

KG  
11366  
v.636

General  
Chronograph Record  
From Mar. 7 1871 to Sept. 8 1871  
Sever, Francis & Co., University Booksellers





940  
 187  


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 88  
 101  
 03  
 83  
 70

44,132  
 264  
 960  
 291  
 339  


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 571  
 261  
 691  
 091  
 141















Mar 1871

Polaris

" Arctis

J. A. R. Co.  
S. M. R. Co.v Argyre  
5-36 or 745 46

35-2 50 0.5

γ Argyre 5-42377-39 07

15-2 2.9-0.5 1 17.6 14.1

δ Argyre 5-5190+3.7 08

40.1 39.3

~~10-3 5.39 47.7 2 45.6 37.2~~

36 Camel 5-5558+65 40

35-3 5.39 47.7 2 45.6 37.2

2 Lyncis 6 8 20 +5-9 03

20 0 14.2 7.9-15-45+15.21-15-4 8.1 1.0

γ Argyre 6 15-2 +49 21

0 2 12.3 6.8-0 1 57.7 45.9-0 1 18.4 11.5

Bar 30.27

Att. N. 65.0

Exp. 31.8



Mar 7 1871

MAR obs  
MAR Acc.

S Geo

5- 3 34.9 36.7

3 Mrs May

5- 2 41.2 41.2

DM. 11 16 16.9 + 9 89

15- 3 50.0 53.5

T Geo.

45- 2 40.4 46.0

L Geo

25- 3 52.3 59.3



Mar 9 1871

2 Lynceis

20 0 7.4 2.5 - 15.4 45.3 4.2 - 4 13.3 7.5

γ Aurigae

0 2 14.2 8.7 - 2 11.3 5.6 7 - 1 15.4 9.0

Gr. 1450

50 4 45.1 42.3 - 4 18.0 16.8

Gr. 1460

10 3 41.0 35.2 - 10 32.6 22.0 - 2 38.8 33.5

36 Lynceis

35 2 24.6 20.6 - 2 58.3 55.3 - 2 15.4 10.3

38 Lynceis

0 2 20.7 17.9 - 2 6.3 5.0 -

40 Lynceis

25 1 47.6 48.0 - 1 35.8 35.2 - 0 45.8 45.0

1 Draconis 14.

Bar. 30.13

ATTN 66.0

Ere. 46.5

Mar 14 1871

57 Cepheus at 9 h.

15 Lynx

45-4 0.1 56.5 - 3 46.5 429 - 2 10.6 5.7

8 Draco, 7<sup>h</sup> 48<sup>m</sup> S. P.



Mar 19 1871 S

9 Draconis Wall miss  
1 Leonis

(31°) 5- 3 52.3 54.4

J. Lev.

21° 5 3 54.8 56.5

W. 325- Jan 2<sup>nd</sup> Min lost - 100 of groups

3° 30 4 6.8 10.8

2 Leonis

25° 3 57.1 57.1

2 Cephei m ef gh. S.P.

B Leonis

7.0 4 58.8 62.2

Bar. 30.24  
EAT 630  
Sp. 35.0

N 6	
37.825	33.478
834	410
817	443
818	438
820	420

A		6	
366	388	426	102
372	385	420	92.9
371	380	418	92.8
370	388	417	92.2
374	380	418	92.4

W. 325.

Mar 22/41

31 Lyncis

45- 1 96 5.0

Gr 1452

55 0 30.3 28.4 50 4 45.0 44.2

Gr 1460

10 3 34.7 30.0 3 26.1 21.3 2 42.5 38.3

i Nydane

2 Bephu

10 1 14.0 11.8 - 1 5.3 1.3 - 10 0 29.2 25.5

✓ Lev.

Obs of 109



Mar 23 1871

$\epsilon$  Hydri

Mar 25 1871

i Canori ~~Pentamer~~

5 4 10.0 11.0 — 3 54.8 57.0 — 2 35.5 36.7

---

57 Canori

15 4 14 3.0 — 3 41.8 43.2

---

✓ Lev

✓ Craters Circled to be

↑ Lev.

myd.

✓ Draw

✓ Lev.

✓ Leptin S.P.

B Lev.

Gr. 4163

Obs. of 109) mixed in with the stone

Re. 7h 29.0



Mar 28

Bar. 30.03

Alt 52.0

Re. 28.3

Pen H 42.4.

With the S. C.

19 Lynx

50 1 43.2 40.7

Pi VII 67

35-4 54.0 46.9 4 40.2 40.2 *Pin found*

a Cam

10 2 15.3 13.0

1 Decoris No

a Hydrum

Obs 2109 on next sheet.

N. Chon E. Ch.

The losing rate of S.C. on N. C. = 2.8 per day

Adjusted S.C. answer for rate

S.C. cleaned.

Mar 29/1871

Polaris

Barnard's 2 f.g. 1.

a. ~~Arcturus~~

Set S.B. with N.B. at  $5^h 53^m$  S.T.

after having regulated it so that  
it is supposed to gain about  $25^s$  per  
day. The examination of the stars

marked close companions.

Mar 29 it will be seen that the

S.B. is not properly compensated



Apr 2 1871

36 Lynce 9 10 52

35 3 57 0.3

40 Lynce 9 13 15

25- 134.0 372

a Nydum 9 21 17

N.B. 10<sup>h</sup> 47<sup>m</sup>

✓ Lev.

91 718

✓ Crat.

11 12 56

✓ Draconis

11 23 47

Gr. 4163 S.P.

11 48 38

A

L

6.5

8.3

103

11.1

6.5

8.2

101

11.0

6.8

8.2

58

10.8

6.2

8.5

58

10.8

6.7

8.1

58

10.8

6.7

8.1

5.7

10.9

6.5

8.1

5.7

10.9

1.6  
1.0  
1.3  
1.1

Ban 2972

ATT 620

No. 4 33

Pain M. 413

Apr. 5 1871

Polaris

a Arctis

26 ~~7~~ Lynx's

30 0 24.7 18.2 - 25 9 44.7 45.6

Some faint stars

11 11 11

11 11 11

11 11 11



Apr 6 1871

Bar 29.97

~~WT~~ 64.0

No. 4 41.7

Pien 44.0

N.B.M. 41.0

27 Lyncis ✓ Jue 2.6 5.4.

7 58 49

25-4 49.7 44.0

3 Draco 11 35-18 + 67.27

55 1 19.5 14.2—0 53.9 51.2—0 14.8 6.1

4 Mus May 11 39 17 + 48 29

50 3 53.2 48.8—3 21.2 50—2 46.1 42.5

bet zero of shut - 23<sup>s</sup>

P = pien Thermometer

N.B.M. = the thermometer on the  
north collimator pien

Apr. 8 ~~AM~~ ~~V~~ obs.  
 obs May 10 1441 + 42 8  
 10 3 530 53.3

---

31 Leo Min 10 20 29 ~~10~~ ~~22~~ 22  
 0 0 16.5 20.1

---

37 obs May 10 26 84  
 457 44

---

35- 3 141 164

---

35- obs May. 10 33 53 + 6 944  
 35- 3 15.2 12.2

---

42 Leo 10 38 45 81 22  
 0 0 55.5 47

---

i bcrph.

r Leo

r Crateris

λ Dracon.



Sh. 13<sup>1871</sup> sheet 107

(2528) M. B. Des.

1871

Sheet 108

Des. of (109<sup>1871</sup>)

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Sh 13<sup>1871</sup> sheet 109  
 Polaris m. e. f. g. h.

Apr. 17/87 Sheet (110)

36 Leaves (9 5 25) A.M. Obs.

35 3 17.3 14.4 - 2 53.7 523 = 2 128 178

(11) 3 Leaves all the vines WTR

53 - 0 58.1 51.3 0 42.5 369 0 8.0 03

x has maj 11-35 17

50 3 35.4 34.0 3 14.4 11.7 2 428 357

B Leaves all the vines

0 4 46.3 - 0 4 1.8 6 2

A.M. obs of the con. buds  
New sheet - (112) with obs.

12 10 54 - 1 20  
40 2 57.8 59.7 2 232 29.1 1 339 392

12 12 31 - 1 19  
40 1 24.3 29.7 ~~45.7~~

12 14 22 - 1 42  
0 4 36.1 43.2

12 18 19 1 45  
Sum



$$12 \quad 24 \quad 50 \quad - \quad \overset{0}{-2} \quad \overset{1}{03}$$

$$\begin{array}{r} 25-1 \quad 300 \\ 20 \quad 4 \quad 270 \quad 3.8 \quad 3 \quad 57.5-59.3 \\ 12 \quad 37 \quad 32 \quad - \quad 3 \quad 02 \quad \textcircled{10} \\ 25-1 \quad 50 \quad 2 \quad \text{wrong}^* \end{array}$$

$$12 \quad 38 \quad 40 \quad - \quad 3 \quad 11 \quad \text{dots}$$

let 2 sec of light =  $-35^{\circ}$   
 10 10 51

$$\text{Bar} = 41.5$$

$$\text{Bar} 389$$

$$\text{N.B.M. } 389$$

$$\text{P.M. } 466$$

$$\text{Bar } 2997$$

$$58.2$$

Apr. 15/1877

Sheet-113

Cus may be failed

Cus may be failed 40 3 13.7 13.0

New Sheet-114

2 12<sup>h</sup> 10<sup>m</sup> 54<sup>s</sup> - 10 20' not seen

2	12	12	31	-1	19'			
40	2	7.3	40	1.32.1	40	0	54.9	
40		12.3		38.2			39.3	

12 18 19 - 10 45' not seen

12 <sup>h</sup>	22 <sup>m</sup>	32 <sup>s</sup>	-10	42'
(0	1	58.2	4.9)	Extra *

5-	0	31.9	0	4	61.1	0	4	08
		38.0			65.8			6.5

8	leam	Van-	12	27	39	15-	3	46.8
15-	4	32.3	15-	4	22.7			44.2
		30.9			21.6			

2 12<sup>h</sup> 38<sup>m</sup> 40<sup>s</sup> - 30 11'

30	2.1.3
	6.8

B 30.07 59.0 J No 4-410



~~40 3 137-130-3 27 23-2 179 164~~

50 0 86 28 — 45 8 220 22.9

3 27 23 — 2 149 16.4

Hel zero of shell = -35<sup>8</sup>

Pin 472  
N.B. 44.8

Apr. 18.-19

The rate of S.C. being definitely  
determined, to be about  $0.1^{\circ}$  losing  
the regulation has been moved so  
as to make it gain on its present  
rate  $1.2^{\circ}$ .

7871 April 21

Sheet 115

o Lrs Maj all the wires S between  $1^{\circ}$  &  $2^{\circ}$   
10 4 13.2 cloudy  
10.8  $9^{\circ}$  37 = sheet X

L Lomis all of the wires

10 to 12m  
14.7  
17.2  
19.6  
22.2  
27.2  
32.3  
35.0  
37.5  
40.1

245.8  
10 to 1 m 27.30  
10 1 30.43  
35.12 slow



After the adjustment, the scale  
was set at  $32^{\circ}$  ahead of its <sup>previous</sup> ~~position~~

position, supposed to be set at  $0^{\circ}$  &  
being 1.40 feet of N.C.  
256 set  $30^{\circ}$  & feet in S.C.

7871 April 23

9 P.M.

9<sup>h</sup> 19<sup>m</sup>

30.200

66°

2 Hydrua  
False obs.

44° No 4

46° N. 6

54° W. P

2 hrs map

45 4 21.3 21.8

~~2 hrs~~ 2 hrs Maj

10 3 52.3 53.7

37 ~~2 hrs~~ 2 hrs Maj

0 0 39.0 41.7

37 2 hrs Maj

35 3 16.2 16.0

35 2 hrs Maj

35 3 13.4 10.0

Clouds

Rime

10

43

20.2

18.8

6

19.5

9.8

A

11.4

18.6

19.9

10.1

11.0

18.2

19.1

10.3

10.4

18.5

19.3

10.0

11.3

19.1

10.2

10.8

C 35.608  
 S 16.541



1871 April

1 Draconis clouds 1+2 last group

u Leonis all the stars  
last one faint

11<sup>1</sup> 3 3<sup>2</sup>

Clouds

Apr 24 1871 sheet 117

Polaris lost 1st win (Apr 23-4)

1st min break = 9 h 6<sup>m</sup>

40 Lynx

4 15 31

34° 56'

1 Draconis-H lost first win

& was May

9<sup>h</sup> 24<sup>m</sup> 17<sup>s</sup>

52° 15'

10 Leo Min

9 26 23

36° 58' 5 fol

Sheet VI = 117  
 (2) = 118  
 (3) = 119



25-

Per failed

25- 1 264 28.0 25 0 368 38.9

Per failed

5- 2 248 5- 2 9.1 5- 1 29.3  
23.2 5.7 26.8

Per ok.

20 4 7.2 20 3 35.0  
9.1 36.3

(Per failed)

7871 Apr 24  
 $12^{\text{h}} 10^{\text{m}} 54 - 10 20'$

$12^{\text{h}} 12^{\text{m}} 31^{\text{s}} - 10 19'$

Simult

$12^{\text{h}} 14^{\text{m}} 22^{\text{s}} - 10 42'$

Simult

$12 \quad 18 \quad 19 - 1 45$   
 $22 \quad 32 \quad 1 42$

Simult

8 can Ven

$12 \quad 27 \quad 39$

Simult

~~2 can Y.b.~~

~~$12 \quad 33 \quad 15 - 124 \quad 04$~~

~~$12 \quad 38 \quad 40 \quad \text{both} *$~~



40 2 28.0  
34.8

40 1 42.7  
49.1

0 4 46.2  
54.6

*Run failed*

0 4 57.6  
5.2

15- 4 30.7 4 19.5- 3 41.2  
31.9 19.1 49.5-

~~30 5 6.4 1 54.2  
13.2 59.3~~

1871 Aug 24  
E. W. W. W.

~~12 48 23~~

W. W. W.

~~12 Can Ven Refailed~~

~~12 50 2 + 39 01~~

+ Vig

12 3 19

43 Comm

13 5 54 + 28 32

20 Can Ven

13 11 48 + 41 15

Polaris

two d & c W. W.



40.3 0.2  
0.3

20 2 3.5- 20 152.9 16.4  
52.3 16.6-

50 0 39.8  
43.3

5- 2 52.6 42.8 4.3  
54.2 43.1 5.2

B. on 30.27  
att. 54.4

m.b. = 45.0

P. = 50.2

Apr. 26 1871

## Special Notice

On and after this date.

