sat.

Japetus

P. obs.

C.:

A.

a

i

Nov. 1, 1878

 $\beta - \beta$  Persei Phot. R

46.3	5.7'	P. obs.
52.0		

9 28

227.3	6.1'
233.4	

---

559.0	11.8'
-------	-------

279.5	5.90'
139.75	2.95'

49.6

1.4'

Shs

Direct image too close to one of the reflected images; probably at times confounded with it.

9 32

229.0	4.8'
233.8	

---

563.4	6.2'
281.7	3.1'

---

140.85	1.55'
--------	-------

9 35

47.2	5.0'
52.2	

227.6	4.4'
231.7	

---

558.7	9.1'
279.35	4.55'
139.67	2.28'

9 55

$\beta$  8 a proposed comparison star  
P. obs. Through clouds.

119.8	40.7
160.5	125.7
286.2	64.6
350.8	

---

917.3	129.0
458.65	14.7
229.33	127.35
	63.68

Position angle of the star from  $\beta$   $40^\circ$ ; distance  $\pm 10'$ .

98

Nov. 1 1878

 $\beta$  and the proposed companion star

9 57

10 1.2

P. obs.

Clouds

Seeing 6, 4, 3 P.  
7, 3, 5 S



2.2 - Apr 2 1878  
 $\beta$  Thesii

Photometer K  
 P. obs.

5 39

175.6  
 290.6  
 130.4  
 343.3  
~~45.2~~ 115.0  
 52.7 147.1

9 39 9

4 6 9 9 5

2 3 4 9 7

358.3

100.5

184.6

272.1

915.5

457.75

2 2 888

0.4

103.2

180.0

287.2

570.8

2 854

1 4 270

353.8

96.1

188.3

279.8

9 200

4 600

2 30.0

212.1  
 131.05  
 85.52

reformed

P. obs.

5 42

87.5

189.7

94.85

47.42

P. obs.

5 43

102.8

107.2

210.0

105.0

52.5

Moved steps to allow  
 sitting down, so as to  
 keep eye steadier.

P. obs.

5 47

100.3

91.5

191.8

95.9

47.95

Nov. 2, 1878

	0.8	106.2	P. obs.
	107.0		
5 49	180.2		
	284.6	104.4	
	572.6	210.6	
	286.3	105.3	
	143.15	52.65	
<del>5 50</del>	17.0	58.0	Sch
	75.0		
5 52	195.0	65.2	
	260.2		
	547.2	123.2	
	273.6	61.6	
	136.80	30.80	
	22.1	61.8	S. obs.
	83.9		
5 55	200.2	53.9	
	2521.1		
	560.3	115.7	
	280.15	57.85	
	140.07	28.92	

Nov. 2, 1878.

P. M.

5 57

359.2	84.7
83.9	
184.4	90.5
<u>274.9</u>	<u>175.2</u>
902.4	87.6
451.2	
<u>225.6</u>	<u>43.80</u>

5 59

358.6	88.1
86.7	
186.1	79.5
<u>265.6</u>	
897.0	167.6
448.5	83.8
<u>224.25</u>	<u>41.9</u>

P. obs.

6 02

21.4	50.0
71.4	
205.2	50.5
<u>255.7</u>	
553.7	100.5
276.85	50.25
<u>138.42</u>	<u>25.12</u>

S. obs.

6 5

20.6	53.9
74.5	
257.2	56.6
<u>200.6</u>	<u>110.5</u>
552.9	55.25
276.45	27.63
<u>138.23</u>	

S. obs.



Nov. 2, 1878

P. obs.

6 8

348.3  
106.4  
166.9  
283.2

118.1

116.3

9048 234.4

4524 117.2

226.20 58.60

336.8

P. obs.

6 10

99.7  
174.7  
282.2

122.9

107.5

8934 230.4

4467 185.2

223.35 57.60

Field dark at this reading

6 14

85.1  
8.0  
199.6

77.1

61.6

261.2

5539 138.7

27695 69.35

138.48 34.67

21.1  
72.2

51.1

S. obs.

6 19

200.5  
254.9

54.4

5487 105.5

27435 52.75

137.18 26.37

S. obs.  
< field br.

Nov 2, 1878

351.2

81.1

89.9 Probs,

6 22

186.2

87.6

273.8

89 23°

177.5

44 61.5°

88.75°

22 3.09°

44.38

344.0

112.2°

96.2

Probs, block stopped  
between first two readings.

6 25

158.2

128.5°

286.7

88 51°

240.7°

44 25.5°

120.35°

22 1.28°

60.17

8.0

75.9°

S. obs.

83.9

6 29

189.4

75.9°

265.3

54 66°

151.6

27 33°

75.9°

136.65°

37.95°

6.3

77.8°

L. obs

84.1

6 32

182.7

91.9°

274.6

54 77°

169.7

27 38.5°

84.85°

136.93°

42.42°

Nov. 2, 1878

~~44.3~~  $\beta$  Persei -  $\beta$  Persei

1. obs.

~~6 39~~

6 39

44.3

3.4

47.6

225.7

3.3

229.0

5465

67

27325

335

136.63

1.67

6 43

44.2

3.0

1. obs.

47.2

226.1

2.8

228.9

5464

58

2732

29

136.60

1.45

 $\beta$  Persei & the comparison star

358.3

88.1

1. obs.

86.2

87.9

6 48

182.1

81.9

264.0

8906

175.0

1698

4453

85.0

849

222.65

425

4245

5.2

723

1. obs.

6 51

77.5

196.3

67.5

257.8

5308

1398

26540

69.9

132.70

3495



Nov. 2, 1878.

 $\beta$  Phoebe -  $\beta$ 

44.2 3.0' Sols.

47.2

225.1

228.6 3.5'

545.1'

27 25.5' 3.25'

136.28' 1.63'

44.2 2.8' 8 Sols.

47.0

225.2 3.4

228.6

545.0' 6.2'

27 25' 3.1'

136.25' 1.55'

43.7 2.9' 9 Sols.

46.6

225.0 3.7'

228.7

544.0' 6.6'

27 20' 33'

136.00' 1.65'

43.3

46.4 3.5' P. obs.

223.4 3.8'

227.2

540.7' 7.3'

270.35' 3.65'

135.17' 1.83'

Dec. 2, 1878

Sun.  $\beta$ 

P. obs.

708

346.6

85.3

98.7

169.6

272.2

102.6

873.7

13

436.85

100.65

218.43

50.33

359.1

87.3

88.2

177.7

84.5

263.2

~~88.73~~

887.3

13.7

443.65

86.85

221.82

43.43

42.4

39

46.3

224.0

38

227.8

540.5

270.25

3.85

135.13

1.93

226.6

46.0

3.4

224.0

3.8

227.8

540.4

270.20

3.6

135.10

1.8

P. obs.

710

 $\beta - \beta$ 

714

P. obs.

716

P. obs.

Nov. 2, 1878.

107

7 22

354.0

P. obs.

96.2

102.2°

164.3

275.0

110.8°

889.4'

13.0°

4447°

106.50°

222.35'

53.25°

346.2

P. obs.

95.3

169.1

7 26

162.3

276.1

113.8°

8799°

22.9°

43995°

111.45°

219.98°

55.72°

Photometer I.

Jupiter.

P. obs.

7 43

137

143

150

164

138

2.32

1.464

7 47

91

82

88

83

74

418

836

11 may

P. obs.



108

Nov. 2, 1878

7 50

283

334

251

288

295

1451

2902

33

32

36

35

43

179

358

9mg. P. obs.

Hyp. P. obs.

lin vis. 35

7 3451

~~22~~

56

44

8

7

0.0

Slovenish started at 11 1 0.0

Nov. 2, 1878

109

## Peak of Jupiter I.

Apparently compared with III.  
10 hrs.

11:7	37.132.4	25.4	45.
	59.157.0		
11.8	19.181.3	23.5	89
	29.154.0	set at 130	24.45
			12.22
11.9	26. <sup>57 6 3</sup> <sub>28 8 15</sub> 144.08	48	19
			19

	34.130.0	29.8	2.7
	45.159.0	37.2	3.8

11.10	1.120.6	42.3	54
	12.104.9	45.7	20 0.5
	21.119.2	48.5	1.4
	33.164.4	51.1	2.6
	44.116.6	55.3	4.0

11.11	1.171.9	62.7	54
	12.109.2	71.4	21 0.5
	20.180.0	71.0	2.1
	42.104.6	71.1	3.5
	56.170.4	72.9	4.9

11.12	11.105.0	76.1	22 0.5
	22.181.9	75.3	1.6
	38.105.6	73.7	3.2
	53.179.3		4.7

11.13	9.104.4	73.7	73.7
	30.100.6	74.2	76.2
		79	99
		73.95	74.95
		56.98	57.47

11.14	1.103.6		
	15.180.7	7.7.1	
	29.103.9	76.1	
	44.180.0		
	55. <sup>56 8 2</sup> <sub>28 4 1</sub> 142.05	13.2	38.3

11.15 15. Stop watch stopped at 35 1/4 Rattle

Nov. 2, 1878.

at 7. 11 22 Brook's circuit and rellish

$$11 \ 23 \ 49 = 8 \ 34 \ 00$$

$$\begin{array}{c} < & 11.95 & > \\ | & \text{-----} & | \end{array}$$

$$\begin{array}{r} < > \\ 3\frac{3}{4} \\ \hline 16 \end{array}$$

$$\begin{array}{r} 150/64 \\ 128 \quad .24 \\ \hline 220 \end{array}$$

$$\begin{array}{r} 11.95 \\ 11.48 \\ \hline 11.47 \end{array}$$



Nov. 3, 1878  
 Opened Dome at 5.

Shadows of I & III very distinct  
 and Nech. III double diameter of I  
 Declin =  $18^{\circ}0$

575 Shadow I passed off very near.

Transits

Three objects the first of which is thought  
 to be Juno (3)

OS	15 Dec,	OS
12	20.5	12.2
25	19.5	24.5

37.5

49.2

Of these  
 objects, the  
 first is  $15'$   
 south of a  
 star  $2\frac{1}{2}$  minutes  
 preceding, the  
 second  $20'.5$   
 the third  $19'.5$

Photometer I

Jupiter

P. obs.

6 0

1.32

1.17

1.41

1.58

1.47

1.390

112

Nov. 3 1878

1 magn. star

6 2

0.62 P. obs.

0.64

.74

.61

.71

332

.664

6 6

.74

.81

.70

.60

.69

354

.708

6 9

.76

.75

.73

.76

.93

393

.786

Sch

Japetus Sch

P. sets again at 1.35

Dec June = 15<sup>h</sup>.0

Nov. 3 1878

Photometer K.  
♄ Capricorni — ♄ Capricorni.