I The new stars and all extraneous stars must be recorded only in the General Chronograph Books, and in their order of R. T. When new stars occur in the midst of a regular zone, the sig. num  $\gamma$  ~~xx~~ will be found in the zone Chronograph record.

II The hour and minute of the first minute break must hereafter be recorded, both on the sheet and in this book plainly, the record being made in the order of ~~R. T. time~~

III Hereafter all new stars and general catalogue stars will



III The record for the general Catalogue will be made in a separate book, but such zero stars as are observed in that list - must be copied in this book (in order of R.A.)

IV Hereafter all zero stars and general Catalogue stars will be observed on all the wires.

V Hereafter only two sets for  $\delta$  will be made, one just before the 1st group and the other just after the last group. The time for setting for  $\delta$  following will be immediately after the middle wire.

VI The observations must be recorded both in this book and the zone Record, both at the beginning and end of each sheet.



VII The date must be recorded on each page.

VIII

The chronogram sheets must be marked as follows.

At the beginning of the record on the side —

Date — No. 1 2 or 3 — Glos. initials —

Zone —

On the end where the index space occurs

Date — General No.

IX ~~All new stars and the general catalogue stars~~

~~must be~~

IX All new stars must

be read up within 4 days after the observations are made  
This applies to D.A.R.



~~X~~ All these records must be  
made on the night of observation

# Pinus

II	5-cls.
VI	5-
VII	5-
VIII	5-
IX*	10
X	25-

Apr 26 A.M. Obs. V.T.R. Co.  
 No 1 = 9<sup>h</sup> 18<sup>m</sup> 15<sup>s</sup> minute

8 Mus Mag

9 24 17 + 52° 15' 350 08  
 42 23

10 Leo. Min

~~Lost - b~~

9 26 23 + 36 58

8 Leo

Circuit broken

9 38 35 + 24 22 18 01  
 42 23

2 Mus Mag

Circuit Broken

9 41 52 + 59 38 342 45  
 42 23

19 Leo Min

Circuit Broken

9 49 50 + 41 40  
 42 23  
 00 43

79 Draco

9 57 16 + 106 52 (Circuit broken  
 ab cd)

a Leo 10 01 33 + 12 36

42 23  
 29 47



Sheet.

Began obs. of Hermin<sup>2</sup> catalogue  
= G.B.

0 0 44.1  
48.0

55 4 44.8  
50.9

40 4 32.7  
32.6

40 3 42.8  
42.6

40 2 43.0  
42.9

40 2 2.6  
3.6

Apr. 26 1871

2 hrs May 10 9 22 + 43 33  
42 23  
5 40

2 Leo 10 12 55 + 4 2

~~31 Leo Min~~

42 23

~~30 May~~

38 00

✓ 58 hrs May 11 23 35 + 43 52  
42 23  
358 31

2 hrs May 11 47 05 + 54 24

512 23  
347 59

4 hrs May 10 14 41 42 08  
42 23

31 Leo. Min + 37 22  
10 20 29 42 23  
5 01

o Varying 11 58 41 + 9 29  
42 23  
32 56

New sheet - no. 3 = 11 54

General Cat. Obs.  
1871  
A. M. rec



45-4 28.7  
29.1

45-3 38.2  
39.0

not fol-

not fol-

55-3 21.1  
23.7

55-2 37.6  
38.7

10-4 6.9  
8.3

10-3 15.3  
16.9

0 0 49.6  
53.1

0 0 4.8

A.M. obs.

Mar 26 1871  
~~A.M. obs.~~

Σ morning 1245 23 + 56 39 miles  
 Right 42 23  
 44

12 Canis 50 02 + 39 01 miles  
 23

Palais 21st Dec.  
 E f. g. m.

No. 1 = 120  
 2 = 121  
 3 = 122



40 3 32.7 33.1  
34.1

40 2 53.6  
54.1

20 1 52.7  
56.1

1 16.7  
18.2

0 0 53.4  
44.5

0 1 4.2  
36.1

13 L 12 m 0<sup>s</sup> Sheet

Bar 30.296 650 NW 41.6  
W. 60 44.8  
W. P. 52.2

Mr 29 1871. Sheet 123  
 1<sup>st</sup> m.b. 9 53. 2<sup>nd</sup> 10 04

a Leo All this  
 10 1

2<sup>nd</sup> m. May.  
 10 522 + 43 33

4<sup>th</sup> m. May  
 10 1441 42 08  
 42 08

31 Leo. 737 m. May  
 10 2654 37 22  
 37 22  
 42 23

35 m. May.  
 10 33 53 69 44

42 Leo. Run  
 10 38 45

8 m. May  
 11 47 05 + 54 24

e.m.b. = 11 48

Sheet 125 1<sup>st</sup> m.b. = 11 56  
 12 40



*A m ols.*

45 4 29.7  
30.8

45 3 45.0  
46.1

10 4 6.1  
8.9

3 24.7  
25.6

35 3 318  
320

35 2 318  
82.6

35 3 232  
19.1

35 2 370  
33.4

0 1 103  
14.0

0 0 227  
26.1

55 3 281  
30.0

55 2 402  
42.1

3-20. WP

42.9 N6

46.2 = No. 4

29.725

67.0

Apr 30 1871 1<sup>st</sup> m. Oct 30 1871

E Leo 9 38 35 +24 22

2 hrs May 9 41 52 +59 38

19 Leo Min 9 49 50 +41 40

79 Deneb 9 51 16 106 52

Washington X<sup>s</sup>  
11<sup>h</sup> 11<sup>m</sup> 26<sup>s</sup> +90 20'

11 12 51 +90 21'

11<sup>h</sup> 56<sup>m</sup> 15<sup>s</sup> -0° 42'

11 58 59 -0° 35'



3 on 5-1° 24.1 Rds.

0 0 43.0  
45.2

55 4. 46.3  
52.0

40 4 38.8  
37.7

40 3 49.6  
48.1

40 3 0.9  
1.1

40 1 54.8  
53.8

wt-Rds.

0 2 53.6  
58.9

0 1 50.0  
55.2

8 two 5 too low

0 0 30.9  
34.2

55 4 23.2  
29.1

2 5 0 2.6  
10.0

P.D. 11 56 0

55 2 21.6  
29.0

12

12 12 0 10.2

2871 April 30

12 38 40

dis dls, 6,

No. 1 = 124

2 = 127



30 2 52.4  
58.4

30 2 2.2  
9.3

h. m. b. 12<sup>h</sup> 41<sup>m</sup> 05

A		b	
59	8.1	13.2	14.0
62	7.8	13.0	14.0
6.9	7.7	13.2	13.6
6.2	7.8	12.0	13.5
6.0	7.9	13.0	14.0

N.b. 48.5  
P 53.2

Bar 29.72 66.5 Ther 44.1 No 4

May 1 18<sup>th</sup> m.b. sheet-128  
 X his my 11 2 28

Gr. 1757 18 9 29

58 his my  
 11 23 35 (in [unclear])

X his my  
 11 39 17

l.m.b. = 11 54  
 (12c) new sheet-18<sup>th</sup> m.b. 11 54

G.B. W.R. obs  
 at the

Polaris W.R.

l.m.b. 13 29



10 0 5-23  
5-29

10 0 152  
169

10 2 141  
13.1

PO 01' 29.7  
29.1

30 0 25  
3.1

25 4 224  
22.1

50 3 193  
195

50° N. b.  
54° W. P.  
29.935 68 N 4.483

0 0 48.7  
42.2

0 0 20.7  
12.6

last str.

1871 May 2

2 Leonis all of the wires

W.A.R. Obs

1 hrs May 10 9 22

γ' Leonis 10 12 55

14 hrs May 10 14 41

31 Leo Min 10 20 29

10 hrs May

Z\* 10 33 53 69° 44'

42 Leo Min.

Z\* 10 38 45 31° 22'

46 Leo Min

Z\* 10 46 9 + 34° 54'

13 hrs May

Z\* 10 54 06 + 57° 4'



1871 May 2  
 ptm. 6.9

			Alt	Re
45	4	34.9 34.3	3	43.2 43.1
50	3	13.1 12.3	2	22.1 26.2
10	4	3.9 4.2	3	20.4 18.2
0	0	38.6 41.2	0	3.4 5.8
35	3	22.8 17.3	35	2 37.0 31.4
0	1	6.0 7.0	0	28.9 31.2
25	3	16.1 18.9	25	2 24.2 26.2
15	3	41.3 40.9	3	1.0 0.2

1891 May 2

W A R Obs

E Jus Maj

Z \* 11<sup>h</sup> 11<sup>m</sup> 35<sup>s</sup> 33° 48'

S Jus Maj

Z \* 11 23 35 +43° 52'

X Jus Maj

Z x 11<sup>h</sup> 39<sup>m</sup> 17<sup>s</sup> +48° 29'

L. S. L. M. A. S.

Bolair S. P. all wins

No 1 = 130

No 2 = 131



1871

May 2

A.M. Rec

~~25.0~~ 14.2  
~~12.1~~

30 4 39.2  
 40.2

fol 5

30 0 14.8  
 13.0

25 4 22.3  
 22.2

50 3 10.2  
 & doubt 9.4

2 39.1  
 37.2

last m.b. 11 55 May 2

New Spec

1st m.b. 12 0  
 11 0

A.M. Rec.  
 0 1 50.0 - 0.8

0 1 16.4  
 11.0

m.b. = 49.0  
 0 = 54.0

Ben 30,075  
 alt. 60.8

emb 13 24

7871 May 7

S.M. obs.

C 35.615

5 16 50

F.M.B. 10 17 0

226 Leporis B & all wires but first  
10 30 01

42 Leo Min 10 3 45

46 Leo Min 10 46 09  
Lark failed

3 hrs May 10 54 06

4 hrs May 11 2 28

5 Leonis 11 7 18

8 hrs May  
11 47 0.5 54 24

Polaris mid wire

No 1 = 132

No 2 = 133



16.20					NR 46°
15.92					NR 51°
<u>200.28</u>					NR 44°5-
.06					29.62
<u>12</u>					64°
18					
- .09					
	16.3	16.4	22.4	22.4	
	16.0	16.3	22.4	23.0	
	15.4	16.3	22.0	23.4	
	15.8	15.6	22.2	22.5	
	16.1	16.4	22.0	22.8	
	29.6	31.0	10	14.1	
	15.92	16.20	22.20	22.82 - 62	
	0	1	5.3	6.3	

25- 3 10.4 13.0

16- 3 43.3 42.4

10 1 5.2 3.1

5 3 48.4 51.5

55 3 26.2 24.4

12<sup>h</sup> 14<sup>m</sup>  
 Van of line -  
 12 18 13<sup>h</sup> 31<sup>m</sup> 0<sup>s</sup> end

8<sup>h</sup> Lewis AR 11 7 15.34  
 11 7 12.70  
 2.6 slow

7871 May 9<sup>th</sup>  
 1st 12<sup>h</sup> 29<sup>m</sup> 2<sup>d</sup> 13<sup>h</sup> 49<sup>m</sup>  
 last

G.B. des. W.H. des.

Runs

A  
 80 86  
 86 90  
 80 87  
 81 78  
 8.3 9.0

B  
 133 152  
 132 147  
 138 157  
 139 149  
 134 144

Bar 29.987

73.5

dry 46.8

P 7h 52.3

N 6h 48.6

C set at 35.653

Dec. Micron set at 16 550

Supposed to be this for the whole evening  
 but not entirely sure.

no 1 = 134





May 10 1871 YAR  
1 m. 6 10 40 Obs.

4h 6 min 10 46 9 34° 54'

New star at 10<sup>h</sup> 50<sup>m</sup>

3 hrs May  
10 54 6

2 hrs May  
10 55 49

11 56 15 - 0° 42'

11 58 59 - 0° 35'

12 12 48 - 1° 31'

6 Can. 12<sup>h</sup> 19<sup>m</sup> 32<sup>s</sup>

74 hrs May  
12 23 58



25 3 11.2  
12.9

being bad

25 2 29.3  
30.8

15 3 24.4  
22.7

15 2 58.9  
56.7

55 1 15.6  
11.7

0 34.2  
31.4

0 4 53.8  
59.5

0 5 12.4  
18.4

55 1 25.2  
32.7

8 full

50 4 5.3  
11.1

50 2 12.3  
23.1

being good

35 3 51.1  
50.3

2 58.3  
58.2

15 1 21.9  
18.1

0 29.8  
26.1







7871 May 11

Sheet -

10h 33 m 05

L m, obs.

42 Leo Min 10 38 45

46 Leo Min

13 Mus May 10 54 06

a Mus May 10 55 49  
Lost - a

# 11 56 15 - 0 42

12 12 48 - 1 31

6 Cam 2 - 12 19 32

12 21 50 - 2 3

74 Mus May 12 23 58



8	1	4,0	6,2	0	11,3	13,5
---	---	-----	-----	---	------	------

25-3	4,4	8,0	2	15,0	18,2
------	-----	-----	---	------	------

15-3	35,1	30,3	2	42,0	47,0
------	------	------	---	------	------

for 5-5-d	30,4	29,4
-----------	------	------

5	8,3	14,2	3	47,0	54,9
---	-----	------	---	------	------

10	3	1,0	8,4	2	11,4	20,4
----	---	-----	-----	---	------	------

35	3	43,5	46,0
----	---	------	------

20	4	51,2	58,5
----	---	------	------

15	4	13,7	12,6	15	22,8	21,2
----	---	------	------	----	------	------

No 1 \ 1871 May 11 / No 2  
 12<sup>h</sup> 30 New sheet 12<sup>h</sup> 33 0

12 37 32 - 3 02

---

12 38 40 - 30 11

---

Gen Cost. W & R Do.  
 emb. 13 43

No. 1 = 137

No. 2 = 138



20 2 42.9  
47.7

51.7 46  
53.0 W.P.  
50.0 10.4  
24.95 Bar  
63.0

Fb before Tm lost &

30 1 7.5  
11.8

5 fol

12 bar van	0 Verg	2 hrs Maj
41.8	2.0	
45.1	4.5	
48.2	6.9	
51.3	9.6	13 10 40.7
57.7	14.5	44.8
4.1	19.3	49.9
7.3	21.6	11.4
10.4	24.3	43.8
13.7	26.9	
249.6	129.6	13 10 43.8
24	14.40	13 10 54.6
5-19.6	17.42	show 10.8
57.73		
0.65		
2.92	3.02	

2871 May 12

11<sup>h</sup> 43<sup>m</sup> 20<sup>s</sup> No 1 139
$$\begin{array}{r} 1 \text{ hrs May } 11 \quad 47 \quad 5 \quad 140 \\ \hline 570 \quad 24 \end{array}$$

Polaris Mid wire

3 hrs May 13 1846

69 hrs May 13 28 45

17 Can Min 13 29 05

Comp 236 13 33 2 34

Kew Street

13 45 0

No 2 140

Boots

~~19 29 04~~

13 48 35



1871 May 12<sup>th</sup>

55' 2 344 32.1 5 full

5 in angle Sun back

46 55.0

WP 36.5

2930.80

65.5

54.0

A

25.8 26.0

26.0 26.3

25.7 26.8

26.0 26.3

25.6 26.7

29.1

25.82

21

26.42

1.82

B

32.1

31.8

32.1

31.2

31.7

89

31.78

33.0

32.5

32.3

32.2

32.4

124

3288

3178

110

-12

22

34

-17

May 13 1871

B in May 10 5406

a in May 10 5547

Phos May 11 2 28

✓ Led 11 17 18

Se 1757 1 1 9 29

new sheet after 12 / 27  
1st on a = 12 / 30

12 Can in 13 or 23  
lost a

Palais all miss.