41.2

45.6

4.4

S. obs.

6 410

223.5

227.2

3.7

537.5

8.1

2687.5

4.05

134.38

2.02

42.0

3.5

45.5

S. obs.

6 416

222.1

5.1

227.2

536.8

8.6

2684

4.3

134.20

2.15



114

Nov. 3, 1878.  
Pole Stars

9 37	B triple 9m	} (	.5		
			4.5		
			4.9		
			5.1	5h 3m	
	C		9.5	7h 12	
	11		8.	12h 20	
			8	12 27	
	12		-1.5	13 25	
	13		1	12 <del>27</del>	
	C?		10	12 30	
			7	12 0	
	11		6	10 55	
	13		2	9 40	
	13		3	8 44	
47			5.5 double	7 17	
	C		7		
			12		
			2.5		
50	B		3	4 54.	
			7	4 25	



116

Nov. 4, 1878

- 1 30 Looked for Jupiter not seen either in  
declin. or lon.
- 2 30 Looked again found on Dec.  $-23^{\circ}0$   
Satellite not seen image bad belts hardly seen
- 2 51 0 Said I suspected  
51 35 " seen 1 diam foll.

Th 25m E of Merid  $20^{\circ} S$ Watch 56 27 at  
3 0 273 0 0.0  
2 59 48.5Watch is 420 feet  
Time obs. = 2 50 18.0

2 24 24

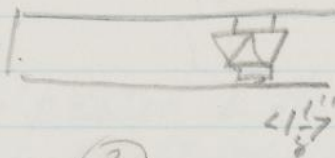
23 41

2 48 5

$\therefore$  Satellite not seen till two minutes later  
Object at best very faint - glimpsed



Area of Whet 0 <sup>Map 4</sup>  $1\frac{1}{2}$  inches from end  
of tube.



Search for Juncos (3).

20		
62		
65		
21.2	26	
90	25	
96	24.5	
141	19	12 magn.
185	25.5	
197	25	
216	29	Probably Juncos (3)
226	21	

Time	Decl.	
0 <sup>m</sup> 05	6	
12	5	10 magn.
31.5	1.5	Probably Juncos (3)
51.8	6	12 magn.
1 <sup>m</sup> 22.3	12	10
29.0	51.5	12
33.9	5	8
52.3	8	11
55.8	3	
2 4	6	12
<del>20</del>	11	12
46	4.5	12

Nov. 4, 1878.

		Decl.	Magn.
2 <sup>m</sup>	53.5	6	9
3 <sup>m</sup>	{	8	9
	}	13	10
4 <sup>m</sup>	12	4.5	
	30.2	2	10
	36.5	7	8
	57	6	11
5 <sup>m</sup>	19	2	8

\*

Dec. = 149

Photometer K

Upper & ~~fainter~~ fainter of two reflected images employed.  
 P. obs.

6 18

2.0	107.0
109.0	
184.3	83.6
267.3	
562.6	190.0
2813	95.0
140.65	144.50

clock troublesome; put on  
more weight.

Nov. 4, 1878

119

Juno (3) - 8 capric.

345.0

118.4

S. obs.

103.4

6 40

287.2

[328.2]

266.5

1002.1

501.05

250.53

4.5

85.4

S. obs.

6 47

89.9

184.8

267.7

546.9

82.9

8 3

273.45

8 4.15

136.72

42.08

193.6

263.1

6.9

85.6

549.5

148.5

274.75

74.25

137.38

37.12

Carefully focussed before beginning

25.3

S. obs.

58.5

Moved dome and began again -

28.2

31.4

59.6

7 14

200.6

37.7

238.3

9.1

526.7

263.35

34.55

131.67

17.28

Not Juno but  
a brighter star below



Mar. 4, 1878

Juno -  $\delta$  Capric.

Richs,

7 21

13.4

63.8

77.2

185.7

75.5

261.2

537.5

139.3

2687.5

696.5

1343.8

34.82

10.4

69.5

Uhrs.

79.9

186.1

75.9

262.0

538.4

54

2692

727

1346

36.35

12.0

60.8

P. E. Loh.

7 28

72.8

190.8

69.3

260.1

535.7

10.1

2678.5

65.05

1339.2

32.53

 $\delta$  -  $\delta$  Capricorni

Richs.

41.2

4.0

45.2

220.9

3.9

224.8

532.1

2660.5

3.95

1330.3

1.97

7 34

Nov. 4, 1878

U obs.

7 37  
 41.3  
 45.1  
 221.1  
 224.7

3.8

3.6

53 22

26 61

3.7

138.85

1.85

40.0

5.0

P obs.

7 39

45.0

221.1

225.0

3.9

5311

8.9

26555

11.45

132.78

2.22

40.6

44.1

3.7

U obs.

7 42

221.3

225.2

3.9

5310

2655

132.75

3.8

1.9

Japetus

1.23

1.38

1.30

1.30

1.34

1.310

P. obs.

7 50

122

Nov. 4, 1878.

7 52

11 mag. star.

P. obs.

.62

.52

.61

.56

.65

---

1.596

1.592

7 54

11 mag. obs

.66

.59

.65

.61

.78

---

1.658

7 57

Jupiter obs.

1.02

1.16

1.17

1.42

1.19

---

1.192



Nov. 4, 1878

123

Dec.

11

12

9 0  
9.5 3.2  
2 9

30

37

52 13 30

50 43 36.8

48 ~~44~~ 39

46 " 44.

45.5 15 6

42.5 12.2

56. 42.

60 44.5

9.3  
8.4

)

8.0

50	0 <sup>5</sup>	0 <sup>3</sup>	0 <sup>3</sup>	0 <sup>3</sup>
48	2.6	2.6	2.1	2.3
46	8.0	8.0	7.2	7.7

1st time

46

48

50

52

46

9 12 = 0 12 (3451)

48

50

52

48 has same RA as 50 and  
has therefore moved about 2.5

Nov. 4, 1878.

U. S. A.

Time	Decl.	Parallax	Magn.	U. S. A.
5' south	23 41 55.2	0	10	a & Aquilae
& Aquilae	412 11.0 15.8	0	10	b
	13.0 18.3	2	8	c
	19.2 24.0	3	7	d
	48.3 53.1	7	3	e
413	5.5 1 10.3	13	7	f
	10.1 1 14.9	5	5	g
	11 16	4	6	h
	13 18	7	3	i
	19 24	6	1	j
	31.0 35.8	7	3	k
	38.6 43.4	12	8	l
	43.6 48.4	6	4	m
44	13.2 2 18.0	1	9	o 9 mag.

23 <sup>h</sup> 45 <sup>m</sup>	33.7	0	10	a & Aquilae
	49.1 15.4	1	9	b
	50.3 16.6	0	10	
	57.2 23.5	2	8	d
46	27.0 43.3	7	3	e
	43.0 19.3	13	7	f
	49.5 15.8	5	5	g
	50 16	4	6	h
	52 18.8	7	3	i
	57 23	9	1	j
47	6 35	14	3	k
	17 43	12	8	l
	22 48	5	5	m
	27 53	10	0	n
	31.3 17.6	1	0	

Nov. 4, 1878

U. obs.

	Time	Decl.	Magn.	
Zone 5 north 2 Aquilae	23 <sup>h</sup> 57 <sup>m</sup>	29.8	10	
		32.0	4.2 17	
		36.7	6.9 11	
		47.5	17.7 20	
		50.0	20.2 18	
		58.0	28.2 17	
		<del>65</del>	10	
	5-2	6.5	36.7 20	
		11	41.2 18	
		13	43 16	
		31.0	1 12 17	
		46.7	16.9 19	
		55.5	25.7 17	
		18.5	48.7 19	
		20.3	50.5 20	
		29.8	2 00	
		39.6	9.8 17	
		45.9	16.1 17	
		48.0	18.2 9	

lost

Same with  
last of  
former sets.

In the column headed "Renumbered" on the preceding page, the declinations are changed from south to north so as to correspond with the numbers used in the northern zone.



Nov. 4 1878

Zone 5<sup>1</sup>  
north of  
A. AquilaTime  
23<sup>h</sup> 55<sup>m</sup>Decl. <sup>half minutes</sup>

Mayer, 2 April

	11		10
	14.3	33	17
	17.8	6.8	12
	28.3	17.3	20
	31	20	18
	39.0	28.0	18
	42.0	31.0	10
	47.8	36.8	20
	51.0	40.0	18
5-6	54.0	43.0	16
	12.0	1	18
	28.0	17	19
	36.7	25.7	17
	59.5	48.5	19
	11.2	2 0.2	18
	14.2	3.2	14
	20.	9	12
	21.	10	17
	27.3	16.3	14
	29	18.	9

same with last  
of preceding set

The numbers used in the Decl. column in  
all the above denote half minutes of arc.

Nov. 4, 1878

Japetus

9 30

1.14

S. obs.

1.10

1.15

1.15

1.35

---

1.178

9 36

11 mag. star

S. obs.

.62

.68

.63

.63

.82

---

.676Phot J. Stars near  $\alpha$  Aquila

9 52

3.14 =  $\alpha$  page 124

P. obs.

1.77 = e

= f

Nov 5, 1878

I    II

~~Infinitesimal~~    ~~II~~    P. obs.

4 30 Latell seen very easily with H when  
 merid cuts off pole of sky. but cannot  
 be seen

4 37    106.6    7  
          287.4    88.4  
          185.0    83.0    very diff  
          10.4

589.4    171.4  
 294.7    85.7 80.70  
 147.35    42.85 40.35

4 41    13.3    84.5    277°  
          97.8

188.9    87.9  
 276.8

576.8    172.4  
 238.4    86.2  
 144.2    43.10

4 44    5.4    10" 10"    227°  
          105.2    80.1

185.3  
 283.7    81.7  
 579.6    161.8  
 289.8    80.9  
 144.9    40.45

4 50    12.2    83.8    50°  
          96.0    < H dis II  
          193.0    80.8  
          273.6    164.6  
          575.0    82.3  
          287.5    41.15  
          144.25

early  
 0" 10"



Nov. 5, 1878.

129

5 17

6.3	
94.8	88.5
191.0	
277.4	86.4
569.5	174.9
2847.5	87.45
14238	43.73

 $\angle \Pi$  dis

Satellite height

 $0^{\circ} 20''$  $180^{\circ} 10''$ 

5 20

7.0	
1070.8	88.8
189.6	
2847	82.3
5821	171.1
29105	85.55
14552	42.77

 $\angle \Pi$  dis

IV III

II I O

5 50

Transits to fix place of  
Juno (3)

Juno to a

17.6	17.6
35.0	17.6
52.6	17.6

Juno.