~~17 Can in~~

20 Can in 13 1148

6.9. in May 13 2345



$i_{mb} = 10.37$  A.M. Sh.

15-3 385, 401 2 380 34,2

550 58,7 59,2 0 29,0 29,0

10 0 54,2 53,6 10 0 + 2,7 + 5,0

5-3 41,6 48,4 5 25-2,7 59,3

10 2 99 10?

emb 12-27

20 1 41,1 42,7 1 40 6,3

5 2 25,1 27,4 1 55,1 57,7  
cont-a

45-1 204 2,12 410 410

My 131871

No. 1 = 141

No 2 = 142

P = 522

Nb = 469

No 4 428

Bar 2983

Att. 610

No. 1 = 140

2 = 142

emb, 13 25



1871 May 13<sup>th</sup> m B 1<sup>h</sup> 14<sup>m</sup> 0<sup>s</sup>  
 Polaris mid & full wires

& Arctis all of the wires

4 m 2 2<sup>h</sup> 2<sup>m</sup> 0<sup>s</sup>

Polaris  
 1<sup>h</sup> 11<sup>m</sup> 55.6 mid wire  
 0.1  
 1.9  
 60.6  
 1<sup>h</sup> 11<sup>m</sup> 0.21  
 1 10 55.76  
 - 4.44

& Arctis

Sheet 143

1<sup>h</sup> 59 37.3  
 40.2  
 42.6  
 45.3  
 50.5  
 56.0  
 58.6  
 1.5  
 4.3  
 45.6.3  
 1 59 50.70  
 1 59 53.04  
 2.34

May 14 1871 W.R. Ds.

Sheet 144 1<sup>st</sup> mb. 1027

35 hrs May 10<sup>h</sup> 33<sup>m</sup> 53<sup>s</sup>  $\delta$  69° 44'

42 Lev Min 10 38 46  $\delta$  31° 22'

1 Lev Min 10 42 32  $\delta$  11° 41'

46 Lev Min 10 46 9  $\delta$  34° 52'

Blus May 10 54° 06'

2 hrs May 10 55

L m 12 0 0

New sheet - 12 3 0 145

12 Can Ven

New sheet 12 50 0 2

12 53 0 146

14 Can Ven W.R. Ds.



Cut at 35.630

35- 3 9.3 5.2 2 28.0 23.7

0 0 58.4 62.0 0 15.6 17.8

25- 3 4.9 8.0 2 23.8 25.4

15- 3 37.0 37.0 2 59.1 59.2

55 1 18.6 17.8 0 35.3 34.5

20 1 12.3  
11.7

50 3 16.1 18.8 50 2 37.2 39.2

Aug 14 1871  
Gen Cat. sm. obs.

P = 528  
n.b. 47.5

emb 13<sup>h</sup> 53<sup>m</sup>

No. 1 = 144

2 = 145

3 = 146

Bar 2987

Alt 66.1

No. 4 452





May 15 1871 248K  
11 11

Ans May 11 55 49  
269K

✓ Ans May 11 2 25

✓ Feb 11 7 15

1757 11.9 29

✓ Craters 11 12 56

Apr 17 71 11 15-14

58 Ans May  
11.23.36 + 43.52

11.47.05 54.24  
Ans May.

Rollin's T m



Aug 1 m 6 = 10 53-

550 256 276

10 0 50.5 503

5-3 326 379

10 2 50 38

20 0 50.5 479

30 0 011  
0.001

5-5- 3 05-2  
070

~~5-5- 3052 2-263~~  
~~670 2-263~~

e m 6 m 0.1 = 12 52 ✓

New Sheet - No. 1 m.b.

3 No May 13 18 46

69 No May 13 23 45

17 Can. No - 13 28 00

Ban 2985

4th 650

No. 4 470

P 539

m.b. 516

l m.b. 13 56

m1 = 147

m2 = 148



~~1257~~ 1257  
 45-1 47.040 45-1 201 212

45-1 197 150 45-0 410 400

Tu 2 fgn

30 1 35.7 387  
 ~ sue

7841 May 16  
M B 10<sup>L</sup> 39<sup>m</sup> 0<sup>s</sup>

4<sup>r</sup> 1757 11 9 29 + 50° 10'

3 hrs May 11 11 21 + 32° 15'

4<sup>r</sup> 1771 11 15 14 + 65° 11'

T Lennis lost a & b -  
11 21 11.

lost first wire 5 foll

58 hrs May 11 23 35  $\frac{43.52}{65.117}$

b. b. WSR obs.

Bar 29.74

Alt 67.5

m. 4 55.6

n. b. 55.2

p 56.2

l. m. b. 72.91

901-149



W.R.O.

10	2	8.9	1	27.3
		6.7		26.0

---

5	2	23.1	1	32.4
		24.6		33.7

---

20	0	53.2	0	24.3
		49.6		19.8

---

25	4	31.2
		30.1

---

May 17 1871

Put in the glass lines.

Adjusted them for perpendicularity.

Adjusted the collimators so that both N.B. and S.B. read about 83.00 for the line of no collimation.

The following are the collimation readings of the coarse wire for the 5 ~~series~~ middle groups.

The collimation <sup>the following</sup> ~~for this date~~ <sup>May 18</sup> is wrong. The cross wires of the collimators were not set right; the coarse wire having been set to intersect the fine. see beyond May 18



a	b	c	d	e
32,859	34,949	37,021		
852	950	14	39,085	41,159
858	950	16	82	146
853	947	10	76	155
840	946	08	70	166
858	940	04	79	158
856	936	00	69	154
862	940	80	76	157
860	944	40	82	152
860	935	20	67	161
550	437	163	85	160
32,8550	34,9437	37,0163	39,0761	<del>41,114</del>
				<del>41,114</del>
				41,1570

32,8550	2,089
34,9437	2,072
37,0163	2,060
39,0761	2,081
41,1570	302
1850481	2,075
37,0096	1,24
37,0163	8300
.006	4150
	2075
	257800

This assuming the value of one revolution of the collimation mechanism to be 1.24 we have for the equatorial intervals between *Simplex* = 2,573

May 17 1871 JWR

$\delta$  Leonis, 11 7 18 + 21° 44'

May 19 - 18

Put in a new set of wires on this glass.  
The intervals are 40 ~~rev.~~ on the Clark  
micrometer, as follows

40 rev. 40 50 40 40 40 40 50 40 40

The equatorial intervals are about 2.5'



Obs. 1 mb. 10 47  
10 52x

0 3 10.6  
16.2

Sheet 150

May 18 NYR Des

8 hrs May  
11 47 06 540 24

Em 6  $13^{\circ} 42' 0''$

new sheet  $13^{\circ} 47' 0''$  marked ~~by~~ <sup>Greeny</sup>

$\epsilon$  Draconis  $14^{\circ} 0' 56''$   $64^{\circ} 59'$

$\gamma$  Procyon <sup>collimation</sup> in line and near

$\epsilon$  Bootis  $14^{\circ} 9' 49''$   $19^{\circ} 51'$

$\lambda$  Bootis 14 11 31  $46^{\circ} 40'$

$\zeta$  Cass 14 18 33  $113^{\circ} 10'$

$\theta$  Bootis 14 20 50  $52^{\circ} 26'$

$\gamma$  Bootis 14 26 56  $38^{\circ} 52.1'$

$14^{\circ} 29' 0''$  emb.



1 m.b. 11 45

55 1 11.2  
8.0 8 full last 5

20 1 19.1 1 43.1  
15.4 39.8

25 3 36.3  
42.2

35 4 26.3? 40 0 18.4  
37.6? 18.0

50 3 31.8 50 4 8.2  
31.7 8.0

25 3 0.7 7  
3.8

May 1871

N.B. = 54.0

D. 58.0

no. 4 57.8

Bar. 30.14

W. 60.8

no. 1 = 151

2 = 152

1871 May 19 Rogers

~~37.65~~ c 37.65 by Rogers & Allen

37.792 33.553

783 .569

779 .574

774 .580

756 .569

384 345

37.777 33.569

37.777

71.346

c set at 35.673

A. M. Allen



1871 May 19 A.M. Obs

11 16 0 marked

B Leonis  
γ Urs Maj

11 49 0 last  
11 55 6

4 Draconis H

B Leonis

12 30 0 last

B Leonis

19.0  
23.3  
25.5  
27.5  
29.6  
31.7

137.6

11 42 27.52

11 42 29.32  
slow + 1.80  
+ .09

γ Urs Maj

34.6  
38.2  
1.7  
5.0  
8.7

8.2

11 47

1.64

11 47

3.10

+ 1.46

slow + 0.35

7871 May 19  
 Polaris mid wire  
 marked 13 12 0  
 at Bootes

13 50 last

Polaris

at Bootes

13 10 43.9  
 47.5  
 50.0  
 140.4

13 10 47.1  
 13 10 59.4

12.3

27.7  
 29.9  
 32.0  
 34.1  
 36.2  
 159.9  
 13 48 31.98  
 13 48 33.80  
 1.82  
 0.8

-12.3 -41.55  
 -1.8 + 0.34  
 -41.89). 10.508 (0.25 n

Shells  
 No 153  
 No 154

B Luminis + 1.89  
 y M. Maj + 1.81 slow  
 y Bootes + 1.90  
 560  
 +1.87 mean





1871 May 20

11<sup>h</sup> 12<sup>m</sup> 0 marked

$\lambda$  Draconis 11 23 47

$\nu$  Leonis 11 30 24

$\beta$  Leonis 11 42 32

---

$\gamma$  Vir Maj 11 47 05

---

44 Draconis  $\pi$  12 6 10

$\kappa$  Draconis 12 28 00

13<sup>h</sup> 7<sup>m</sup> 0<sup>s</sup>

New Star 13 9 0

---

$\delta$  Bootis 14<sup>h</sup> 20<sup>m</sup> 50<sup>s</sup> 52° 26'

3 Bootis 14 26 19 30° 56'

---

33 Bootis 14 34 4 44 58

End 14 37 0



Runs			
A		B	C
7.8	8.0	16.1	17.7
7.2	8.2	15.8	17.2
7.0	9.0	16.3	17.3
7.2	8.3	15.2	17.1
7.9	8.4	16.0	16.8

55 0 42.6  
43.1

C 35.673

5 17.518

W P 64.0

A.C. 59.5-

No 4 53.2

Bar 30.10

Ther 66.5

50 3 36.7 36.8

25 2 48.0 50.3

20 2 35.3 36.9

Sheets

W 155

N 156

1871 May 21<sup>st</sup>

34.840	33.578
.830	.572
.821	.572
.830	.583
.836	.573
<hr/> 157	<hr/> 383

52.831	33.577
33.577	
71.408	
35.704	

1<sup>st</sup>  
11<sup>th</sup> gm 05

hr 1771 11 15 14 +65° 1

marked 11 30

hrs May 11<sup>th</sup> 47<sup>th</sup> 2<sup>nd</sup> +54° 25'

4 Draconis H. 12 6 10

2 Virgin lost 1<sup>st</sup> gr

K Draconis 12 37 58 +70° 30'

12 32 0

New Dr 12 37 0



<u>Runs</u>			
A			
21.3	21.8	29.0	29.8
21.0	21.8	29.2	29.3
21.6	21.3	28.7	30.0
21.9	21.8	28.8	30.1
21.2	21.4	29.2	29.3

15-4 12.4 10.0 5 full  
lost first group

55 0 33.7 33.4

DN P 640  
N6 600  
W04 550  
Bar 29.99  
Thur 670

50 0 24.8 20.0

Shuts Nov 157  
Nov 158

1871 May 21

---

0 Bootis 14 20 50 +52° 26'

---

3 Bootis 14 26 19 +30° 56'

---

33 Bootis 14 34 4 +44° 58'

---

14<sup>h</sup> 37<sup>m</sup> 05



50 3 32.4 30.8

---

20 3 49.7 53.8

---

20 2 36.4 36.8 Ink failed

---

May 23 1891 A.M.

2 Leo 11 30 24

3 Draco 11 35 19

2 Mus Mus 11 39 17

13 Leo. 11 42 32

2 Mus Mus. 11 48 05

a Draco 14 05 6

a Bootis 14 09

c Bootis

l m h. 14 13



Obs. 1 m.h. 10 19

50. 2 59.0 56.5 ~~13.5~~ 50.8 50.2

~~5~~ 50 130.9 32.7

~~55-0 30.8~~  
~~32.0~~

55-0 30.5 1 31.6  
32.9 34.1

20 0 57.3 20 1 55.0  
56.9 55.1

25-3 30.6  
39.4

20 2 26.8 20 3 30.3  
~~38.8~~ 33.0

P 57.2  
n.b. 59.0

Bar 30.01  
alt 66.0

mm. 15.9  
no 2 16.0

7871 May 24

---

 3 Leonis 11 42 32 +15 18
 

---

 1 ~~Vergens~~ <sup>Ins Maj</sup> 11 42 5 54 24
 

---

 0 Vergens 11 58 41 +9 27
 

---

 W 12 to 93 to  
 TR 12<sup>2</sup> 2-33<sup>5</sup> - 0 52 5
 

---

 1 Can Min  
 12 9 42 +41 22
 

---

 13 11 0  
 New Star 13 13 0



---

0	2	16.2	3	7.4
		23.0		13.7

---

55	0	44.8	1	37.0
		45.1		37.2

---

50	2	43.9	3	46.8
		50.2		53.6

---

10	1	57.7	2	49.4
		4.2		58.2

---

55	2	26.8	3	22.5
		27.3		25.2

---

N.C. 52.0  
 W.P. 61.2  
 Bar 30.51  
 A 63.0  
 M4 57.8

No 1 - 161  
 2 - 162

1871 May 24

$\alpha$  Draconis 14 0 56 +64 59

$\alpha$  Bootis

14 9 49 +19° 51'

$\gamma$  Bootis 14 11 38 +51° 56'

$\sigma$  Bootis

14 20 50 +52° 26'

5 Urs Min 14 27 49 +76° 15'

33 Bootis

14 34 4 +44 58

Lut 14<sup>h</sup> 36<sup>m</sup> 0<sup>s</sup>



20	0	53.4	1	57.2
		52.0		56.7

25	3	27.2	4	36.3
		34.2		43.2

25	0	2.7	1	58.8
		2.5		58.6

50	3	26.5	4	22.6
		27.0		23.9

0	4	39.9	5	49.2
		37.3		44.8

20	2	38.2	20	3	25.2
		38.0			26.0

May 25 Noon  
Peymen Yamin

Box 236

236 50.0 feet of S.L.