Declin =  $15^{\circ} 0$

130

Nov. 5 1878  
Jupiter I, II Photometer H.

6 17

7.6  
98.3 - outer satellite  $\left\{ \begin{array}{l} \text{S. obs. } 150^\circ 5'' \\ \text{disappears} \end{array} \right\}$   
185.3  
281.0 95.7  
572.2 6.4  
286.1 93.2  
143.05 46.6

Outer satellite is II.  
Inner " " I.

6 22

5.6  
100.4  
181.4 81.0 <  
283.9 81.7  
571.3 7  
285.65 81.35  
142.83 40.67  
Complement 49.33

outer from inner satellite  $330^\circ 5''$  S. obs.  
inner satellite disappears

6 30

Jupiter III, IV  
22.8  
83.0 60.2  
208.1  
262.8 59.7  
571.7 119.9  
285.85 59.95

IV from III  $160^\circ 5''$  S. obs.

6 33

142.93 29.98  
355.0  
112.7 58.7  
171.4  
292.6 62.4  
931.7 11  
465.85 60.55  
232.93 30.27

S. obs.  $320^\circ 5''$ Somewhat  
cloudy

Nov. 5, 1878.

June ③ - 8 bapric.

Phot. K.

P. obs.

8 2

359.3

88.0

87.3

181.8

85.6

267.4

8958

13.6

4479

86.80

223.95

43.40

Star a

P. obs.

10.3

66.9

77.2

8 5

192.9

60.9

253.8

5342

7.8

2671

68.90

133.55

31.95

③

Star a

8 08

23.0

42.1

65.1

200.5

49.7

250.2

5388

11.8

2694

45.9

134.7

22.95 ③

8 11

20.2

49.3

69.5

197.0

61.2

258.2

5449

110.5

27245

55.25

136.23

27.63



Mar. 5, 1878-

(3) *S. capricorni* P. obs.

188.4 66.4

254.8

8.0 68.9

76.9

52.81 135.3

26.405 67.65

132.03 338.2

15.0 58.8

73.8

191.0 61.4

252.4

532.2 120.2

266.1 60.1

133.05 30.05

21.3

43.0

64.3

195.6

47.5

243.1

524.3 10.5

262.15 45.25

131.08 (3) 27.62

13.6

61.0

74.6

195.8 56.2

252.0

536.0 117.2

268.0 58.60

134.0 29.30

P. obs.

Hazy

Star M. obs.

Hazy

M. obs.

Nov 5, 1878

S 28 Cr.

8 34

37.3

44.8

220.2

224.9

527.2

263.6

131.8

7.5

4.7

12.2

6.1

3.05

S - S

P. obs.

38.3

6.6

44.9

218.8

6.2

225.0

527.0

12.8

263.5

6.4

131.75

3.2

8 39

38.8

5.1

U obs.

43.9

220.0

4.2

224.2

526.9

9.3

263.45

4.65

131.72

2.33

39.1

4.9

P. obs.

44.0

219.7

5.0

224.7

527.5

263.75

4.95

131.88

2.47

8 42

134

Nov. 5, 1878  
 Photometer  
 11 mag. star near Saturn  
 P. obs.

9 26

3.20

3.50

3.35

3.76

3.90

---

 3.542

Moon near

9 32

3.05

3.06

3.47

3.18

3.32

---

 3.216

u. obs.

9.36

3.37

3.12

3.04

3.49

3.74

---

 3.352

S. obs.

Through clouds

Things looked for; probably  
 seen by P.

Seeing

~~2~~  
 4  
 4

2  
 4  
 4

6  
 8  
 7

9  
 6  
 8

(P.)  
 (S.)  
 (u.)



Nov 6, 1878.

Damey died at 5 PM

Jupiter I, II

5-16

5.7  
100.6 9  
189.0 88.4  
283.6 82.1

14.11  
◯ I dis.

I II

II I

I from II 90° 5"

I > II

57 89 10 5  
289 45 85.25

II > I, if the disappearance  
of I occurs between 1<sup>st</sup> two readings.

5

144.73 42.63 Complement 47.37

5-19

8.6  
100.1  
190.6  
279.6 89.0

< II dis.

I > II

57 89  
289 45  
144.73

.0.5  
90.25  
44.12

Complement 44.88

28.6

Seen at 5 ③

577

94 = 47 m day

28.6  
17.6  
46.2

Clouds

Nov. 6, 1878.  
~~8 mag.~~ -  $\delta$  Capric.

P. obs.

Lower and brighter  
 image of  $\delta$  used  
 in all measures  
 tonight

7 18

14.6 56.2  
 70.8  
 194.6 55.8  
 250.4  
 5304 1120  
 2652 560  
 13260 280

x 20

June (3) -  $\delta$  Capric.

P. obs.

7 20

349.2 1014  
 90.6  
 169.4 104.6  
 274.0  
 8832 2060  
 4416 1030  
 2208 515

7 26

$\delta$  Ursa Maj =  $\gamma$  Cass. P. obs.

7 29

June (3) -  $\delta$  Capric. U. obs.

$\beta$  Ursa Maj =  $\epsilon$  Cass.

8 mag. -  $\delta$  Capric.

7 33

64.2 48.1  
 16.1  
 187.5 68.9  
 253.4  
 5212 1154.0  
 2606 5750  
 130.3 2875  
 2850

350.3 June (3) -  $\delta$  Cap.

U. obs.

7 37

84.3 94.0  
 171.6 97.0  
 268.6  
 8748 1910  
 4374 955  
 2187 4775

Nov. 6, 1878.

Juno -  $\delta$  Capric.

P. obs.

7 39

0.9  
81.8 80.9  
185.6 77.8  
263.4

531.7 158.7  
265.85 79.35  
39.67

132.92  $\delta$  mag. -  $\delta$  Capric.

P. obs.

7. 42

346.6 105.8  
92.4  
185.9 67.8  
253.7  
878.6 173.6  
439.3 86.8  
219.65 43.4

7 45

6.4 67.8  $\delta$  mag.  
74.2  
183.6 80.9  
264.5

U. obs.

528.7 148.7  
264.35 74.35  
132.17 37.18  
349.6 113.4  
103.0

U. obs.

7 50

159.5 127.7  
287.2  
899.3 41.1  
449.65 120.55  
224.83 60.27

Image of (3) ←  
poorly defined



Nov. 6, 1878-  
 $\delta - \delta$  Capricorni -

P. obs.

7 58

39.0  
 43.6 4.6  
 219.4  
 223.7 4.3  
 52.57 .9  
 26 285 11.45  
 131.43 2.22

U. obs.

8 01

38.8  
 44.0 5.2  
 219.2 4.6  
 223.8  
 52.58 9.8  
 26 29 4.9  
 131.45 2.45

P. obs.

8 5

39.0 4.4  
 43.4  
 218.7 5.4  
 224.1  
 52.52 9.8  
 26 26 4.9  
 131.3 2.45

U. obs.

8 7

39.2 5.6  
 44.8  
 218.9 4.5  
 223.4  
 52.63 .1  
 26 3 15 5.05  
 131.57 2.02

Nov. 6 1878.

Jupiter I, II. Photometer H.

8 14

11.8 82.5

94.3

191.3

276.7

5741

28705

143.52

82.5

85.4

7.9

83.95

41.97

U. obs. 50° 4"

— ~~II~~ (satellite ~~farthest from~~ ~~from~~ Jupiter) disappears.

8 16

11.7

97.4

182.3

281.4

5728

2864

143.2

84.9

90.3

175.2

876

43.8

U. obs. 50° 4"

— ~~I~~ (satellite nearest Jupiter) disappears.

Photom. K

2 Urs. Min

39.2

450

217.6

222.9

5247

26235

131.18

5.8

5.3

1.1

5.55

2.77

P. obs.

8 46

8 Urs. Min-

29.9

50.8

210.6

230.2

5215

26075

130.37

20.9

49.6

5

20.25

10.13

P. obs.

8 53

Nov. 6, 1878  
51 Cephei

Prob.

8 57

28.2 22.2  
50.4  
209.0 25.0  
234.0  
521.6 7.2  
2608 23.60  
130.4 11.80

2 Ursa Min.

Prob.

9 3

16.9 43.7  
60.6  
200.7 38.7  
239.4  
517.6 2.4  
2588 41.2  
129.4 20.60

2 Ursa Min.

Prob.

9 14

39.2 6.5  
45.7  
297.3 5.9  
223.2  
525.4 6.4  
2627 3.1  
131.35

Sat. of  $\Psi$  - 2 Arietis

9 46

.58  
.50  
.55  
.62  
.55  

---

.560

Prob.  
Achromatic eyepiece  
Neptune out of field  
Sat. well seen



Nov. 6, 1878

Satellite Neptune &amp; Antis L. to.

10 0

0.60

0.58

0.56

0.51

0.67

42

0.584

U obs.

10 7

.58

.60

.57

.56

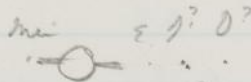
.58

0.578

Minas not seen



(W)



R.

P. to

142

Nov. 7, 1878

Comparison of time pieces.

Phot. H.

7.3451

21<sup>h</sup>5<sup>m</sup>

12.5

21<sup>h</sup>9<sup>m</sup>

13.0

03.394

0.0

6

0

0.0

S. obs.

imaginary line

{ 250° 25" }  
IV from IIIDisappearance  
of Jupiter IV

21 32

116.4

48.9

165.3

294.8

~~344.1~~

50.9

345.7

922.2

998

461.1

499

230.55

249.5

34

113.8

49.6

163.4

297.1

50.9

348.0

922.3

99.6

100.5

461.15

498

50.25

230.57

249.0

25.12

38 3

113.0

56.7

25

169.7

38 30

56

113.1

38 56

53

169.2

28 53

17

112.9

56.1

56.4

28.2

53.7

51.0

56.50

28.25

141.25

39 17

166.16

34

111.0

39 45

56

169.4

39 56

13

122.6

Clouds

559.9

279.95

139.97



Nov. 7, 1878.