S.L. = 1.50 feet;

236 = 49 feet;

1.2,

2.2

4	6	35.0	4	8	52.0
	7	2.5		9	23.0
	7	34.0		9	55.0
	8	7.0		10	26.0
	8	35.0		10	55.0
		<hr/>			<hr/>
	37	56.5		49	37
	7	35.2		96	53.40
	1	8.0		1	8.0
		<hr/>			<hr/>
	8	43.2		8	47.4
	8	47.4			
		<hr/>			
		90.6			

8 45.3  
7 55.9  
7 49.4  
Time of passing ~~408~~ 408 46





May 25

Put in a new set of wires  
on account of a defective declin-  
ation wire. The interval is the  
same as before. The follow-  
ing are the readings of the  
collimation micrometer

$a_1$   $b_1$   $c_1$

$a_2$   $b_2$   $c_2$

---

$a$   $b$   $c$   $d$   $e$





May 25 1871 A.M. Obs.

+ Mus May. 11 39 14

Plus May. 11 47 05

~~12 12 50 12 7 33~~  
~~053~~

B Comae 12 17 53

+ Comae 12 20 34

l m b, 12 43

New Hunt - 1 m. b, 12 47

33 Bortis 14 34 04

~~2 Bortis 14 42 04~~

no. 2 l m b, 14 45

B m m 14 51 06



1 m.b. 11 31

50 2.39, 400

55-2 0.2 5982 530 530

30 2 240800 316.8 225

20 2 6.6 12.3 3 0.1 6.4

640 W.P.  
620 X.L.  
30.06 Bag  
69.2 J  
62.8 Noh

20 3 469.522 20.4073 406

New shear inv. 3. 1 m.b. = 1448

40 1 20,8 18,3 40 1 56,4 52,0

May 25-1891

2 hrs Mini No 14 5533

B. Boates 14 5707

No. 1 = 163

2 = 164

3 = 165



55-0 4,3 4,0

55-0 34,7 33,0

u hepue

20-233,6 37,0

3 12,8 22,9

7871 May 26.

7 In B  $11^{\circ} 37' 20''$ 

B Leonis 11 42 32 +150 18'

 $\gamma$  Urs Maj 11 47 5- +521° 24'

4 Draconis H

12 6 10 78 19 0

7 Virginis mid group P faded  
12<sup>L</sup> 13<sup>m</sup> 0<sup>s</sup>

74 Can Ven

12 19 0

74 Urs Maj  
12 23 0

8 Can Ven

12 27 39 +420 3

0 3 32.8  
37.9

---

55 1 59.4  
59.3

---

35 2 26.7  
~~27.4~~

---

10 4 46.7  
46.0

---

15 2 57.3  
57.8

---



7841 May 26<sup>th</sup>

Draw into 12<sup>h</sup> 43<sup>m</sup> 0.8

12 Can Ven

12 50 2 + 39° 1'

Polaris 12 3 + 4 - 6 7 8 9

LMB 13 16 0

W Shet 13 24 0

5 Boats

15 10 21 + 33° 48

1 Ins Min H  
lost first group

15 13 11 + 67° 50'

ii Boats

15<sup>h</sup> 22<sup>m</sup> 5

5 fol

20

1. 17.2

1901

0 0 44.0  
36.1

Run

A

15.11

15.5

22.8

23.2

15.10

15.3

22.3

23.2

15.10

15.2

22.1

23.1

15.3

15.2

22.6

23.4

15.2

14.9

21.8

23.2

14.8

66° N C

69° W P

65° 2 N 4

29.95 Bar

71° A

N1=166

2=167

30 3 37.2  
41.1

30 2 38.8

35.0

5 fol

Run failed

30

1

38.0

40.2

1871 May 27  
12 28<sup>m</sup> 05

76 hrs. May

12 35 58 +63° 25'

8 hrs May

12 48 23 + 56° 39'

12 Can. Ven

lost first group

12 50 2 + 39° 1'

17 Can Ven

13 4 11 + 39° 11'

Polaris Mid Group  
seeing bad

New Sheet <sup>14 9 0</sup>  
14 19<sup>m</sup> 0

5 Boots 15- 10 21 + 33° 48'

1 Per. Min <sup>14</sup>  
15- 13 11 + 62° 50'

7 Boots  
15- 26 20 + 41° 16'



1871 May 27 5

53-1 37.8  
38.3

40 2 68  
8.4

20 1 20.0  
22.0 5 feet

10 0 20.9  
23.3

W P 65.3  
N C 38.2

30.27

64°

404 58°

30 3 34.8  
41.2

30 2 37.9  
36.8 5 feet

5 0 9.3

11.2 ink N S

1871 May 27  
 + Brooks

15 33 14 + 40° 46'

15 34 C

1871 May 28

C

35.052

.061

.048

.042

.052

251

35.051

35.052

35.050

.061

.057

.048

.048

258

35.052

C 44-

35.051

35- 0 4.9  
6.8

W1=168

W2=169

---



May 29 1871

Pewee Hawk

1 L

2 L

22 45.5

23 20.5

23 51.5

24 24.5

24 55.0

119 20.0

25 10.5

25 41.5

26 13.5

26 46.5

27 14.5

31 09.5

5.5  
5.5  
3.8

23 52.00

1 8.20

25 00.20

5.60

5.80

26 13.80

1 8.20

25 5.60

Level = 0

4 25 29.0

4 24 09.8

53.6

Dad

236 is 54.5 feet of lb

A change of 1/100 in level makes a  
change of 3.8 in range



1871 May 29

γ Irs Maj

11 47 5 +54° 24'

~~B 16 42 87~~

~~12 39 109 +416° 09~~

Pen failed 12 13 5123

76 Irs Maj

12 36 58 +63° 25'

ε Irs Maj

12 48 23 +56° 39'

33 Bootis

14 34 4 +44° 58'

ε Bootis

14 39 4 +27° 37'

22 Libray 443 48

22 ~~Dracunis~~ 14 48 11 +59° 49'



55- 1 50.2  
49.8

2 39.2  
41.0

55- 1 26.9  
26.2

2 15.7  
15.0

40 2 41.0  
42.3

Full mid g

20 3 55.2  
55.8

4 42.6  
43.2

40 4 11.2  
13.1

45-0 8.4  
11.0

30 2 30.2  
29.1

3 28.1  
26.8

1871 May 29  
 B hrs Run  
 14 51 6 +74°40'

---

2 hrs Run  
 14 55 33 +66°26'

---

Lm - 15<sup>h</sup> 2<sup>m</sup> 0s

No. 1 170

2 171

Bar 30.03

Alt 76.0

No. 4 70.7

2 69.0

N.B. 70.0

40 1 10.2 2 12.1  
6.1 8.9

---

55 0 57.3 Aug 1 1.2  
2.2 57.9

---



May 30 1971  
Polar Hand-

1 L		2 L	
4 26 49.5		29 10.5	
27 19.5		29 41.0	
27 57.5		30 13.0	
28 25.0		30 47.0	
28 55.0		31 18.5	
<hr/>		<hr/>	
35 20.5		151 10.0	
27 52.10		30 14.0	
1 8.20		1 8.2	
<hr/>		<hr/>	
29 0.30		29 5.8	
5.8			
6.1			

$$\begin{array}{r}
 4 \ 29 \ 3.0 \\
 1 \ 28 \ \underline{13.4 - 5.7} \\
 \hline
 49.6 \ 55.3
 \end{array}$$

$$236 \ 55.8 \text{ four } 1/2$$

$$\text{Level} = +.15$$



June 1 1871

Put in a new set of wires. Inter-  
val same as before viz. .40 Rev. of  
the (Clarke) Micrometer. These wires  
are smaller than the preceding, and  
the last two wires are purposely broader

Reading of wires by  
the collimator micrometer.

~~a b c a b c d e a b c~~  
26 27 28 29

a <sub>1</sub>	b <sub>1</sub>	c <sub>1</sub>
26 120	27 741	29 423
125	740	420
123	750	416
113	753	422
111	747	414
113	743	422
110	748	414
112	743	413
115	740	416
110	755	418
<hr/> 152	<hr/> 460	<hr/> 194
26,115	27,746	29,418

(These settings are for  
the middle of the wires)



a	b	c	d	e
32.758	34 412	36.028	37 721	39.360
740	416	86	721	358
746	406	35	700	362
733	404	24	706	368
740	400	23	712	362
735	401	21	709	364
753	400	25	703	358
749	413	27	712	356
740	407	28	718	362
746	406	30	708	362
440	65	277	110	62
32.744	34.406	36.028	37.711	39.361

32.744  
 34 406 1.662  
 36.028 1.622  
 37.711 1.683  
 39.361 1.650  


---

 30250  
 36.056

26.115 1.631  
 27.746 672  
 29.418 3.326 663  
 32.744 662  
 34.406 622  
 36.028 683  
 37.711 650  
 39.361 328 664  
 42.689 644  
 44.333 364  
 45.797

a	b	c
42 699	44.336	45.790
693	339	822
683	333	755
684	330	804
684	337	807
700	334	796
688	333	806
692	330	790
680	330	790
684	330	790
698	332	791
888	334	7971
42.689	44.333	45.797
39.6328		
35.032		

# Readings of the first edge of the wires.

a	b	c
2.6038	2.7686	29.360
025	696	360
038	691	350
041	680	353
041	681	346
041	683	346
043	682	353
041	675	350
039	662	358
043	684	348

26.039    27.683    29.352    d    e

32.644	34.312	35.949	37.620	39.271
632	302	952	610	280
630	308	951	621	274
637	312	948	623	273
638	306	950	620	272
640	313	940	612	279
642	314	950	628	271
640	310	960	615	270
644	307	943	614	270
634	311	958	610	271
			<del>628</del>	276
<u>32.638</u>	<u>34.309</u>	<u>35.950</u>	<u>177</u>	
			37.618	39.274

$a_2$  $b_2$  $c_2$ 

42.590

44.197

45.677

597

202

690

597

192

682

592

180

686

593

187

680

592

188

683

614

192

690

589

180

686

596

197

686

586

196

686

42.59544.192

45.674

Readings of the 2<sup>nd</sup> edge $a_1$  $b_1$  $c_1$ 

26.190

27.816

29.484

189

830

485

180

812

470

180

815

472

182

816

474

190

820

473

178

818

471

183

816

483

180

819

481

177

824

483

829166782

26.183

27.817

29.478



$$\begin{array}{r}
 34 \\
 35 \\
 36 \\
 37 \\
 38 \\
 39 \\
 \hline
 28
 \end{array}
 \begin{array}{r}
 35.0 \\
 06.0 \\
 38.0 \\
 12.5 \\
 43.0 \\
 14.5 \\
 \hline
 181
 \end{array}$$

$$\begin{array}{r}
 35 \\
 1 \\
 \hline
 36
 \end{array}
 \begin{array}{r}
 3880 \\
 82 \\
 \hline
 47.0 \\
 57.4 \\
 \hline
 98.4
 \end{array}$$

$$\begin{array}{r}
 37 \\
 38 \\
 \hline
 75.8 - 26.4 \\
 \hline
 49.2
 \end{array}$$

$$\begin{array}{r}
 36 \\
 37 \\
 38 \\
 39 \\
 40 \\
 \hline
 38 \\
 1 \\
 \hline
 4.37
 \end{array}
 \begin{array}{r}
 57.0 \\
 28.0 \\
 02.0 \\
 33.5 \\
 40.5 \\
 03.0 \\
 0060 \\
 8.2 \\
 \hline
 51.4
 \end{array}$$

June  
17/

Perm  
Navit

$$\begin{array}{r}
 4 \text{ level} = +0.7 \\
 3.5 \\
 \hline
 2.8
 \end{array}$$

236 is 57.5 feet of SL

2nd edge

a      b      c      d      e

32,800	34,443	36,099	37,754	39,420
874	910	94	971	425
803	470	94	972	434
802	475	96	971	430
<del>77</del>	460	86	966	420
806	490	96	972	424
816	457	100	977	420
815	464	90	977	418
803	474	87	964	425
810	471	80	964	422
		925	960	
32,8056	34,4634	36,0925	37,7672	39,4238
<del>34,4634</del>				

a<sub>2</sub>      b<sub>2</sub>      c<sub>2</sub>

42,760	44,886	45,911
774	403	801
749	409	899
750	417	890
740	420	910
742	422	900
742	424	890
750	416	918
752	425	890
752	422	914
42,7511	44,4174	45,9023

	1 <sup>st</sup> edge	2 <sup>nd</sup> edge	diff. length of grains		Mean	diff
a <sub>1</sub>	26.039	26.183	.144	072	26.111	1.639
b <sub>1</sub>	27.683	27.817	.134	067	27.750	.665
c <sub>1</sub>	29.352	29.478	.126	063	29.415	.665
d	32.638	32.806	.168	084	32.712	3.297
e	34.309	34.463	.154	077	34.386	1.674
c	35.950	36.092	.142	071	36.021	1.635
d	37.618	37.767	.149	074	37.692	1.671
e	39.274	39.424	.150	075	39.349	1.657
						324 W

a <sub>2</sub>	42.595	42.757	.156	078	42.673	1.639
b <sub>2</sub>	44.192	44.417	.225	118	44.312	1.476
c <sub>2</sub>	45.674	45.902	.228	114	45.788	

Middle wire of middle  
group = 36.021  
mean of the three lattices  
= 36.019

Mean of middle groups  
= 36.032

If  $i_{av} = 1.24$

The distance between the wires = 2.067<sup>5</sup>

$$\begin{array}{r}
 39.6209 \\
 36.011 \\
 \hline
 36.019 \\
 180160 \\
 \hline
 36.032
 \end{array}$$

$$\begin{array}{r}
 1.654 \\
 413 \\
 \hline
 2.067
 \end{array}$$

64  
66  
65  
67  
64  
67  
66  
66  
64  
46  
1.654



1871phae.proj.1640M

4  
66  
65  
67  
64  
67  
66  
66  
64  

---

45  
54

June / 1871 W &amp; R Do.