40	50	170.3	47.7	5739		
<del>40.52</del>			<del>55.3</del>	28695		
41	2	114.0	53.0	143.48		
<del>18</del>			0.9			
31	9	167.0	25.18			
<del>209</del>			53.6			
418	20	113.4	54.2			
<del>40.52</del>			62.7			
21	29	167.6	71.64			
<del>41</del>			57.3			
40	49	110.3	62.7	141.07	32	15
<del>32</del>			60.2			
42	1	173.0	58.9			
<del>30</del>			55.9			
42	51	112.8	53.4			
48		168.7	51.0	109.3	33	14
33	17		53.4	142.57		
57		117.7	56.5			
43	9	171.1	60.6			
<del>44</del>			58.4			
25		114.6	58.4			
43	54	165.8	58.4			
46		107.7	139.10			
34	20					
44	2	168.3	50.0			
21		118.3	45.8			
44	56	164.1	50.3			
47		115.0	49.2			
35	22		58.0			
45	5	165.3	140.67			
22		117.5	47.8			
37		161.8	41.2			
55		120.6	41.6			
46	6	161.7	41.2			
25		120.1	42.6			
39		161.3	41.9			
50		118.7	42.1			
47	2	160.8				
16						

Let of June to this point

31 46

55

32 15

24

56

33 14

23

35

51

34 12

28

47

57

35 13

30

48

36 08

20

38

50

37 04

18

28

42

11 36 02

18 36 20

11 36 31

19

14

11

12

14



144

Nov. 7 1898

47	30	122.8	35.7	37	55	14
47		158.5	36.4	38	12	17
59		122.1	35.4	24		12
48	12	157.5	37.9	37		13
27		124.6	<del>Clouds</del>	<del>38</del> 52.		15

Clouds

55 9 158.4 limit of vis. of 3<sup>rd</sup> sat.

This last reading was obtained during a momentary brightening of the field during which the fourth satellite might perhaps have been seen if its brightness had remained constant instead of diminishing.

The observer's eye was kept at the telescope steadily until there was no longer any chance of seeing the satellite again.

The bright image of the third satellite continued visible.  
Comparison of time pieces

F. 3451	22	9	23
B. 394	7	0	0

Nov. 7, 1878  
 Cleared off at 8 30

R. E. - O -

Hy.

9 03 Minus U. ds. astron. cyfine

Hyperin

P. ds.

9 18

.71

.55

.52

.61

.50

2989

.528

Hyne 4

U. ds.

9 25

.40

.46

4.30

Clouds

Sun 79.8  
 78.8

146

Nov. 8, 1878

Photometer I

11 magn. star near Saturn

6 31

0.90

S. obs.

0.94

.61

.78

.71

---

1.788

6 35

Japetus -

1.42

S. obs.

1.19

1.36

1.34

1.27

---

1.316

6 48

1.65

Robin

1.44

1.45

1.33

1.55

---

1.484



Nov. 8, 1878

6 50 11 magn. star P. obs.  
 0.98  
 .93  
 .94  
 1.00  
 0.86  


---

 0.942

7 20 ~~Sapetus~~ 11 mag. U obs.  
 .74  
 .72  
 .68  
 .66  
 .78  


---

 .8  
 7.6

7 23 .90 Sapetus U obs.  
 1.07  
 1.12  
 1.13  
 1.26  


---

 5.48  
 1.096

Search for (3)  
 8<sup>m</sup> Dec. 9 0.0 St. watch  
 \* 12 1 19.5  
 = 8<sup>m</sup> 9 1 35  
 Junes? 9 2 11.5  
 \* 8.5 39.5

148

Nov. 10, 1878

5 48

Japetus. Photometer J.  
P. obs.

1.61

1.51

1.36

1.35

1.50

7.35

1.466

11 magn. stars

5 53

0.91

1.06

0.93

1.02

0.94

486

.972

P. obs.

5 57

.89

.88

.88

.86

.92

443

.886

Schr 11 mag.

6 02

1.44

1.44

1.35

1.48

1.35

706

1.412

Japetus Schr

Nov. 10, 1878

6 01  $\beta$  Antiqua =  $\delta$  Cass. Obs  
Search for Pallas

Decl. Magn.

Dec 9  
P.M. only  
= 11.0 S

	<sup>s</sup> 0	0	
	25.4	6	10
1	38.9	9	9
	56.0	14	9
2	33.5	4.5	10
	39.5	12	11

17.3

5.5

- 11 28 39  
11 19 4922 39 17  
40 55<sup>55</sup>  
108

9

172

W. 22<sup>h</sup> 894 - 11 3

11 7

22 43 47

22 44 3

<sup>55</sup>  
19  
1007

17

18.9

53

567

945

1001.7

Time

Decl.

<sup>s</sup>  
0

4.5

34

8

53.5

6.5



150

Nov. 10, 1878,  
Search for Cens ① through clouds.

\* 8.8

$$\begin{array}{c} \wedge \\ 3' \\ \vee \end{array}$$

Obj. 12100 free and 3' 2 of 8.8

$$\begin{array}{r} 2 \quad 18 \quad 12 \\ \hline 2h \quad 17 \quad 21 \\ \textcircled{1} \quad 2 \quad 19 \end{array} \quad \begin{array}{r} 1 \quad 10 \\ 20 \quad 26' \\ 2 \quad 20 \end{array}$$

Nov. 12, 1878.

Photometer H.

Jupiter; two satellites preceding; near Jupiter about 25" apart.  
S.O's.

6 47

10.8

98.5 87.7

188.5

276.8

574.6

287.3

143.65 44.0

Position of nearer from farther  
satellite  $340^{\circ} 5''$ 

farthest from Jupiter disappears I dis

88.3

176.0

88.0

I Brightest

S.O's.

6 50

103.0

179.8

281.7

361.4

925.9

462.95

231.478

Position of nearer from farther  $135^{\circ} 5''$   
farther from Jupiter disappears I dis

76.8

79.7

16.5

78.25

39.13

I Brightest

Sat. of Neptune P.O's.

7 13

.61

.60

.64

.61

.66

12

.624

Satellite very distinct

7 16

.62

.71

.60

.63

.50

6

.612

U.S.S.

By Comp at 6 48 I at  $95''$   
II at  $73''$ 

Alpha

I II



152

Nov. 12, 1878

Ubs. *Scorpius* *supra*

7 25

.70  
 .69  
 .57  
 .67  
 .55  


---

 .636

Not seen steadily but  
 observed as it occasionally flashed  
 out. It was <sup>very</sup> plainly seen at these  
 intervals.

7 31

1.01 Second look shows it to be decidedly too bright.  
 .86  
 .59  
 .71  
 .66  


---

 .766

7 40

Jupiter

P. obs.

1.71  
 1.49  
 - 1.57  
 1.60  
 1.40  


---

 1.554

7 42

11 mag. star

P. obs.

0.92  
 .87  
 .91  
 .99  
 .99  


---

 .936



Nov. 12, 1878.

7 45

11 mag.

U det.

.89

.79

.79

.65

.66

---

 1.752

 .4 1.  $\odot$ 

Hydrium easily seen by P.  
 Transit lat. 19.6 sec 20.0 = cent. time  
 U det.

7 50

Lat.

1.32

1.36

1.59

1.44

---

 1.32

1.406

154

Nov. 12, 1878.  
Zen near Saturn

	0.0	6		0	6	12
	11	7		1	9	14
	12		14			
	50	3				
1	<del>48</del>	5				
	48	3				
	52	4	1			
2	32	4	fr.			
	46	1	hr.			
	<del>8</del>					
3	8	8				
	37	5	10			
	38	-2	10			
4	0	4				
	9	3				
	19	4				
	28	1				
	33	5				

Nov. 12, 1878.

155

Search for Juncos (3)

Deed

~~Deed~~ 7 $\begin{matrix} 0^m & 0^s \\ 3. & 4 \end{matrix}$  $\frac{9}{4}$  $\begin{matrix} 4 & 34.5 \end{matrix}$  $\begin{matrix} 5 & 46 \end{matrix}$  $\frac{7}{7.5}$ 

Probably Juncos (3)

 $\begin{matrix} 0^m & 0^s \end{matrix}$  $\frac{37.5}{2}$ 

37.3



156

Nov. 13, 1878

Photometer H. Jupiter II, IV.

6 14

2.6  
107.1  
179.1 72.0  
288.9  
577.7 73.7  
28885 5.7  
144.43 72.85  
36.42

S. obs. IV from II 60° 90"  
IV disappears.

6 22

7.2  
95.9 88.7  
196.0  
276.0 80.0  
575.1 8.7  
287.55 84.35  
143.78 42.17

S. obs. IV from II 60° 90"  
II disappears.

Set again at 7.2 to test 1st  
reading; images about equal.

6 31

7.7  
819.75 81.8  
184.2 86.0  
270.2  
551.6 7.8  
275.8 83.90  
137.90 41.95

U. obs. IV from II 45° 90"  
II disappears

6 33

109.1  
192.7 83.6  
283.9  
368.4 84.5  
954.1 81.  
477.05 84.05  
238.52 22.03  
42.03

U. obs. IV from II 45° 90"  
II disappears  
Barely seen; cloud.

Nov. 13, 1878

6 47  $\theta$  Auriga =  $\beta$  Pegasi (Blocks rather faint) } U. obs.  
 47  $\beta$  " =  $\alpha$  Andromeda

6 50 11 mag. star  
 1.50  
 1.33  
 1.23  
 1.17  
 1.20  


---

 1.286

Phot. I

S. obs.

Looked to see if  
 anything was in the way  
 of the prism.

6 56 Japetus  
 1.50  
 1.43  
 1.38  
 1.49  
 1.62  


---

 1.484

S. obs.

The 11 mag. star looks  
 about as bright as Japetus.  
 After this set, both  
 observers looked at the  
 objects to make sure  
 that the same objects would  
 be observed by U.

7 3 11 mag.  
 .99  
 .94  
 .87  
 .88  


---

 .94  
 .924

U. obs.



158

Nov. 13, 1878.

7 11

Jupiter  
1.80

U. ob.

1.41

1.60

1.69

1.46

---

1.592

Charts of stars near the pole,

U. obs.

Reference Star 9.5 magn. at bottom of field

x reckoned to the right, y upwards.

8 30 Reference Star  
Star 12 magn.

x	y
26.8	24
6 25	25
18 37	2
20 39	5 7
24 43	13 15
27 46	8 10
23 42	13 15
28 47	17 19
14 33	18 20
23 42	17 19
26 42	28
26.4	28.8

Chief component Triple " star 9.3 "



Nov. 13, 1878

Second set. the reference star for this set is the triple star last in the first set.

		x		y	
8 40.	Triple star (chief component)	<del>23</del> 23	42	<del>27</del> 27	28
	Star 13 magn.	1	20	2	23
	" 13 "	4	23	7	28
	" 13 "	11	30	1	22
	" 13 "	20	39	2	23
	" 13 "	28	47	2	23
	" 11 "	21	40	8	29
	" 12 "	22	54.5	7	28
	" 13 "	30	49	8	29
	" 14 "	8	27	11	32
	" 14 "	8	27	16	37
	" 13 "	15	34	12	33
	" 12 "	13	32	17	38
	" 13 "	20	39	13	34
	" 13 "	18	37	18	39
	" 14 "	21	40	16	37

These two  
are the second  
& third components  
of the triple star

Lat.

Hyp.

Lira &amp; Di

m. Engel.

Feb.

Nov, 13, 1878.

Third set, (moved down 10 divisions in  $y$ )  
 This brings the triple star (in  $y$ ) to  $-30$ .  
 The last star but one in the second  
 set is now at  $x 18 \quad y 8$ .  $-3 \quad 28$

	$x$	$y$
Star 13 magn.	15 34	12 43
" 13 "	22 41	11 42
" 13 "	26 45	13 44
" 11 "	20 39	20 51
" 9.5 "	18 37 38.2	22 <del>47</del> 55.4

This last star is on the  
 chart of reference stars, above  
 the triple star. It is the first of the  
 following set.

	$x$	$y$
8 55 Star 9.5 magn.	18 37	12 53
" 10 magn.	0 39	5 56
" 14 "	24 43	13 64
" 13 "	23 42	17 68
" 13 "	6 25	16 67
" 13 "	7 26	18 69
" 13 "	14 23	18 69
" 14 "	10 29	15 66



Nov. 13, 1878. {probably first  
Fifth set, beginning with last star  
of previous set.

		X		Y
		18 37	—	8 53
Star 12 magn.		12 31		13 74
" 13 "		13 32		13 74
Reference star from chart	" 8.9 "	0 19		17 78
" 13 "		3 22		19 80

g<sup>h</sup> 0

Sixth set.  
Beginning with reference star  
marked c on chart 6' in x & 3' in y  
from triple star.

9 15	Star 9.3 magn.	X		Y
	Triple star	30 54		8 34
		18 42		2 28
	12 "	17 41		2 28
	11 "	16 40		3 29
	13 "	10 34		7 33
	13 "	15 39		9 35
	14 "	24 48		14 40
	12 "	9 33		13 39
	14 "	15 39		9 35
	13 "	13 37		13 39
X first of next set	12 "	10 34		18 44
	13 "	18 42		17 43
	14 "	24 48		14 40
	13	26 50		16 42



162

Nov. 13, 1878  
Sixth set continued.

Star	13 magn.	X	Y
		27 51	15 41
	13	21 45	18 44

star marked in last set. *Seventh set, beginning with*

9 20	Star	12 magn.	X	Y
		9.5 "	20 34	18 44
		10 "	0 14	5 31
		14 "	0 14	8 34
		14 "	8 22	3 29
		14 "	19 33	2 28
		13 "	30 44	7 33
		12 "	28 44	13 39
		12 "	1 15	16 42

*Eighth set, beginning with*  
second star in seventh set.

9 24	Star	9.5 magn.	X	Y
		11 "	30 44	5 31
		12 "	5 -11	9 35
		13 "	19	10
		13 "	10	20
		12 "	18	20

Nov. 13, 1878

North set beginning with second  
star in eighth set.

9 26	Star 11 magn.	25 -11	9	36
	8.5 "	13	10	
	11 "	17	— 4	
	12 "	17	4	
	13 "	14	10	
	14 "	12	14	

9 56 Minus Udr

.62  
 .59  
 .55  
 .59  
 .57  
 .584

Enceladus Udr

Area to Min = Min to Enc  
— ...

9 58

.86  
 .77  
 .90  
 .75  
 .90  
 .832

Minas seen with  
 unusual distinctness  
 even with planet fully  
 in field.

164

Nov 13 1878

Mimas S. obs.

10 05

$$\begin{array}{r}
 .64 \\
 .13 \\
 \hline
 .62 \\
 .67 \\
 .63 \\
 \hline
 .638
 \end{array}$$

10 14

Enceladus

S. obs.

$$\begin{array}{r}
 .85 \\
 .78 \\
 .70 \\
 .72 \\
 .84 \\
 \hline
 .778
 \end{array}$$

10 17

Mimas Enceladus

P. obs.

.64	
	.80
.64	
	.77
.61	
	.83
.57	
	.77
.55	
<u>        </u>	<u>.74</u>
.602	.782



Nov. 13, 1878

Hyperim

P. obs.

10 27

.38  
 .47  
 .42  
 .51  
.46  
 .448

10 33

.43  
 .40  
 .35  
 .39  
~~.42~~  


---

 .398

S. obs.

10 40

.36  
 .34  
 .37  
 .29  
 .32  


---

 .336

U. obs.

10 47

Meimas

.60  
 .69  
 .63  
 .63  
.60  
 .630

U. obs.

Meimas  $\frac{6}{10}$  of the way from  
 the ansa to Enceladus:  $\frac{3}{5}$  of the length of the ansa beyond it. (P. & U.)

166

Nov. 13, 1878  
 Minnas P. obs.

10 521

.65

.66

.72

.61

.67

.662

Seeing

7, 8, 8, P.

8, 9, 9, u

Cloud at 11.0

	Mn	En	H <sub>2</sub>
u	584	832	336
s	638	778	398
p	602	782	468
u	630		
p	662		

Nov 14, 1898  
 New tailpiece attached by Mr. Black.

6 36	11 mag. star	Phot I
	.62	P. obs.
	.69	
	.65	
	.69	
	.75	
	<u>.680</u>	

6 40	Japetus	P. obs.
	1.25	
	1.34	
	1.26	
	1.48	
	<u>1.68</u>	
	1.402	

6 44	Japetus	S. obs.
	1.36	
	1.34	
	1.30	
	1.26	
	<u>1.35</u>	
	1.322	

6 53	11 mag. star	S. obs.
	1.07	
	1.10	
	1.21	
	1.09	
	1.02	
	<u>1.098</u>	



168

Nov. 14, 1878

11 mag. star

u. obs.

7 5

.86

.83

.88

.94

1.09

.920

Jupiter

2.02

u. obs.

7 12

1.46

1.63

1.43

1.42

1.59<sup>2</sup>

Juno examined and found to be  
 7<sup>m</sup> 40<sup>s</sup> following the 8<sup>m</sup> star used as a  
 reference star in previous observations

St. watch June precedes a fainter star

7 45

sf by 15<sup>s</sup>

Nov. 14, 1878.

169

 $\gamma$  Aquilae

S. obs.

8 30

Position zero  $305^{\circ} 35'$  read on circle of new  
tail piece the stars moving parallel to  
the edge of the prism of Phot. I.

Diameter of field  $40^{\circ} = 10'$ Companions to  $\gamma$  Aquilae

Approx. P.A.	Pos. Ang. Recd.	Distance	Mag.
$270^{\circ}$	$295^{\circ} 39'$	$\pm 50''$	13
270	do	130	11
45	$245^{\circ} 7'$	120	11

 $\beta$  Aquilae

0	$208^{\circ} 5'$	120	13
0	$201^{\circ} 19'$	150	10.5
90	$123^{\circ} 10'$	100	12.5

8 54  $\eta$  Urs. Maj. =  $\epsilon$  Cassiope P. obs.55  $\gamma$  Urs. Min. =  $\epsilon$  " P. "56  $\alpha$  Aquilae = Saturn P. "9 5 Int. of Lyra to Saturn =  $3 \times$  Int Saturn to  $\alpha$  Aq. U. obs.9 17 Jupiter =  $\alpha$  Aquilae U. obs.

170

Nov. 14, 1878.

9 16

Moimas

0.55

.52

.55

.55

.54

0.542

Photometer I  
P. obs.

f.

Sketch of position of images

9 19

0.415

91

U. obs.

.46

.455

.67

.57

.58

.59

.57

.48

.586

Altered relative position of images, so  
that they may  
be symmetrical with  
respect to ansa.

f.

9 29

Achromatic eye-piece

.54

.49

.50

.54 (poor)

.55

.524

P. obs.

Moimas not seen by U. with achromatic  
eye-piece.



Nov 14, 1878.

Companions to  $\alpha$  Delphinus S. obs.

Position zero  $14^{\circ} 25'$  (star runs on wire)

9 52	Approx Pos.	Reading	Distance	Mag.
	$270^{\circ}$	$147^{\circ} 35'$	$40''$	12
	200	164 48	70	11.5

Seeing 7, 7, 7 (21.)

Nov. 15    1878 .

Photometer J. 11 mag star near Saturn

6 43

5.50

5.14

4.77

4.94

5.50

5.175

5.070

S. obs.

Upper & fainter image used

Objects very indistinct  
in haze.

6 54

3.65

4.08

4.36

4.13

4.24

4.272

4.092

U. obs. Images very faint.

6 58

4.43

3.18

3.98

3.94

3.71

3.848

P. obs.

Nov. 15, 1878.

Japetus

Phot. I

P. to

1.30

1.22

1.20

1.37

1.37

1.292

11 mag star

1.84

.94

.93

.73

.901.868

P. to

Titan

3.59

3.69

3.89

4.13

3.57

3.87

~~3.594~~

3.774

4.54

4.32

4.65

4.76

4.07

23.4

4.468

P. to

U. ds.



174

7 25

1.33

1.37

1.34

1.00

1.73

1.17

1.234

Nov 15, 1878

U. S. S.

Japulus

7 30

.68

.77

.78

.70

.69

3.2

.724

11 mag. U. S. S.

8 10

Photometer Mo.

 $\gamma$  Delphini

Pinion at 66.38

P. obs.

Vernier A at 96

Position angle by milled head  $9^{\circ}54'$ 

Pinion

65.03

— 11 —

66.00

13.58

Images good, faint  
Increasing reading

Cloudy

Nov. 15, 1878  
 $\beta$  Cephei P. obs.

9 16

377.6  
 373.7  
 377.2  
 378.1

Increasing reading  
 Decreasing "  
 Inc.  
 Dec.

~~378.22~~

26.6

13.3

Mean

~~376.65~~

Set pinion at 68.00

9 21

258.0

258.1

258.12

257.46

~~181.68~~

18.84

Mean

257.92

258.0

Increasing

Decreasing

Increasing

Decreasing

0

1

12

14

27

7

.03"

Set pinion at 64.50

9 25

258.26

258.55

259.21

258.8

~~34.82~~

17.41

258.72

14.573

1146.34

2500

Increasing

Decreasing

Increasing

Decreasing

+1 -16

+30 +13

-4 +39

-34

102

25'

= 0.10

170

~~42 258.25~~

258.42'

10 = 124

16816

176

Nov. 15, 1878.