1 mb. 12<sup>h</sup> 19<sup>m</sup>

76 Ans Maj

12<sup>h</sup> 35<sup>m</sup> 38<sup>s</sup> Right

N. C.	C	S. C.	C set at
35.663		35.848	35.751
.632		.840	
.661		.850	
.652		.849	
.650		.846	
<u>278</u>		<u>233</u>	
35.656		35.847	
		35.656	
		1503	
		35.751	

Polaris lost first wire  
γ Bootis

2 Draconis  
 2 Bootis

14 11

No 172

~~55 1 08 1 30.5~~  
~~2.3 31.4~~

q Rump 6

34	48	13.0	139
27	47	13.1	134
36	52	12.2	132
38	43	13.2	130
40	48	12.8	132

Nb, 640  
 P 690  
 No. 4 600  
 Bar. 30.3

2.1m Main mid wire  
 13 10 42.0 - 41.41  
 2.13 11 8.4  
 - 2.14  
 - 0.3 + 36  
 42 21.1 48  
 35.1

2.1m 675

2 Bootis	2 Draconis	2 Bootis
13 48 29.0	14 0 42.0	14 9 43.2
31.3	52.0	45.4
33.4	56.2	47.5
35.3	61.6	49.8
37.7	66.5	52.0
	33.9	37.9
16.9		47.58
13 48 33.38	14 0 56.78	14 9 47.89
33.74	14 0 56.28	- 0.31
- 0.36	+ 0.50	- 18
- 0.77	- 1.07	- 0.49
- 0.53	- 0.57	
- 0.17		
- 0.49		
15.9		

Clock East 0.53 + 7 sec q



Penn <sup>11</sup> Navit - Jan 21/82

Edward Pennan  
Geonimister  
Mars

12 22  
51.0  
22.8  
52.0  
28.0  
59.0  
217.8  
6  
227.8  
55.6  
8.2  
47.4  
- 2.0

Level = +0.7  
285-

236 =  
88.5 foot - 88.6

41 41 45.4  
41 40 29.0  
16.4

Adjusted Level  
Office des

12

55-06.6  
55-37.0  
56-08.0  
56-42.5  
57-13.5  
30.470

56 94  
1 8.8  
57 18.1  
56 55.2  
22.9  
26.3  
24.6

dune 6

6-7 26.5  
5-7 55.0  
5-8 29.0  
59 4.0  
59 34.5  
42 31.0

58 30.2  
1 5.5  
57 21.5  
55.2  
26.3

151

236 is 33.5 foot of 86



and 8 paper for Conf. says.  
 New Wires, June 2. The old ones cut. Come in my.

1871 June 2<sup>d</sup>

12 55 0

Palans

14 56 0

New Sheet 4 59 0

48 Cepheus H. Mid Group 15 54

8 Bootes, 15<sup>h</sup> 10<sup>m</sup> 21

u' Bootes

15 19 39 + 37° 50

y' Bootes

15 26 20 + 41° 16

2 Coronae

15 29 16 + 27° 9'

φ Bootes

15 33 14 + 40° 46

15<sup>h</sup> 47<sup>m</sup> 00



W P 70.2  
 A C 67.3  
 W L 65.1  
 Bar 30.26  
 Ther 70°

30 4 7.2  
 11.8

30 2 8.2  
 9.9

5 0 30.1  
 32.0

10 2 44.4  
 49.2

35 0 27.3  
 29.2

W 173  
 W 174

7841 June 3

12<sup>h</sup> 28<sup>m</sup> 0<sup>s</sup>

7 4 hrs May 12 35 58

E. hrs May 12 48 23

12 Can Lem 12 50 03

Polaris at 12<sup>h</sup> 28<sup>m</sup> 0<sup>s</sup> d. lat. 41° 50' N

20 Can Lem 13 11 48

New Star

✓ Bootis 15 10 21

1 hrs min 16 15 13 11

u, Bootis

A. M. Oles.

53-1 564 2 42.3  
58.4 45.4

40 2 281 3 196  
30.9 22.7

20 1 00 1 41.4  
3.9 43.1

3-1 450 5-2 36.1  
46.4 36.8

30 4 14 4 470  
5.3 53.1

30 2 170 30 02 57.5  
14.7 55.3

30 2 83 30 255.1  
12.9 58.3



Jun 3. 1871.  
 L' D 2000 15-22 05

21 Brts 15-26 20

~~22 Brts 15-25 12~~

emb. 15-28

Sheet-1 = 175.

2 = 176

Bar 29.92

Att 78.5

Vol 75.4

N. Ry 74.1

N. Co 75.2

53-02 128  
131

2 571  
582

5-0 369  
380

0 160  
178

June 4 1881

12 48 = 1, m, h,

19 Can in 13 04 11

43 come

Polaris e d e

20 Can in 13 11 48

3 h m y 13 44 6

new star - 1 m h

18 Arctis 14 57 07

✓ Arctis 15 10 21

1 h m y 15 13 11



704R Jan 20RBo

5 3 47,5 50,2

45 4 48,2 54,9

5 01 50,8 54,3

45 1 6,8 11,1

X 1440

25 03 9,1 12,3

30 04 3,7 10,0

30 2 140  
12,9

June 4 1871  
 u Books 15 19 39  
~~u Books~~

C Procs 15 22 01

$\gamma$  1 Books 15 26 20

$\gamma$  2 Books 15 27 12

a Corona 15 29 10

C M. b. 15 33



30 0257 11.2

55 2 577 58.5

5 0 42.7 45.2

0 2 223 28.0

$n_p$  71.0

$n_b$  71.0

$w_1$  4 67.8

Bar 2983

Att 71.1

Mr. Duns

10 3 8.4 16.6

$w_1 = 1.77$   
 $w_2 = 1.78$



Perman Yarnit - June 5

2 L  
 4 48.50.0  
 54 21.0  
 54 53.0  
 55 27.0  
 5-55 7.5  
24.28

54 53.7  
 1 86  
53 45.1

4 53 42.8  
 4 5-2 48.1  
54.2

265

236 = 61.5 feet 78.6.

June 4 game 53.0



7871 June 5<sup>th</sup> $\alpha$  Cass sp. 12 53 15<sup>-</sup> $\epsilon$  Urs Maj

12 48 23

+56° 39'

12 Can Ven

last four no

12 50 2

+39° 1'

Adj focus

26 Can Ven

13 11 48

+41° 15'

~~Newth 13 26 0~~~~3 32 0~~ $\delta$  Bootis 15- 10 21 +33 48

1 Urs Min H

15- 13

01 +67° 50'

h' Boots

15- 19

39 +37° 50'

Cen

15- 23

0



40 2 29.2  
33.2

40 3 11.2  
15.0

20 1 51.8  
54.7

8 full

5 1 44.0  
46.0

2 13.8  
17.3

30 2 56.9  
65.0

30 4 53.2  
60.0 ✓

30 2 19.8  
20.0

30 3 1.6  
3 1.7

rej 12th 5

30 2 0.8  
6.7

30 2 52.3  
57.8

$N_1 = 179$

$N_2 = 180$

June 5-1871

NP 701

Nb 59.8

Ban. 2887

~~1871~~ 64.5

Nov 56.8





June 6 1871 AM, obs.

12 Can. 12 39 01

43 Comae 13 5 55

Polaris b.e.d.e

10 Draco 13 47 42

b.e.d.e a.b.c

Emb. 13 52

Emb. 13 55

8 Bootis 14 20 52

Ly. 2125 14 28 14

12 Bootis ✓ full loss a,  
15 27 12

a cor. Boot. 15 29 16

0 1 182 138

1 mb. 124 8

~~20~~

20 1 3.27 36.5

14 50 0 429 459 536  
46.8 591

0 1 13.2  
13.8

55.0 11.0 13.2 0 53.0  
56.8

30 4 34.1 35 0 12.2  
36.9 15.5

0 2 13.0  
18.2

10 2 39.0 3 26.2  
49.2 34.4

June 6 1871  
 4 Bores 15-33 14

15-4 39<sup>m</sup> 05

no 1 = 18.1

2 = 18.2

June 7

Put in a new set of wires  
 there being some difficulty with  
 the illumination of more or less.  
 The intensities on the Clark screen  
 are .50 res. cc 1.50 - .50 - 1.50 - .50



35-0 253  
29.7

1 107  
162

Baur 29.53

wt 67.5

n.b. 63.6

n.p. 68.0

may 68.1

1871 June 9<sup>th</sup>12<sup>h</sup> 42<sup>m</sup> 0<sup>s</sup>

E Mars Maj last first group

12 48 23 + 56° 39'

4 Virgins all of the wires

13 3 19

43 Comae

13 5 54 + 28° 32'

Polaris g-f-d d c-b-a

2 Virgins all of the wires  
between d-c of Polaris

19 Can Ven H

13 29 0 + 37° 50'

14 36 0

14 38 0 New Short

E Coronae

15<sup>h</sup> 5<sup>m</sup> 2<sup>s</sup> 17<sup>s</sup> + 27° 0' 15"

40 2 0.2  
2.3

5 fold

45- 3 18.2

23.2

25- 4 43.2

45.0

50 10.1

15.1



7841 June 9  
 + Draconis right 1<sup>st</sup> time

15 59 30 +88° 52

0 Heron's

16 4 44 +45° 16'

2 Scorpio all of the wins

16 22 20 S

N 183

184

0 Virgins

13 3 12.7  
 15.3  
 17.8  
 - .08 20.6  
 23.2  
 39.6  
 13-3 17.92  
 13 3 17.25  
 +.67  
 .03  
 +.70  
 .59  
 .65  
 .39  
 23.3  
 .58

2 Virgins

13 18 20.3  
 22.8  
 25.5  
 28.1  
 - .18 30.7  
 27.4  
 13 18 25.48  
 13 18 24.96  
 +0.52  
 07  
 + .59

2 Pans May

13 10 55.4  
 57.1  
 59.1 -41.41  
 21.6  
 13 10 57.1  
 13 11 14.6  
 - 17.5  
 41 16.9  
 n=

23- 1 180  
20.2

0 4 11.5  
14.0

WC 610

WP 710

WV4 56.85

Bar 30.12

+ 670

ε Coronae

α Scorp.

15 52 11.4  
14.6  
17.5  
+0.51 20.3  
23.2

16 21 26.5  
29.4  
32.2  
-0.49 35.0  
38.2

37.0  
15 52 17.40  
16 52 16.55  
+0.85  
- .20  
+0.65

10.3  
16 21 32.06  
16 21 31.87  
+0.19  
7.20  
+0.39

7871 June 12

12 58 0

43 Comae <sup>first</sup> 4 wires of m jr

13 5 57 + 28° 52'

Polaris L.C. b-a

3 Wires May

13 18 44 + 53° 36'

69 Wires May

13 23 45 + 60° 36'

17 Can Ven

13 29 5 + 37° 50'

13 48 0

New Star - 13 51 0

Book

14 20 52 + 52 22

42 21 25

14 28 14 + 60° 47'



241225

8 fol

45-

4

27.2

34.1

40

4

36.8

41.7

45-

0

41.1

44.2

40

3

0.0

2.8

45-

0

3.9

58.0

25-

4

47.0

52.2

30

0

46.1

49.1

50

3

50.4

52.5

55-4

48.8

52.8

mid gr 1 fol

30 4

1.3  
5.3

1891 June 12

2 Corvinae

15 29 16 +270 9'

0 Boote

15 33 14 +40° 46

3 Corvinae for

15 34 33 +320 3

1 Corvinae

15 37 22 +126 42

N.P. 67.2

N.B. 60.8

NO 4 57.7

Ben 29.54

A 63.05

NO 1 185

2 180

10 1 18.2  
25.2

10 2 9.1  
17.8

30 4 4.8  
9.2

15 2 8.3  
11.9

15 3 4.8  
9.2

35 3 4.3  
7.9

35 3 68.3  
6.2



June 14 1871 A.M. Pas-

Polans ~~13 44~~, all wins

3 Ins Myr. 13 1844

17 Can Zen N 13 2905

n Ins Maj 13 42 32

~~n Bortis 15 48 29~~

a D rocons 14 00 58

l m b. 14 18

1 m b 14 20

4<sup>th</sup> Hercules 16 04 44

822320 76 5-59 Middle group

1 m. l. 12 ~~58~~

40 4 354  
40.5

20-54 468 30 0 403  
532 45.1

20 3 4.9 7.4 4 90  
12.6

20 2 174  
17.9

0 4 6.1 10.5 0 50 8.9

10 2 590 600

June 14 1871  
 T. Neuculis 16 15-59

Feb. 16 17

W1 = 187	N.P. 663
2 = 188	N.B. 622
	W4 584
	Bar 2899
	AAH 652



40 3 178  
21.9

4 171  
22.7





1872

	Star	May	a	1872	Circle
A	u Androm	12	0	1 46	+280 23
	13 Cas	23	0	2 22	+58 26
	22 Androm	66	0	3 41	+45 22
A	4 Draconis	324	0	6 11	+101 39
A	2 Pegasi	32	0	6 39	+14 29
	11 Cass	45	0	25 44	+62 13
	11 Draconis	34	0	28 0	+109 28
	3 Cass	40	0	29 51	+53 11
A	a Cass	200	0	33 10	+55 50
A	16 Eri	2	0	37 10	+18 40
A	21 Cass	6	0	37 14	+74 17
	10 Cass	5	0	37 36	+44 36
	11 Cass	43	0	41 23	+57 08
	12 Eri	6	0	42 58	+63 23
A	32 Camelopard	54	0	48 13	+95 54
	7 Cass	2	0	49 00	+60 01
	a Androm	4	0	49 39	+37 48
A	2 Piscium	41	0	56 18	+7 13
A	Polaris	2	1	11 58	+88 34
	7 Cass	5	1	16 55	+67 17
	11 Cass	3	1	17 28	+59 34
A	16 Eri	3	1	17 38	-8 50
A	38 Cass	6	1	21 44	+69 36
A	11 Piscium	43	1	24 38	+14 42
	11 Piscium	43	1	30 09	+44 59
	43 Cass	6	1	32 53	+67 23
X	4 Persei	4	1	35 39	+50 03
A	10 Piscium	4	1	38 38	+8 31
	8 Cass	34	1	45 13	+13 02
A	10 Arietis	32	1	47 34	+20 11
A	50 Cass	4	1	52 37	+71 48
	2 Androm	23	1	56 04	+41 43
A	a Arietis	2	1	59 58	+22 52
	a Draconis	34	2	0 56	+114 58
	55 Cass	6	2	4 28	+65 55
	6 Persei	6	2	5 06	+50 28
A	31 Eri	45	2	6 13	+8 15
A	11 Cass	4	2	18 33	+66 49
A	51 Mus Mus	54	2	27 49	+103 42
	12 Eri	76	2	33 51	+62 16
	8 Persei	4	2	35 28	+18 41
A	2 Eri	34	2	36 40	+2 42
	11 Persei	43	2	41 22	+55 22
	11 Persei	4	2	45 11	+52 14
	11 Mus Mus	2	2	51 06	+105 18
	8 Persei	3	2	55 32	+105 18
	a Eri	23	2	55 35	+53 50
	11 Persei	43	2	56 59	+38 21
	11 Persei	24	2	59 50	+43 28
	11 Persei	4	2	59 51	+49 07
A	48 Eri	6	3	4 10	+22 15
A	2 Arietis	45	3	7 33	+20 34
A	2 Persei	2	3	15 12	+49 24
	2 Camelopard	54	3	18 43	+57 29
A	21 Mus Mus	3	3	20 57	+102 41
	10 Persei	5	3	21 34	+47 33
					354 50

No. 21 - circle readings for reflection observations submitted







Star	Mag	1872	$\alpha$	$\delta$	
$\gamma$ 706	6	3 <sup>4</sup>	31 <sup>4</sup>	4.	+ 62° 47.9 62° 48°
$\delta$ Persi	3	3	33	49	47 22
$\gamma$ " "	4	3	36	30	42 10
$\gamma$ Tauri	3	3	39	53	23 43
$\gamma$ Persi	3		46	0.5	31 30
$\gamma$ Camel H	6		46	15	60 44
$\gamma$ 23 20	4.5		48	41	101 47
$\gamma$ Persi	3.4		49	16	39 38
$\gamma$ " "	4		50	40	35 25
$\gamma$ Eudamp	3		52	03	-13 51
$\gamma$ Persi	4.3		59	22	47 22
$\gamma$ 23 20	4.5	4	5	59	111 49
$\gamma$ Tauri	4		12	31	15 20
$\gamma$ " "	4.3		21	9	18 54
$\gamma$ Camel	6.2		21	34	53 38
$\gamma$ Dracon	3.2		22	18	118 8
$\gamma$ Dracon	5		28	15	110 55
$\gamma$ Tauri	1		28	35	16 15
$\gamma$ Camel	6		37	21	56 31
$\gamma$ Camel	4		41	20	66 02
$\gamma$ Aurigae	3		48	40	32.58
$\gamma$ Camel	4		52	02	60 15
$\gamma$ Aurigae	4		52	47	43 38
$\gamma$ " "	4		53	32	46 53
$\gamma$ Orionis	5		54	15	15 14
$\gamma$ Aurigae	4.3		57	32	41 04
$\gamma$ 23 20	4.5		59	10	97 44
$\gamma$ Aurigae	4.5	5	4	40	38 20
$\gamma$ Aurigae	1		7	14	45 52
$\gamma$ Orionis	1		8	23	-8 20
$\gamma$ Camel	6		18	5	42 57
$\gamma$ Tauri	2		18	12	28 30
$\gamma$ 966	2.7		22	38	24 57
$\gamma$ Draconis	3.2		27	32	127 26
$\gamma$ Leporis	3		27	05	-17 53
$\gamma$ Orionis	2		29	43	-1 16
$\gamma$ Aurigae	6.5		36	00	49 46
$\gamma$ Draconis	5		37	42	111 09
$\gamma$ Aurigae	4		42	37	39 07
$\gamma$ Draconis	4.5		44	13	107 45
$\gamma$ Orionis	1		48	15	7 23
$\gamma$ Aurigae	4.5		48	59	54 16
$\gamma$ " "	2.3		50	08	44 56
$\gamma$ Draconis	2.3		53	38	37 18
$\gamma$ Camel	6.5		59	58	65 40
$\gamma$ Camel	5.4	6	4	44	69 21
$\gamma$ Lynx	5.4		8	20	59 03
$\gamma$ 23 20	4.5		13	37	93 22
$\gamma$ Aurigae	5		15	02	49 21
$\gamma$ Lynx	3		15	13	22 35
$\gamma$ Lynx	6		25	59	61 35
$\gamma$ Aurigae	6.7		29	47	29 30
$\gamma$ Lynx	2.3		30	19	16 31
$\gamma$ Aurigae	6		37	30	43 42
$\gamma$ Can Maj	1		39	30	-16 31
$\gamma$ Cephei	5		39	44	87 13
$\gamma$ Lynx	5		46	12	58 34
					339° 35'
					353-01
					0 13
					19 40
					10 53
					341 39
					300 36
					2 45
					6 58
					56 14
					353-01
					290 34
					27 03
					23 29
					348 45
					284 15
					291 28
					26 08
					345 52
					336 18
					9 23
					342 08
					358 45
					1 30
					27 09
					1 14
					304 39
					4 03
					356 31
					50 43
					339 26
					18 53
					327 26
					274 57
					60 16
					43 39
					352 37
					291 14
					63 16
					244 38
					35 0
					348 7
					357 27
					274 05
					336 43
					333 2
					343 20
					304 01
					353 2
					199 48
					340 48
					282 53
					25 52
					357 41
					58 54
					315 16
					343 49

















































1871 June 17

13 + 1m 05  
 Polaris lost first two hours  
 A.M. Obs  
 W & R Obs

17 Can Ven  
 13 29 5 +390.50'

New  $\frac{14}{14}$  17.0  
 20.0

hr 23 20  
 16 5-59 +68 8

T Hercules

16 15-54 +46° 37

16 17 0

46 60.0  
 WP 65.1

Bar 30.17  
 at 62.6  
 No 4 56.0

W01 = 199  
 V = 190

7871 June 17th

---

25	4	46.1	30	0	41.8
		50.2			44.2

---

---

10	1	50.4	2	57.2
		50.6		56.6

---

40	3	170	4	16.8
		20.1		20.1

---



1871 June 19

Potaris mid group

A.M. Obs

marked 13<sup>h</sup> 15<sup>m</sup> 00<sup>s</sup> C 39.924

---

N	S
39.884	40.045-
.896	.037
.897	.042
.893	030
.896	042
<u>16</u>	<u>196</u>
39.893	40.039
	39.893
	79932
	39.966

15<sup>h</sup> 59<sup>m</sup> 00<sup>s</sup> marked

a Druce 14 00 58  
 de Bruto 14 04 34  
 de Bruto 14 20 57  
 B Ab 4797 14 22 58  
 E Bruto 14 39 23

14<sup>h</sup> 46<sup>m</sup> 00<sup>s</sup>

draw sheet next page



1871 June 19

B Ins Min 14 51 06

Marked 14 53 0

B Herculis

lost - 1st time

16 24 -

A Deneb

16 28 15

~~f~~ Herculis

16 30 0

Nb. = 57.0

n.p. 602

wy 688

Ben 2988

st. 621



40 2 49.0  
48.9

3 52.8  
52.8

35- 1 31.2  
34.3

2 34.0  
42.3.

20 1 0.5-  
0.6

1 36.3  
35.8

40 1 7.1  
10.0

40 1 58.9  
61.8

No 1 = 191.

2 = 192

June 21 18 Sm. Ss  
 (Put back old wines)  
 Polaris (all wines)

~~69 Mrs Mary 132345~~

n Mrs Mary 13 4230

a Dues 400 58

8 Bortis 14 20 51

B A B 4797 (14 22) 58

Q Bortis 14 26 18

e. m. b. 14 45-

1 mb 13 h on

25 0 41.2  
42.6

1 277  
30.9

1<sup>st</sup> mb. 14 50



Jan 21

csDrocom 16 28 15

~~5 Hercules 16 30 01~~

3 Hercules

11 Hercules

n P 66.5

n b, 58.6

n'4 54.4

Ban 30.10

att 69.4

200 444  
43.8

20 128.7  
25.4

80 244.5  
57.2

243  
328

10 255.0  
2.2

3 382  
45.8

Emb. 16 41

MO 1 = 193  
2 = 194

June 22  
Perseus Transit.

22  
6 4355

5-65

5-380

6 115-

6 435-

28 150

185

5 39.0

1 9.0

4 30.0

22

6 4 28.8

6 3 18.2

1 09.6

fair

424 = ~~1~~ 1<sup>m</sup> starting S.b.

S.b. = 2.8 sec

424 = <sup>m.s.</sup> 16.3 feet





7871 June 20<sup>th</sup>

Polaris

14 53-0

Clear 8 hnt

14 58 0

a Procy 14 00 58

8 Bootis 14 20 51

~~Bab 4797 14 22 58~~

~~2 Bootis 14 39 04~~

7 Bootis 14 26 52

2 Bootis 14 39 04

~~Gr. 21 64 48 17~~





7871 June 25<sup>th</sup>

3 Hercules

16 36 22 + 31° 49'  
23-

η Hercules

16 38 24 + 39° 09'

W\* 16 49 29

30 2 39.9  
45.3

3 26.2  
30.1

10 2 41.2  
45.3

3 41.8  
46.3

40 1 19.7  
30.1

2 24.9  
33.2

emb. 76 53

$n_b = 620$

WP 65.8

Nb 4 609

Ban 3010

W 65.9

$\mu_0 = 195$

$2 = 1\%$

June 26/87 AM Sun.

Polaris <sup>B</sup> 1245 = 8<sup>55</sup> to 8<sup>00</sup> am

~~17 Can Leo 15 29 05~~  
 2 hrs Aug 13 42 30

a Draco 14 00 18

δ Bootis 14 10 51

λ Bootis 14 26 18

γ 2164 14 48 11

β Bootis 14 57 10



(424 R. S. Polaris)

$$1 \text{ m b} - x = 1318$$

$$25-0 \quad 34.8$$

$$34.3$$

$$1 \quad 26.0$$

$$24.8$$

June 26 1871

AD wco 16 28 15

o Mercurius 16 30 00

3 " " 16 36 28

n " " 16 38 30

No #. 16 48 24 - 19 20 fol #

emb = 16 51



$$l\text{ mb } X = 150.3$$

$$1\text{ mb} = 15.10$$

$$20 \quad 1 \quad 190 \quad 189 \quad \checkmark \text{ ful.}$$

$$40 \quad 0.507 \quad \cancel{5} \quad 40 \quad 140.4$$

$$53.9 \quad 43.0$$

$$30 \quad 2 \quad 410 \quad 30 \quad 8 \quad 253$$

$$46.5 \quad 31.6$$

$$10 \quad 2 \quad 540 \quad 3 \quad 404 \quad 45.9$$

$$58.8$$

$$40 \quad 1297 \quad 40.2 \quad 2 \quad 21.2 \quad 30.9$$

$$m = 69.0$$

$$M_1 = 197$$

$$2 = 198$$

$$M.P. \quad 70.0$$

$$M_4 = 67.3$$

$$Bac \quad 299.7$$

$$M_0 \quad 72.3$$



June 27 W & R Dr  
 Polaris = a,

2 hrs Mag

2 Draconis

14 0 58

2 Bootes

14 9 49

1 Bootes

14 11 38

2 m b 15 49 00

New Sheet

15 9 0

3 Hercules

16 36 28

n Hercules

16 38 30

$$1 \text{ Mh} = 18 \text{ 10}$$

25	0	36.8	1	33.7
		37.5		34.8

40	3	59.9	4	34.0
		58.3		33.2

30	1	34.0	2	19.3
		41.2		25.4

25	0	36.9	1	12.7
		37.8		13.6

30	2	42.9	30	3	25.1
		47.2			30.5

10	2	45.5	3	40.1	22.2
		49.2		45.8	23.0

NP 221  
N.B. 635  
No 4

Bar  
ATT.

NOV 199  
2.200

emb 1658

7871 June 29

M b 13<sup>h</sup> 41<sup>m</sup> $\eta$  Bootis13<sup>h</sup> 48<sup>m</sup> 29 $\alpha$  Bootis

14 9 50

 $\gamma$  Herculis -

16 15. 54

Isroom 2343.

16. 21. 38 -

 $\beta$  Herculis

16. 24 48?

Wash X

16 15 —



15- 4 56.4  
62.2

30 1 27.7  
34.1

follows -

15 1 35.6  
45 39.5

30 3 22.9  
26.9  
4 3.4  
7.4

35- 1 28.4  
39.0

35 2 33.6  
4 2.1

~~repeated~~ lost lot w =

Could not see -  
too near -

A Draco.

16 28. 15.

---

o Hercules

16 - 30. 0

---

Wash \*

16 49 29-  
 19. 20

---

Σ Ues. min.

---

IVP 71.3

VC. 65.0

20.1, 20.9  
 21, 3  
 middle tally -  
 5f -

---

2 f - m.c. -  
 40 1 26.4  
 28.8

---

40 1 30.8  
 41.4

---

2 39.6  
 50.3

---

Bar - 29.932  
 T 71.0  
 No. 4. 60.0

No 1 201  
 2 202



1871 June 30<sup>th</sup>

2 Bortis

14<sup>h</sup> 9<sup>m</sup> 05

---

2 Bortis 14 26 54

---

2 Bortis 14 35 23

---

En. 2164 14 48 11

---

10 Bortis 14 57 10

14 39 05

New Sheet

15<sup>h</sup> 3<sup>m</sup> 05

30 1 23.8

32.1

A. M. P. S.  
v. Re

7871 June 30

3 Hercules

16 36 28

---

2 Hercules

16 38 30

---

E Mars Min

---

174 2m 0



30 wire 1 5 4 heat  
 2 52.6 3 29.1  
 56.3 35.1

10 2 57.0 3 55.2  
 61.0 59.2

690 W P 30.164 Run  
 620 A C 67.8 A  
 570 Jrog

Av 203

Av 204

July 1891

Q Bortis 142618

Gr 2164 144811

B Ins Min 145117

B Bortis 145710

W Bortis 145859

Over.