Set. at 248, 13, 0

9 30	66.10	Increasing	7
	66.25	Decreasing	8
	66.20	Increasing	3
	66.15	Decreasing	2
	<u>70</u>		<u>20</u>
	735		.05
	66.17		

Reading 268°, 0'

9 34	66.56	Incr.	20
	66.23	Decr.	13
	66.17	Incr.	19
	66.47		11
	<u>143</u>		<u>63</u>
	71		.16
	66.136		.14

.03  
 .10  
 .05  
 .14  
.32  
 .08



Nov. 15, 1878.

Same N. obs.  
Arms.

60

g 46      <sup>in</sup>  $\text{Pinion at } 7^{\circ} 27'$        $\text{Arms } 80.5$   
 $257^{\circ} 27'$  inc.  
 $7 \ 13$   
 $6 \ 37$   
 $7 \ 15$   


---

 $32$   
 $08$

 $257^{\circ} 8'$ 

$\text{Pinion } 58.31$   $7^{\circ} 58' 31''$   
g 53       $259^{\circ} 48'$  inc.  
 $10 \ 24$   
 $8 \ 17$   


---

 $9 \ 12$   
 $10 \ 1$   
 $9 \ 25$

$259^{\circ} 25'$   


---

 $258^{\circ} 16'$  u  
 $258 \ 21$  p

$5'$        $14'$  / 680  
 $.02$

g 56       $65^{\circ} 20'$  Dec.  
 $5.92$

 $250^{\circ} + 0^{\circ} 0'$

Mar. 16 1878

A. 3451 21 50 OH = 6 5 0.0 B 394

16 6 4 10.0

23 41.

6 27 51

6 4 45.5

23 6

21 50 0.

22 13 6

6 35 Jupiter emerged from cloud about  
five minutes too late Cloudy later

7 45 Jupiter Obs

139

140

146

140

130

195

1.39 0

Homa

Obs

7 55

100

109

83

85

99

4.76

.952

Nov 16, 1878

8 16

122

1.42

1.51

1.57

1.36

7.08

1416

Sols

Jupiter

8 20

1.19

1.09

.97

1.12

1.53

1.38

7.28

1.213

Sols

11 May.

too bright

Continual variations of  
brightness; probably clouds not  
uniform over Saturn & the stars.

Photometer K

$\beta$  Persei -  $\beta$  Persei; upper of two reflected  
images.

8 44

44.6

48.3

223.6

227.6

227.6

59.4

29.705

148.52

136.02

P. obs.

3.7

4.0

7.7

3.85

1.93



845  $\beta$ - $\beta$  Persei S Ls

44.5  
48.8

848

223.4  
227.2  
5439  
27  $\times$  1.95  
135.98

4.3

3.8

8.1

4.05

2.02

$\beta$  Persei - Companion B

Rebs

358.2

88.3

90.1

853

173.7

269.4

95.7

889.6

185.8

444.8

9290

222.40

46.45

326.8

84.8

188.0

B S Ls.

858

174.9

285.6

110.7

Rebonds

8721

2287

43605

11435

218.03

57.17

Nov 16, 1878

B

Obs.

too faint clouds

182

Nov. 23, 1878

Jupiter IV, I

Photometer H.

D

low power

Reading 7.22

11.11.11

70° 5'

64.2  
 115.6  
 179.8  
 298.3  
 63.4  
 595.4  
 127.6  
 2977  
 62.80  
 148.85  
 31.90

7 25

192  
 93.8  
 74.6

D

11.11.11

240° 5'

197.0  
 274.7  
 77.7  
 5847  
 152.3  
 29235  
 76.15  
 146.18  
 3807

Days Mended.

Clouds

8 05

~~Deflected~~ 11 mag

Photometer I

D

95  
 88  
 93  
 103  
 86  
 0.930

99  
 88  
 78

Minor Probs.  
 for before entry

89  
 89  
 445  
 890

Done begins to at 9/10  
 Seimens vis 0.75

8 20



Nov. 23, 1878

Mars well seen 4 P.  
dreadfully brighter than 10.75Joh  
Rh No Hyp

8 28

Japetus

1.32

1.01

1.00

1.21

1.16

---

1.40

P. obs.

8 30

Hyperion

0.44

.39

.43

.44

.39

.29

.418

P. obs.

Limit of visibility 0.25  
certainly much the better

8 39

.34

.40

.36

.39

.37

.36

.372

Hyp. Obs

limit vis. 30

Nov 23, 1878  
S. L.

8 45

.91  
1.09  
1.09  
.81  
.92  
4.82  
.964

8 50

8 50

$\gamma$  Ursa Maj. =  $\beta$  Cygni P  
" " =  $\alpha$  Cygni P

11 my

8 51

1.07  
.89  
.92  
1.01  
1.08  
4.97  
9.94

Sols.

Transits.  
Saturn to Jupiter

10.2

10.8

11.2

~~Photometer~~ Focussing screw of new tail-piece, negative  
Pinion of Phot. L. for distance, "  
Graduated circle " L. "  
" " " H. "  
Head of Phot. I "

All other scales of photometer L. & M. positive;  
that is, movement like the hands of a watch increases readings.

Nov. 24, 1878  
 Reappearance of Jupiter IV hidden by clouds.  
 Set seen at (nearly) full brightness at 22 54

6 5 J Jupiter IV, II. Photometer H.  
 In line; Jupiter out of field;  
 4.3 P. obs. IV from II  $250^{\circ} 15''$   
 112.6  
 186.8 74.2 # disappears  
 290.6

594.3 73.7  
 147.19  
 297.15 73.95  
148.58 36.97

6 7 23.8 P. obs. IV from II  $250^{\circ} 15''$   
 92.0 68.2 IV disappears.  
 207.8 62.3

270.1  
 593.7 130.5  
 296.85 65.25  
 148.43 32.62

6 15  $\beta$  Urs. Maj. =  $\beta$  Cassiopeiae. S. obs.



Nov. 24, 1878.  
Photometer I

6 20

Moimas

0.80

P. obs.

.65

.63

.74

.68

350

.700

6 35

Japetus

1.46

S. obs.

1.45

1.04

1.24

1.28

.47

1.294

6 40

Hyperion

0.411

S. obs.

.34

.34

.42

.27

.178

.356

Limit of visibility .23

11

mag

7 54

$\beta$  Ursae Mag. =  $\alpha$  Cephei

$\alpha$  " " "  $\gamma$  Cass.

P.  
P.

Nov 24 1878

659

Mins

Secs.

0.73

.80

.77

.82

.80

39 2

7 8 4

Hyp. Obs

.41

.39

.38

.45

7 10

.44

20 7

.4 14

final vis 0.26

7 12

108

118

~~117~~

106

108

1.17

24

7 15

89

84

85

88

95

38

.876

11 May

188

Nov. 24, 1878.

7 17

9 my  
300

337

346

370

356

209

3.418

7 21

15 my  
155

39

35

39

32

30

.360

15 my. c

c a

ac. little 7 ch

Di	1/2	mi.	0	2	Rh?	Lat.
?	?				Hyp	

July 30

102 looked again his light Mins

Mins.	(Corrected)	Alt.	Dist.	End	Alt.	Di	Hyp	Lat.
72	155	135	75	123	282	44	92	
37	60	153	130	75	120	243	43	101
59	179	127	97	187	294	38	95	
54	65	137	139	82	161	402	40	119
56	66	139	143	92	166	294	39	96
806	24	263	174	421	237	15	204	505
	.648	1.526	1.348	.842	1.474	3.030	0.408	1010



Nov. 24, 1878.

Phil M. Seligman

2 Draconis

Trans 74.2

8 38

8 38.6 Jupiter = 2 Lyrae.

40.7 " " 2 Aquilae

40 Saturn = "

42.5 Jupiter = 2 Cygni

48.5 " " 2 Ursa Mai

51.6 " " 8 Virgo "

52.5 Jupiter dis.

229.9

233.6

463.5

9

553.5

276.8

It dis one image star

Set h at 277.

185.2 = 1/2 par. indica E par to images

A = 274.2

94.2

9.3

Set at 183.0

190

Nov. 24, 1878.

Transits for 24th of Nov.

51.5 ±

16.0

24.5

23.6

47.1

Index E at 180°

Index E at 190°

12.5

28.1

9 17

A = 188.5  
Polar Circle 13° 34'

58" - 87.8

58.78

9 30	+	188.5	13° 34'
	-	194.2	4 1.3"

+	<del>187</del>	48.41	...
-		48.70	
		<hr/> 48.55	

Set at

+	187.3	12° 22'
-	196.2	6° 09'

+	<del>196.2</del>	<del>6° 09'</del>
---	------------------	-------------------

Nov. 24, 1878.

Turned position circle  $180^\circ$  nearly  
about  $10^\circ$

$$\begin{array}{r} 49 \text{ Diet} \quad 49 + 50.20 \\ - \quad 0.30 \\ \hline 50.25 \end{array}$$

52

Dist. P. Cen  $10^{\circ} \pm$   $49^{\circ}.7$   $9.50$   
+ 54 = 55.55  
- = 56.20  
11.75  
55.87

Long back

$$\begin{array}{r} 5387 \\ 4853 \\ \hline 732 \\ 361 \\ \hline 9 \\ 3349 \end{array} \quad \begin{array}{r} 3435 \end{array}$$

Seeing a Saturn P 9.7.8



Nov 26, 1878

50

Tried Phot. Ls. on moon, and Pleiades  
0 30 Rank 35° A of Anti & Leo.

6 47

Jupiter

Phot. I

U. obs.

1.49

1.08

1.20

1.10

1.07

1.188

Image blurred -

6 54

11 mag. star

U. obs.

0.88

.91

.84

.79

1.07

.898

Image blurred

7 0

11 mag. star

P. obs.

.78

.83

.77

.68

.74

.760

Nov. 26, 1878

Jupiter-

188

,63

,73

,86

,91

---

802

P.O.b.

7 3

Phot. S.

 $\alpha$  Urs. Min. & star Srf  $\alpha$  on Carrington's chartIndex B  $217^\circ$ 

Distance of objects 0.57

Consecutive settings for position angle without  
wires to guide.

6° 18' -3

6 21 -1

6 21 -1

6 25 +3

6 25 +3

6  $\frac{22}{12}$   $\frac{0}{11}$  2 D. 1.8 = .36 $\frac{12.3}{738''} / 3434$ 

1" = 5' angle

Distance by slow motion

9.33 -16 -8

9.34 -15 -7

9.29 -20 -12

9.57 0 +16

9.56 +15

9.36 +5

---

245 639.49<sup>th</sup>  $\pm .105$  .095

Nov. 26, 1878

 $\alpha - \alpha$  Urseae Min.