1871 July 1<sup>st</sup>  
13<sup>th</sup> 58<sup>th</sup> 0

2 Draconis

---

Gr. 2415. 17.3.36 - 40.41 -

---

2 Herculis

---

11 Herculis -

---

20 3 50.8 AM obs  
52.2 Rec

---

40 1 53.9 2 40.5  
56.4 45.0

---

250 33.1 1 26.0  
38.8 34.1

---

WP 67.03  
UL 59.8 30-250  
66.2  
57.8  
UL 205  
CL 206

1871 July 3<sup>d</sup>14<sup>h</sup> 11<sup>m</sup> 015<sup>h</sup> 14<sup>m</sup> 0

Short camel

15<sup>h</sup> 51<sup>m</sup> 0

marked

2 Bores 14 38 23

for 21 64 14 45 11

B no m 14 57 17

B Bores 14 57 10

4 Bores 14 58 59

for 24 15<sup>h</sup>17<sup>h</sup> 3<sup>m</sup> 36<sup>s</sup>

3 Draconis

17<sup>h</sup> 8<sup>m</sup> 28<sup>s</sup>

11 Herculis

17<sup>h</sup> 10<sup>m</sup> 36<sup>s</sup>17<sup>h</sup> 12<sup>m</sup> 0



W.P. 76.0  
A.C. 69.8

30 036

73.1  
68.9

---

40	2	4.0	2	55.3
		5.2		57.1

---

30	1	2.2	1	48.5
		1.3		45.5

---

25	0	37.8	1	27.5
		41.3		

---

W01 = 207  
2 = 208

July 5-1871 VMOs.  
 E Bortis 14 39 23 ~~14 32 0~~

Lm 2164 14 48 11

B Bortis 14 54 06

B Bortis 14 57 07

✓ Bortis 15-10 07

W. Bortis 15 19 39

L P 2000's 15-22 05

L m h = 15 23 0

L m h. 15 28 0

B P 2000's 17 27 32

J. P 2000's 17 29

M P = 74.1

Ban 3002

N B. = 72.5

W 74.0

M m m m 68.2

1, mch 14<sup>th</sup> 82<sup>nd</sup>

45 0 423 1 338  
468 35.2

30 4 370 564  
355 59.3

40 2 582 3 202  
51.8 18.4

25-3 592 4 446  
63.2 47.7

35 0 60 0 557  
101 61.2

30 3 96 687  
11.7 58.2

55-3 141 3 572  
16.2 58.2

55-4 240 0 0 56  
26.0 6.8

5 1 574  
61.5

L. m. 6 17 30

m1=209  
2=210



1871 July 6

14<sup>2</sup> 33<sup>5</sup> 05

33 Roots 14 34 0.4

---

Σ Roots 14 39 0.4

---

W. T. R. Oly

25- 0 22.2 1 209  
223 223

---

45- 0 50.3 1 45.3

54.6

46.3

last stroke for 52d

---

Wol = 211

7871 July 7<sup>th</sup>

14 23 0

hr 21 6 4  
 14 4 8 11 - 590.50

Buss Min mid hr 5 fol  
 Pole Star 14 5-1 17

hr 22 96  
 15- 54 46-

15- 55- 0  
 may 16 shut 3 0

hr 24 21 ?



NC	70.2
WP	72.0
NO4	68.2
A	74.3
Prar	79.82

30      4      12.3  
12.4

40      3      10.3  
6.4

15-      1      26.1      26.3

25-      4      26.8  
29.6

1 NO = 212  
2 NO = 213







Aug 8 1871 J. H. R. S.  
Gen Bot 215

1871 July 9<sup>th</sup> Atm Obs

Polaris mid 8<sup>h</sup>  
13 17 0

J. H. R. S.

1. mb. = 14 19

2. Boottis 14 26 54

5. Her Min 14 27 56

Gr. 2164 144811

B. Her Min 14 51 06

B. Boottis 14 57 07

~~1. Her Min 15 13 14~~

15 1 20<sup>2</sup> 0<sup>3</sup>

1 mb 1455

emb. 15-38

M = 214

sm. obs.

30	4	106	4	520
		10'0		53'0

40	02	350	3	200
		334		180

25-	4	13	4	420
		47		448

M = 215

1871 July 9<sup>th</sup>

Puns

74.8 WP

15.3 15.8

21.6

24.8

16.1 16.7

23.0

24.0

77.7 N.C.

15.3 16.6

22.4

25.2

15.6 17.2

22.3

24.2

80.0 No4

15.0 16.7

23.1

24.4

29.74 Bar

81.9 At

1871 July 10

Blue Tring

14

51

17

15-31 0

Bar 29.86

At 73.2

No4 68.0



A-M - 005

---

40 2 39.2 36.3

---

A-M 005 -

Runs  
f b

73 82	14.8	16.0
75 80	14.2	15.2
75 80	14.4	15.4
77 86	14.4	15.3
80 84	14.5	15.3

Sheet = 216

July 11/84  
Wine in keure

487754  
44.250

81

a.	b.	c.
3 54,228	52,575	50,947
241	571	941
230	583	943
230	588	948
235	582	938
<u>164</u>	<u>359</u>	<u>217</u>
54.233	52,580	50,943

a	b	a	d	e
47,641	45,988	44,319	42,686	40,037
648	992	313	684	048
650	986	313	683	038
650	983	314	680	050
651	982	314	686	034
<u>240</u>	<u>438</u>	<u>23</u>	<u>21</u>	<u>207</u>
47,648	45,988	44,315	42,685	40,042

44,330  
325  
320  
322  
327  
319  
43

44,324

44,075  
315  
39  
195







Wm. S. B.

c<sub>2</sub>

b<sub>2</sub>

a<sub>2</sub>

34,42

177

173

190

182

404

181

35,839

837

885

841

830

182

836

37,489

490

492

481

482

434

487

a

b

c

b

a

40,780

781

790

787

990

428

786

c

1

42,423

436

420

427

431

137

427

427

44,083

083

068

072

071

377

44,075

44,075

45,766

750

758

743

742

253

751

751

a

1

47,410

400

397

392

397

1996

1996

400

397

397

50,706

714

700

698

692

3510

702

702

52,348

342

346

330

336

202

340

340

53,977

978

968

979

975

975

977

976

976

Wm. S. C.

$$a_1 = 53,975 - \text{Jb. N 6}$$

$$b_1 = 52,340 \quad 1.635 \quad 653$$

$$c_1 = 50,702 \quad 1.638 \quad 637$$

$$a = 47,399 \quad 1.650, 647$$

$$b = 45,751 \quad 1.648 \quad 660$$

$$c = 44,075 \quad 1.676 \quad 673$$

$$d = 42,427 \quad 1.648 \quad 630$$

$$e = 40,786 \quad 1.641 \quad 643$$

$$299 \quad 1.649 \quad 656 \quad \begin{array}{r} 20438 \\ 44,087 \end{array}$$

$$a_2 = 37,487 \quad 1.551 \quad 660$$

$$b_2 = 35,836 \quad 1.655 \quad 650$$

$$c_2 = 34,181$$

$$\begin{array}{r} 484999 \\ 44,089 \end{array}$$

Reading by M. B. mini Sb.

$C_2$

$b_2$

$a_2$

34.170

167

173

173

169

$C_2$  d

35.814

813

822

817

823

$C_2$  2.2

37.448

470

470

469

471

$b_2$  472 a

40.777

781

780

780

776

3894

779

42.407

428

422

427

425

109

423

44.060

063

068

069

058

319

064

45.748

756

752

745

756

257

750

47.399

397

395

398

402

991

398

$C$

12

50.708

702

707

700

700

17

703

$b$

7

52.352

342

342

345

348

229

52.346

$a$

7

53.965

940

978

977

978

378

9756



$\alpha$  53.976  
 $\beta$  52.846 1.630  
 $\gamma$  50.703 1.643  
 $\delta$  47.398 1.651  
 $\epsilon$  45.750 1.648  
 $\zeta$  44.064 1.686  
 $\eta$  42.427 1.637  
 $\theta$  40.772 1.648  
 $\iota$  38.822 1.653  
 $\kappa$  37.472 1.650  
 $\lambda$  35.822 1.652  
 $\mu$  34.170 1.652  


---

484957  
44.088  
44.073  


---

.015

26418  
440836

8

$\epsilon$   


---

44.073  
.078  
.073  
.072 4  
.073 6  
.075 5  
.069  
.068  


---

726  


---

.073

Note. I have found from workings of the obs.  
emissions of June 25, that either the lines were not  
adjusted perpendicularly - or that the angle  
of inclination was about  $5^{\circ} 10'$ . This date  
the sun was much redder.

1871 July 12<sup>th</sup>

B. Probs 14 26 57  
B. Probs Min. 14<sup>h</sup> 51<sup>m</sup> 17<sup>s</sup>

B. Probs

14<sup>h</sup> 57<sup>m</sup> 10<sup>s</sup>

7 Probs Min 15 26

L<sub>1</sub> Probs

L<sub>2</sub> Probs

15 36 0

New sheet

a Cen Bm 15 29

15 38 0

γ<sup>1</sup> Draconis

17<sup>h</sup> 29<sup>m</sup>

7 Draconis

17<sup>h</sup> 32<sup>m</sup>

17 38 0

W.A.R. Jones

40 2 38.3 ~~33~~ 25.3  
35.1 22.7

25- 4 2.3 4 45.7  
3.3 46.2

5 2 2.3 2 39.8  
3.3 41.0

10 0 42.0 1 13.6  
42.0 10.6 Sum

NP = 77.0  
NB = 76.2  
no4 74.2  
Ben 29.97  
W.A.R. 78.0

M1 = 217  
M2 = 218



July 13 A.M. 1471  
 Pofais  
 Bous Min

Work. # ~~last~~ C<sub>3</sub>

emb = 16 17

W.P. 820

No 6 730

No 4 710

Bar. 30.07

HA 770

W1 = 219

2 ~ 2w

$$1 \quad 1 \text{ mb } X = 145.4$$

$$40 \quad 2 \quad 55.3 \\ 57.3$$

$$3 \quad 25.4 \\ 22.1$$

no ✓

A

b

July 17 1941 NAR

Si. 2296 15-5445

Q D wens 15-5980

Q Hercules 16 0444

Si. 2300 16 5-5-9

Q Pucos 17 01 20



Des JHR Ric

$$1 \text{ mb} = 15.48$$

$$10 - 1 \quad 15.2$$


---


$$20.6$$

$$20 - 3 \quad 87.5 \quad 21 - 4 \quad 80.4$$


---


$$38.4 \quad 4 \quad 33.0$$

~~$$5 - 1 \quad 84.0 \quad 5 - 2 \quad 58.0$$~~


---

~~$$35.1 \quad 60.8$$~~

$$10 \quad 4 \quad 45.3$$


---


$$44.4$$

$$10 \quad 01 \quad 15$$


---


$$5.91$$

$$1 \text{ mb} = 17.47$$

$$1 \text{ mb} = 17.49$$

$$21 - 4 \quad 46.1$$


---


$$49.1$$

2 Perseus <sup>July 17</sup> 175308

---

o Hercules 18233

---

~~Gr. 2533 181140~~

---

~~u Leo Min 181338~~

---

b Deneb 182202

---

a Elgen, 18222

---

July - 221  
2 - 222

Gr. 2640 182562

---

57 Ceph. R. d. only 8 P.



50 2 56.7  
58.4

35 3 63  
14.6

15 1 16.6  
19.4

45 2 59.9  
56.7

~~l m b 18.8~~  
35 4 51.4 54.2

40 3 56.7 62.1

α

6

54	59	13.9	15.3
52	50	13.9	15.3
51	58	14.8	16.3
60	56	14.6	16.6
58	61	14.4	15.8

26.6 = 78.0

26.6 = 66.2

26.4 = 62.0

Bar 2 8.2.1

α 6.6.6

0 1 10.2  
10.2

l m b 17.42



July 19 1871

Some one (don't know for certain who)  
broke out the wires by showing in  
the eye piece.

Put in new wires. Interval  
same as before.

July 20

Collimation

46. 277	46. 410
281	412
282	426
283	418
275	419
<hr/>	<hr/>
46. 284	
46. 419	
<hr/>	
703	
<hr/>	
46. 351	



July 20 1841

2<sup>nd</sup> Min 14 55-33 2<sup>nd</sup> step for

e Bootis 15 1 4 2

u, Boot 16 19 39

16 15 12 Wm M #

6 Dec 18 2202



$$126 \times = 14$$

of

$$55 \quad 2.227$$


---


$$233$$

$$0 \quad 0 \quad 247 \quad 312$$


---

$$30 \quad 3 \quad 419.9$$


---

$$40 \quad 0 \quad 44.7 \quad 60.3$$

$$lmb = 16^{h} 22^{m} 0$$


---

$$1 \quad m \quad 16 \quad 25.0$$


---

$$55-4 \quad 45.3 \quad 53.2$$


---

~~lmb 1828 h.~~  
 J.M. Dr. G.L.

24  
 23  
 22  
 21  
 20

Aug 20

W 31 amb. 18 34

G 2 264 18 35 49

51 Epm 8 P R A

2 Lyrae 1840 08

B Lyrae 1841 21

or Sagittari

50 Procyon 18 50 29

r Lyrae

16.

284	285	389	404	28.02	39.46
285	290	402	05'5	27.46	40.36
278	293	392	40.5	29.44	300.90
278	294	397	402	+0.9	-18
276	291	397	402	-18	
2802	2936	394	405	-0.9	
				-0.4	

0 1 2 1.1 22.5

(6)

50 0 5 1.3 56.3

10 0 5 3.9 64.8

5 1 5 7.9 58.6

50 2 1.0 8.2

e m. u. 18 56

Ma 700

AD 61.5

av 4 593

Ma 2588

AD 1682

q = 223

2, 224

3 = 225

Seeing fairly good during the first part of the night and fairly good during the last part.