Phot K

P. ob.

(8 40)

44.3	5.6
49.9	
224.1	4.6
<u>228.7</u>	
547.0	10.2
273.5	5.1
136.75	2.55

upper imp

comp  $\alpha = \text{imp}$  $\alpha - \alpha$  Urseae Min. obs.

Phot K.

U. Prob.

(8 42)

44.3	5.3
49.6	
223.0	5.9
<u>228.9</u>	
545.8	11.2
272.9	5.60
136.45	2.80

Comp.  $\alpha$  a little fainter $\alpha - 88, 4$ 

P. ob.

(8 45)

20.7	54.5
75.2	
187.3	67.5
<u>254.8</u>	
538.0	122.0
269.0	61.0
134.5	30.5

u. ob.

8 50

17.9	48.8
66.7	
201.8	46.0
<u>247.8</u>	
534.2	94.8
267.1	47.4
	23.7
133.55	



Nov. 26, 1878.

a - 88° 9

P. obs

8 58

176.3 105.0

281.3

351.2 1039

95.1

9039 208.9

45195 104.45

225.97 52.22

U obs

9 01

0.6

89.8

185.6

278.6

5546

2773

138.65

88.2

9

93.0

1842.2

98.8

45.3

45.55

89.3 too nearly equal to images  
4 inches.

d - 2 U obs -

P. obs -

9 17

199.4

250.6 51.2

16.8

53.8

70.6

5374 105.0

2687

134.35

52.50

26.25

U obs.

9 21

190

73.8

206.2

247.0

5460

2730

136.50

54.8

40.8

95.6

47.8

47.8

Image very poor

Nov. 26, 1878.

 $\alpha - \delta$  Ursa Min

9 28

34.6	33.2
67.8	
207.7	38.6
246.3	
556.4	71.8
278.2	359.0
139.1	179.5

P. obs -

Seeing has become very  
bad - star a large blur.

Wrong Star

9 31

31.9	32.1
64.0	
211.0	36.5
247.5	
554.4	68.6
277.2	34.3
138.6	17.15

U. obs.

Wrong Star.

 $\alpha - \delta$  Cephei

9 40

32.5	24.9
57.4	
213.4	22.2
235.6	
538.9	47.1
269.45	23.55
134.73	11.77

P. obs -

9 42

33.8	27.3
61.1	
216.8	23.4
240.2	
551.9	50.7
275.95	25.35
137.98	12.67

U. obs.

Nov. 26, 1878

 $\alpha - \delta$  Ursa Min.

P. obs.

9 48

40.2  
54.7 14.5  
217.0 18.8  
235.8  
549.7 33.3  
27.385 16.65  
136.92 8.32

9 57

33.9  
52.5 18.6  
216.0 18.1  
234.1  
536.5 36.7  
268.75 18.35  
134.4<sup>13</sup> 9.17

U. obs.

 $\alpha - \alpha$  Ursa Min.

P. obs.

10 1

43.4  
51.8 8.4  
223.6 5.8  
229.4  
548.2 14.2  
27.41 7.10  
137.05 3.55

10 5

43.2  
50.0  
223.9 5.6  
229.5  
546.6 12.4  
27.33  
136.65 3.1

U. obs.

seeing

8.43 (U) 2 P



Nov 29. 1898.  
Jupiter. 9 hrs

Sat. 4 Sep = 22.8 sec.

5 34

.66  
.68  
.67  
.73  
.70  

---

1.688

5 42

Obs 11 mag.

.65  
.64  
(.49) too faint  
.73  
.79 too low  

---

330  
.660

Jupiter 9 hrs.

5 43

1.28  
1.08  
.98  
.87  
.99  

---

1.040

Clouds coming on; may  
have interfered with observations  
11 mag. 9 hrs

lebrudy

8 51

11 mag.

1.21

1.05

1.09

1.08

1.05

1.096

Nov 29, 1878

S. J. S.

8 50

 $\eta$  Ursa Major =  $\delta$  Ursa Minor $\beta$  " " =  $\delta$  Cass. $\alpha$  " " =  $\gamma$  "S. J. S.  
S. J. S.  
S. J. S.

8 56

1.11

1.26

1.17

1.17

1.20

1.182

Labeling

S. J. S.

9 12

 $\eta$  Ursa Major =  $\kappa$  Cass. $\beta$  " " =  $\delta$  "S. J. S.  
S. J. S.

Nov. 29, 1878  
Stars near pole. Photometer I,

Distant (northern) component of triple star  
P. obs.

9 43

1.45

1.37

1.513

1.139

1.556

22.4<sup>1</sup> 1.45<sup>1</sup> mean 12.29<sup>1</sup>  
14.48<sup>1</sup>

Star north of triple star

9 46

0.92

0.83

0.90

0.92

0.70

4.27<sup>1</sup> 0.45<sup>1</sup> 13.44 = mean.  
8.54<sup>1</sup>

Upper star of quadrilateral round pole  
P. obs.

9 51

1.37

1.07

1.03

1.18

0.98

1.126<sup>1</sup>

mean = 12.44<sup>1</sup>

Left hand upper star of quadrilateral  
P. obs.

10 0

0.57

0.57

0.63

1.50

1.67

mean = 14.25<sup>1</sup>



Nov. 29, 1878  
Left hand given size of quadrilateral  
P. obs.

10 4

0.53

1.52

1.47

1.53

1.42

24 7 ^

0.494 ^

mag. = 14.63 ^

Limit of visibility P. obs.  
Seen at 0.29

Seeing 8, 5, 5. (P.)

202

Nov 30, 1878

Photometer I.

5 57 Japetus. Schs

1.11

1.04

1.03

1.08

0.89

1.030clouds in the  
neighborhood

6 05

0.73

.71

.60

.66

.66

0.672

11 mag. Schs.

6 9

11 magn. star

0.88

.79

.72

.80

0.788

P. obs.

6 11

Japetus

1.22

0.99

1.08

0.96

0.97

1.042

P. obs.

Nov. 30 1878.  
 6 30  $\gamma$  Mrs. May =  $\gamma$  Lyrae S. obs.

$\beta$  Cephei Phot. M. ~~Phot. Obs.~~

$$A = .800 \quad a = 90^\circ 0' \quad P = 0^\circ$$

$$E = 265^\circ 0' \quad R = 155^\circ 00' \quad Z = 293^\circ 0'$$

7 58

10.0

$\Sigma$  at  $255^\circ 0'$

9.8

7.9

$$A.P. = 95^\circ 5' 0'' \quad R.D. = 153^\circ 5' 00'' \quad Z = 80.0$$

$$R = 293^\circ 0'$$

$\Sigma$  at  $250^\circ$

25.8 25.6

24.6

49.2 23.6

$E$  at  $265^\circ$

15.8 15.8

15.1

30.3 14.5

$E$  at  $255^\circ$

30.2 30.2

$\frac{34.1}{35.4}$  35.4

68.3 38.1

Second difference more accurate,  
double weight

$E$  at  $260^\circ$

9.5 9.5

9.5

19.0 9.5

$E$  at  $253^\circ$

26.6 26.6

30.8

61.6 35.0



204

Nov. 30, 1878

8 27

E at 263°

N at 293°

11.3

11.3

12.4

24.7

13.4

Determination of position angles

$$\begin{array}{l} Z = 81.2 \quad D = 68''.30 \quad N = 313^\circ.4 \quad D = 62''.4 \\ A = 78^\circ \quad \left\{ \begin{array}{l} P = 2^\circ 16' \\ 3^\circ 25' \\ (91) \end{array} \right. \quad \left\{ \begin{array}{l} + \\ - \end{array} \right. \quad \left\{ \begin{array}{l} P = 2^\circ 54' + \\ 3^\circ 47' - \\ \hline 161 \\ 262 \\ 65 \end{array} \right. \end{array}$$

Determination of distance

$$85^\circ, 10^\circ 45' \quad 78^\circ 5'$$

$$\begin{array}{r} 66''.14 + \\ 66''.52 - \\ \hline 66.330 \end{array}$$

$$72^\circ, 11^\circ 30'$$

$$\begin{array}{r} 66''.37 + \\ 66''.76 - \\ \hline 17.9 \\ 66''.447 \end{array} \quad 66.565$$

$$\begin{array}{r} 66.45 \\ 37.71 \\ \hline 104.16 \\ 52.08 \\ 28.74 \\ 14.37 \\ \hline 129.33 \end{array}$$

Position angle.

$$\begin{array}{l} A = 78^\circ \quad Z = 81.2 \quad N = 349^\circ.8 \\ D = 35''.94 \quad D = 40''.12 \\ P = 2^\circ 24' + \quad P = 2^\circ 32' + \\ 2^\circ 25' - \quad 2^\circ 22' - \\ \hline 49 \\ 103.26 \end{array} \quad \begin{array}{r} 12.93 \\ 77^\circ 45' \\ \hline 77^\circ 26' \\ 65 \\ 91 \\ 45 \end{array}$$

Distance.

$$68^\circ, 8^\circ 17'$$

$$\begin{array}{r} 37''.69 + \\ 37''.93 - \\ \hline 162 \\ 123 \\ 285 \\ 37.71 \end{array}$$

$$86^\circ, 11^\circ 43'$$

1/4 object glass covered by dome.  
Dome moved.

$$\begin{array}{r} 37''.50 + \\ 37''.73 - \end{array} \quad 7$$

Nov. 30, 1878

7.81.5

82.6

Set at 82.0

Same S. hrs. Zero of Position

9 12 N. at  $51^{\circ}8'$ 10 m. dia. Set at  $96^{\circ}8'$ ~~AP  $94^{\circ} + 15^{\circ}20'$~~  AP =  $86^{\circ}11'42''$  $\tau = 83.6$  $\Sigma = 75^{\circ}0'$ but AP at  $95^{\circ} + 5^{\circ}20'$  $\Sigma = 85^{\circ}0'$ 

9 30

26.2

66.3

33.150

15.2

30.1

15.050

AP 96  $6^{\circ}16'$  $\Sigma = 85^{\circ}0'$ 

17.6

353

17.650

 $\Sigma = 75^{\circ}0'$ 

9 42

25.1

47.0 uncorrected

25.8

25.4

9 47

Set  $78^{\circ}0'$ 

41.6

84.4

42.2

 $\Sigma$  at  $83^{\circ}0'$ 

21.4

40.2

20.1

Summary 6.5.7



$$15 \overline{) 103} \text{ " } / 513 \\ 10.26 \quad 20.0$$

$$\begin{array}{r} .342 \\ 171 \\ \hline 513 \end{array}$$

18.01

$\alpha.M.$	$\epsilon$	$t.$				
95° 0'	250	24.6	1.23	1.98	+ .02	96° 48'
	265	15.1	.75		1° 48'	
	255	35.4	1.77	2.24	-.24	96° 34'
	260	9.5	.49		1° 34'	
	253	30.8	1.54	2.16	-.16	97° 14'
	263	12.4	.62		2 14'	
95° 20'	75	33.1	1.65	2.40	-.40	97° 9'
	85	15.0	.75		1 49'	
96 16	85	17.6	.88	2.15	-.15	97° 6'
	75	25.4	1.27		50'	
	78	42.2	2.11	3.12	- 1.12	96° 16'
	83	20.1	1.01			

$$+ .23 \times -.25 \div .02 = + .23 \times .25 \times 50 \times 15^\circ$$

$$- .77 \times .53 \div .24 \times 5$$

$$.54 \times .38 \div .16 \times 10$$

$$\begin{array}{r} 127 \\ 181 \\ \hline 307 \\ 96^\circ 51' \\ 77 \quad 26 \\ 19 \quad 25 \\ \hline 2710 \quad 3516 \end{array}$$

$$\begin{array}{r} 23 \\ 25 \\ \hline .0575 \\ 50 \\ \hline .0287 \end{array}$$

$$\begin{array}{rcl} P. obs. & 12''.93 & 250^\circ 58' \\ \Sigma & 13.57 & 250.03 \end{array}$$



Dec 1, 1878

5-0

Dawn church

5-10

 $\beta$  Cephei $\tau = 79.8$ Photometry M.  
P. obs. $AP = 97.7^{\circ} 0'$   $N = 97.0$  $\Sigma = 75.0$  16.4

34.0

85.0 18.2

37.1

5-17

Back beyond pinia began again.

5-22

 $RD = 155.0$  $AP = 97.7^{\circ} 0'$ 

5-25

 $\Sigma = 75.0$   $\tau = 18.4$ 

37.6

18.8

85.0

18.0

5-29

35.7

17.85

5-37

 $AP = 77^{\circ}$   
 $RD = 68.89$  $N = 327.3$  $AP = 3^{\circ} 13'$  $3^{\circ} 46'$ 

43

 $3^{\circ} 11'$  $RD = 62.93$  $AP = 3^{\circ} 16'$  $2^{\circ} 28'$ 

5-41

 $RD = 65''$ 

5-42

 $AP = 65^{\circ}, 4^{\circ} 50'$  $RD = 65.53$ 

209

65.29

65.52

 $AP = 89^{\circ}, 14^{\circ} 18'$ 

65.77

65.570

5-46

 ~~$AP = 97.7^{\circ}, 7^{\circ} 10'$~~

208

Dec. 1, 1878.

 $\beta$  Cephei continued.

5 52

$$AP = 79$$

$$RD = 34''.26$$

$$N = 58''.0$$

$$AP = 3^\circ 33' 20'' 12 7'$$

$$\begin{array}{r} 2 \ 43 \\ 2 \ 3 \\ 1 \ 48 \end{array} \left\{ \begin{array}{l} \text{clouds hide} \\ \text{star from} \\ \text{naked eye.} \\ \text{Seeing from.} \end{array} \right.$$

5 57

$$39''.42$$

~~$RD = 65''$~~   $RD = 37$   
 $AP 65'' 50'' 0'$

$$RD \ 65''.00$$

$$37''.40 \quad 420$$

$$36.98 \quad 37.05$$

5 59

$$AP 90^\circ, 14^\circ 11'$$

6 3

$$37.00$$

$$36.82$$

6 7

$$AP \ 97^\circ 10' \quad N \ 97^\circ \quad RD \ 155''$$

$$E \ 75^\circ 0' \quad J \ 17.5$$

$$36.9 \quad 18.45$$

$$E \ 85^\circ 0' \quad 18.0$$

$$38.3 \quad 19.15$$

$$3 \ 11 \quad 65.52$$

$$2 \ 32 \quad 37.05$$

$$5 \ 43 \quad 28.47 \quad 14.23 \quad 12.707$$

$$2^\circ 51' \quad 102.57 \quad 51.28$$

$$96 \ 51 \quad 77^\circ 26' \quad 12.93$$

$$97 \quad 77^\circ 51' \quad 12.71$$

$$77^\circ 40' \quad 12.97$$

$$57 \ 128$$

$$2 \ 114$$

$$140$$

$$1^\circ = .23$$



Dec 1, 1878  
Jupiter III III

6 30

100.8

197.6

278.2

12.2

80.6

88.6

588.8

294.4

147.20

169.2

84.6

42.30

P. obs.  
II disappears

210° 25"

6 34

71.8

100.4

197.7

280.9

586.8

293.4

146.70

97.3

86.9

184.2

92.1

46.05

P. obs.  
II disappears

210° 25"

6 40

13.3

99.2

193.2

286.8

592.5

296.25

148.13

94.0

86.5

180.5

90.25

45.13

S. obs. III from  
II disappears

210° 20"

6 50

14.7

104.6

195.1

284.3

598.7

299.35

149.67

89.9

89.2

179.1

89.55

44.78

S. obs. II from III  
III disappears

30° 20"

○ I III IV II

Satellites barely seen  
with Phot II.

Assumed positions  
Hazy, faint & uncertain  
When one set of images is  
extinguished, III and II appear about equal,  
I a little fainter, IV hardly visible.



210

7 10

Dec 1 1878  
Jupiter = S. Call. P. Obs.

8 34

Jupiter, Clouds delay  
S. Obs.
$$\begin{array}{r}
 .66 \\
 .62 \\
 .57 \\
 .49 \\
 .69 \\
 \hline
 0.606
 \end{array}$$

8 37

P. Obs.

$$\begin{array}{r}
 .99 \\
 .86 \\
 .88 \\
 .94 \\
 \hline
 1.05 \\
 0.944
 \end{array}$$

8 42

11 magn. star,

P. Obs.

$$\begin{array}{r}
 0.93 \\
 1.03 \\
 0.86 \\
 0.87 \\
 \hline
 1.01 \\
 4.70 \\
 .94
 \end{array}$$

8 44

11 mag. S. Obs.

$$\begin{array}{r}
 .82 \\
 .72 \\
 .74 \\
 .76 \\
 \hline
 .74 \\
 .28 \\
 .756
 \end{array}$$

9 0  $\beta$  Cephei <sup>Dual 1878</sup>  $A = 79.5$   
 Sit Fat 800  $= 180.5$

RD = 153.00  $\alpha = 97.0$   $\Sigma = 75.0$

9 09  $\Sigma = 75.0$   $\alpha = 16.6$   
 40.8 20.4

$\Sigma = 85.0$   $\alpha = 24.0$   
 40.7 20.35

9 20 RD = 69.38  $\alpha = 123.0$   $A.P. = 76.136''$

RD = 62.20  $2^{\circ}56'$   $\leftarrow$  Clock clutter  
 $2^{\circ}57'$  wts down.  
 $3^{\circ}58'$   
 207  $2^{\circ}52'$

9 30 AP  $94.406$  66.18  
 5.81

AP  $57.12^{\circ}40'$  5.34  
 6.00

9 43 RD  $36.20$  333  
 65.83

~~SE.W~~ ~~35.8~~  
~~43.6~~

212

Dec 1, 1878

$$n = 226.3$$

9 46 RD 31".40

a.p.

76, 1° 30'  
1° 53'

RD 40".60

77.2 38

3 34

155

335

89

77° 29'

36.90

6.61

6.98

7.33

382

36.95

9 52 a.p. 73° 3' 20"

a.p. 64° 4' 35"

9 58  $n = 97.0$   $Q = 98° 0'$   
 $\Sigma = 75.0$   $I' = 16.2$

34.7

17.3

85.0

 $Q'' = 23.7$ 

41.9

20.9

77 52 65.83

77 29 36.95

77 8' 28.88

77° 40' 10278

14.44

12.996

51.39



Dec 6, 1878.

Photometer Mb.

Polaris

P. obs.

Position of bar in eye-piece parallel to images.

5 5

$N = 196^\circ$

$E = 78.8$

$78.6$

$257.9$

no doubt 256.9

should be 257.0 etc.

$277.0$

$277.0$

$278.0$

$276.0$

thought to be a little too great  
decidedly too great  
" " small.

5 12

Points of disappearance

$N. = 140.2$

$142.24$

Mean 141.3

$319.1$

$323.1$

Mean 321.1

Transits to find value of

$0.0$

$7.8$

$15.8$

$24.0$

$32.0$

$40.3$

$48.0$

divisions of scale used  
in search for Juno (3); see  
next page. Each small  
division represents 2'.

214

Dec. 6 1878  
 Search for Jumbo (3)  
 23 50 0  
 6 26  
~~23 43 34~~  
 23 56 26  
 1

4 48  
56.5

8.6 + 14

W. 22<sup>h</sup> 816. Star set 2' above centre

Jumbo =	<sup>m</sup>	Decl.	Magn.
5	31.5	3.5	9
	36.5	3.0	11
6	8.3	6.8	9
	11.6	2.2	11
	20.8	-0.2	11
7	1.0	5.9	10

0	0.0	-1.3
	3.9	-1.8
	58.0	2.2
1	0.7	-2.2

0	0.0
	4.0
	57.3
	0.0



Dec. 6 1878

Same stars on three wires.

Wire 1

Wire 2

Wire 3

0.0

21.0

42.0

4.0

4.0

25.1

4.1

45.9

a little <sup>3.9</sup> early

58.0

58.0

1<sup>m</sup> 18.9

57.9

39.5

57.5

1<sup>m</sup> 1.0

61.0

21.8

60.8

42.0

60.0

Transit of Saturn &amp; Japetus 34.4

Eph = 36. or  
less given. It is more exact.

Photometer I

Japetus. S. obs.

6.17

0.75

.59

.60

.58

.78

328

.656

Clouds near  
Saturn

6.23

.72

.63

.82

.70

1.01

388

0.776

H. my. S. obs much more distinctly  
with than Japetus



Dec 6, 1878

6 23

11 magn. star

P. obs.

0.89

1.14

0.82

0.91

0.86

4 6 2

0.924

6 25

Japetus

P. obs.

0.66

0.73

0.68

0.65

0.61

3 3 3

0.666

6 31

Japetus

U. obs.

0.85

0.75

0.85

0.79

0.74

0.39 8

0.79 6

6 34

11 magn. star

U. obs.

0.63

0.70

0.67

0.66

0.82

3 4 8

0.696

9 magn. star 3' north of P.  
 { 29.8 Japetus 5 follow it  
 { 30.2