July 22-1871 ~~7412~~  
~~1412~~

---

Islo, XX

En 2 23 43  
 16 21 38

---

Right D. uenies  
 & hook II

---

a Lyne 83236

En 26 40 18 35 49

51 Ceph SP. 261

1 mb 15.5-3

---

50 3 12.3  
12.0

---

C mb -16 24  
1<sup>st</sup> mb 16 27

~~30 3 37.1~~ Rej  
~~52.5~~

---

C mb 18.7  
1 mb 18 30  
40 3 3.9 10.3  
0 1 2.3 3.2



B & you Harry  
 or Say it in 184720  
 or 2000184918

No. 1 = 226

2 = 227

3 = 228

8 long good

56	81	180	193
48	81	183	198
20	81	188	195
59	81	182	197
62	74		199



10 0  $\pm$  28 4.5

b e d

5-4332 36.5

emb. 185-3

W P 685

Nb. 615

W 4568

Ban. 3003

alt. 621

Calculation = 1/16, 362

July 23 1 mb = 15.06

$\gamma$  Bootis 15 10 19 + 33 48

$\beta$  Corvina 15 22 30 + 29 30

$\delta_1$  Bootis 15 26 28

$\delta_2$  Bootis 15 27 10

$\alpha$  Cor Bn. 15 29 18

$\gamma$  Vir Min 15 48 05

$\epsilon$  22 96 15 54 45

$\theta$  Deneb 15 19 30



W & R  
W & R

30 - 0 - 1,2 50

Ch comp 01-7 14-0-<sup>8</sup> 30<sup>8</sup>

50 0 27.5 34.6 *free* *rej* *SI*

5-1 32.8 38.3

1- 0 2 40.2 46.1

10-3 44.7 6-2.7



l m b - 16 36  
 1 m b 16 39

2 D ~~Drac~~onis

4 D ~~Drac~~onis

22 Camel  $\frac{18}{40} \frac{44}{36} + 110 36$

Gr Dis 30 18 11 40 + 42 07

Mus Min 18 13 38 + 86 36

L P Lacous 18 22 02 + 38 43

W a Lyn 18 02 36  
~~W a Lyn 18 24 27 - 37 42~~

G 2 26 40  
 18 25 50 - 37 53

5-1 CSM A B C D E - 1  
 Comets with Ch at 10 27

Regin

15 1 14 5-3

R # orig

35-4428 471

40 3 0.7 7.2

0 1.80 9.6

(1)

July 23 1871

Reading of wires

a

$$\begin{array}{r}
 56,278 \\
 283 \\
 272 \\
 \hline
 28.3 \\
 56.277
 \end{array}$$

b

$$\begin{array}{r}
 54638 \\
 1645 \\
 642 \\
 \hline
 125 \\
 54,642
 \end{array}$$

c

$$\begin{array}{r}
 52986 \\
 1989 \\
 989 \\
 \hline
 264 \\
 52,988
 \end{array}$$

a

b

c

d

e

a

b

nc (S b)

c

d

e

$$\begin{array}{r}
 49690 \\
 689 \\
 689 \\
 \hline
 278 \\
 49693
 \end{array}$$

$$\begin{array}{r}
 48.021 \\
 030 \\
 032 \\
 \hline
 83 \\
 48.027
 \end{array}$$

$$\begin{array}{r}
 46.367 \\
 340 \\
 373 \\
 363 \\
 367 \\
 370 \\
 \hline
 340 \\
 46.368 \\
 316 \\
 704 \\
 \hline
 352
 \end{array}$$

$$\begin{array}{r}
 44,731 \\
 721 \\
 735 \\
 \hline
 87 \\
 44,729
 \end{array}$$

$$\begin{array}{r}
 43,067 \\
 059 \\
 060 \\
 \hline
 186 \\
 43,062
 \end{array}$$

a

b

c

$$\begin{array}{r}
 39,758 \\
 756 \\
 758 \\
 \hline
 22 \\
 39,757
 \end{array}$$

$$\begin{array}{r}
 38,088 \\
 055 \\
 087 \\
 \hline
 250 \\
 38,090
 \end{array}$$

$$\begin{array}{r}
 36,438 \\
 430 \\
 431 \\
 \hline
 9 \\
 36,433
 \end{array}$$



Winn M.C.

a, 5-~~6~~.277

1.635

b, 5-4.642

1.654

c, 52.988

1.647

295

a 49.693

1.666

b 48.027

1.659

c 46.368

1.639

d 44.729

1.667

e 43.062

668

3205

a 39.757

1.667

b 38.090

1.657

c 36.433

510066

46.369

31879

46.375

Aug 23 1871

Rollin's den = 46,352

Runs

A

B

249	252	357	373
255	250	351	379
246	219	350	374
248	257	357	373
240	213	357	370.

no 68.2

no. 65.2

no 60.8

no 30.14

no 65.4

WIR<sup>rs</sup>  
WIR<sup>ve.</sup>

emb = 1842

W1 = 229  
2 = 230

Being good the 1<sup>st</sup> part of the  
evening and bad the last. A <sup>2</sup> fine  
hazy towards the last.



July 27

Collimator

46.355	46.288
354	289
371	290
365	290
370	292
46.365	46.278
278	
643	
46.322	

used as. 1/2 p.m.

Sheet no. 1 { 1 mb 15 28 h m  
last m b - 16.34

Sheet no. 2 { 1 mb 16.37  
Lambert-Dus & reads further out

181140 Cr. 2533 - 15 0.55.9.58.4

144 41 η Serpantis - no rattle -  
no use -

181815-109 Herculis. 40 - 0.04.8 + 0.022

18222 δ Draco - 35.4.42.0 44.5

1828141 Aquilae. lost by clouds -  
8 only gotten -

183236 γ

Lyrae - 40:2.57.4 62.5  
new print.

1839 51 Cygni - 35.3.49.0 44.8  
Ry.

No 1 = 221

2 = 202

3 = 233

Rings =

4.6 5.4

4.4 5.4

4.4 5.5

4.6 5.4

4.1 5.9

Q

58.8 1.1

58.1 1.7

58.4 1.0

58.7 1.5

58.0 1.2

New Sheet

Bar 30-0 30

~~58.1~~ 73.6

Nov. 67.

Seeing bad.

~~July 31~~ Aug 2 1874

46.385	46.365
387	
383	306
389	314
387	318
<u>25</u>	311
46.385	<u>54</u>
46.311	311
696	
46.348	

46. 45820 M.G.

1 mb = 1527

new sheet - 16.59 -

3 hrs Min 15-45-25

522296 15-5445

19 hrs May 16 14 45-

R D room's 16 22 18

R Peron's 16 38 04

Li. 2377 16 44 25



42 23  
37 4 2  
80 , 5

37 53  
42 23  
80 , 16

Rec.

10 2 19.8 17.3

15 1 30.8 30.8

10 2 00 58.7

~~4 482 51.9 29.2 31.9~~  
~~35 0~~

10 2 50.2 3 31.7  
58.8 35.8

20 2 15.5 3 14.7  
18.2 16.6

Over

2 Draco 17 5-3 38+51 30

~~18 25 50 - 37 53~~

~~18 50 01 - 50 33~~

~~18 56 57 - 50 21~~

Aug 2 — fol. - zero stars -

θ Lyrae - 19, 12 31

K Cygni - 19, 14 9

T Draco. 19, 18 0  
lost α -

52 2 5-10 3 35,3  
50,0 40,8

15-1 2+6 2 319  
52,0 46,0

~~50 0 -01 1.0 464~~  
~~47,8~~

~~50 0 2 10 2 279~~  
~~2,2 290~~

25-3, 39,2 44,9

4,26,2 320

15,0,24,0 25,4

1,10,3 11,3

15,2,04,9 4,1

2,26,6 26,0

Feb 1928

M. P. 74,0

W, -234

N. C. 70,0

2 = 235

M. 4 72,0

3 = 226

Bar 3012

at 73,0



Aug 3 1871 ~~W. G. B.~~  
 G.B. (unpublished)  
 16 38 34

N B begins here  
 N New 16 38 84  


---

 16 43 04  
 E New 16 55 24

mb = 15.34  
 collimator same as Aug 2

10	3	01	3	368
		4.4		361

20	2	234	20	03	10
		29.1			4.1

15	0	446	15	01	362
		513			43.0



E. Mrs. Min.

br. 2415- 17 3 36

O Lyra 18 1156

K Cassin 18 1409

No. 1 = 207

2 = 238



5- 4 154  
4.2

5 4 1568  
54.3

40 2 15  
5.3

2 15.0  
30.5

e. mb 17 0.5

1 mb 17 0.5

25- 3 414 4 30.1  
46.7 34.8

15 0 20.1  
21.1

e mb - 19 1.5

W P 740  
n b 756  
noy 764  
Ban 29.57  
xit 50.0

Aug 5 7th Row  
 5 6

i Lyrae - 19 2 44

d Sagitt - 19, 10 9

θ Lyrae 19, 11, 56

K Cygni - 19 14, 9

Orbit = 19/6

$$1 \text{ mb} = 16 \text{ } 29$$

$$2 \text{ mb } 18 \text{ } 17$$

New Chart:

25.3.59.4 4.4.9

4.56.9 5.2.6

10 0.40.8 48.1

1.27.4 33.1

25 3.35.8 39.8

4 11.9 15.1

15.0.26.2 26.2

1.5.7 5.9

Ben  
29.73

W.P.  
77.2

N.C. - No 4  
73.9 82.1

48.73  
77.0

$$m = 239$$

$$2 = 240$$



Aug 6 1871 UPR, Des.  
 lb

l. m. b. = 1740

<u>A</u>		<u>b</u>	
143	141	248	253
44	143	238	259
142	143	241	254
445	142	242	258
143	143	241	257

W. P. 773

n b 734

Aug 6 morning

46436	46291	46419
410	298	295
410	292	74
416	252	46357
428	301	
56	1474	
419	295	

W. P. = 241  
 242

~~1871 Aug 28~~

~~19 1/2 40 d.~~

Aug 9 1871

GL.



1, m.b.

H. b. obs.  
200.

E, m.b. 1743

-1, m.b. 1746

- Umb - 19.18

Dagulae - <sup>lost on Chrs</sup> 5.2.2.2 13.31 m.b. 19.26  
(Cygni?)

♂ Cygni - 25 1.7.9 9.5

15 do. 20 0.4.1 8.5

♂ do middle tally

lost kt wire - ♂ -  
30 4.4.4 44.0

E Draco &amp;

25 2 110 9.2

X Cygni -

15 2 187 19.4

lost some of these

1st after break -  
 30 Aquilae 30 4, 7, 2 21.1  
 31 Cygni - mt, 55 2, 4, 5, 6 49.0  
 33 do mt 10, 3, 29, 2 31.6

---

Runs -

	A		C
43.4	45.0	53.7	56.5
43.7	45.0	54.2	55.8
44.6	45.0	54.0	56.0
44.4	44.7	54.0	55.3
44.4	45.1	54.6	55.3
44.4			

N.C. 68.2

29.506  
 72.2  
 64.5

$m_1 = 243$   
 $2 = 244$





Aug 10 1871 AM Dps.

Callimachus  $\begin{array}{r} 46.447 \\ 46.255 \\ \hline 46.351 \end{array}$

G.B. 18 13 0

New Sheet 18 17 0

Beygni 19 26-34

$\gamma$  Aquilae 19 40 57

$\epsilon$  Aquilae 19 44 27

Runs  
A 6.

48.2	49.3	57.2	58.8
48.0	49.4	57.3	58.4
48.3	49.2	57.3	58.2
47.8	48.8	57.7	58.6
47.9	48.9	57.8	59.0

Av 1 = 245  
Av 2 = 246

S.M. 6 19 56 08

$$1 \text{ mb} = 16.16$$

40 1 16.2 22.5-

0 4 21.3 29.3

50 0 35.6 43.2

30.00 Bar

69.8 Thu

66.2 No 4

2821 Aug 11<sup>th</sup>

16	34	0
<u>17</u>	<u>34</u>	<u>0</u>
17	44	0

19 54 0

20 L 7<sup>30</sup> as

0 Cygni

20 9 35-

24 Vulturinae  
20 11 18

1 Cygni

20 12 38

401 = 248 with 103

2 = 248

3 = 249 with 101



Runs

A — 6 —

44.0	45.8	52.3	52.8
43.3	45.2	52.4	52.7
43.0	45.1	51.5	52.3
43.4	45.1	51.8	52.6
43.0	45.5	52.2	52.9

A m ~ d m

0 ~ 0.2 1.3

mid for 1 fol

51 43.4 47.7

30 ~ 12.0 19.8

End 20-21-0

W P 74.0

U 6 69.8  
not

404 668

Bar 29.96

+ 720

Aug 13 1871 W. A. R.

E. Ins Min

16 59 40

17 29 0

17 29 0

1 Lyrae

19 2 44

2 Lyrae

19 11 56

10 Cygni

19 14 9

e. m. b. 19 18 0

W. 1 = 250

2 = 251

1246X 16 18

5- 4 5.3 2.8

5- 4 31.2 29.8

74.9 W D  
66.6 N C

25- 3 44.8 4 36.0  
49.7 41.8

25- 3 37.8 4 24.8  
40.3

16- 0 16.9 1 4.3  
17.0 4.9

W 4 64.3  
Bar 30.13  
~~68.8~~



7871 Aug 13

44 Ophi

17<sup>+</sup> 18<sup>-</sup> 32.2

34.5

36.7

41.2

43.4

45.7

47.9

50.1

54.2

56.9

59.1

502.4

45.67

17 18

31.45

17 18

- 14.22

- 3.01

- 14.17

14.46

fact

Aug 17<sup>th</sup>

L Circulis

17 9 58.7

1.0

3.0

5.0

7.3

---

15.017<sup>th</sup> 9<sup>th</sup> 3.00

17 8 47.37

~~+15.63~~

13

-15.50

L Cygni

20 37 14.2

17.6

20.5

23.3

26.3

---

102.4

20 37 20.48

20 37 4.43

~~-16.05~~

5.5-

-15.50

9<sup>th</sup>  
3<sup>rd</sup>

1871 Aug 17<sup>th</sup>

16<sup>h</sup> 56<sup>m</sup> - 05

2 Hercules 20 5

clouds

18 56 0

18 59 6

1 Puc Min mid 4 & 5 - Wires

2 Aquilae 20 4 - 39 5

31 01 Cygni 20 9 34

1 Cygni 20 17 34

2 Delph 20 33 39.

2 Cygni 20 37 2

20 38 0 1 m 6



75.03 W P

No 46304

66.06 AC

AT 70.02

30.08

Runs A

B

4.1	5.0	12.6	12.9
4.0	4.8	12.8	13.0
4.3	5.1	12.5	12.9
4.5	4.8	12.5	13.0
4.3	4.5	12.8	12.7

30	4	15.2	23.4
----	---	------	------

6	3	2.9	1.0
---	---	-----	-----

30	3	9.7	10.9
----	---	-----	------

56	4	55.8	62.5
----	---	------	------

3.0	3	52.4	53.3
-----	---	------	------

AC 20 51 0 1st m b

SC 20 53 0 1st m b

Brilliant Aurora  
Arch of white light  
low down

M1=252

M2=253

1871 Aug 18

16<sup>h</sup> 19<sup>m</sup> $\alpha$  Scorp Mid wire

---

E Ins Min 16<sup>h</sup> 59<sup>m</sup>

---

u Herculis 17-41-

---

E Draco 17-51-

---

O Cygni 18-33-

---

15 Cygni 19-39 39

---

L Aquilae 19-44-

---

last m. 19-46-

---

W T 72.0

N. C. 65.1

5 4 5.2 4.1

30.4, 50.3 56.9 5.36, 0 40.5

25 4 31.4 34.6 5.21, 2 22.6

25 2.41, 4 44.7 3 27.1 30.7

20 0.3, 9 9.7 0.39, 7 44.8

50 0 26.9 34.5 1.21, 4 29.6

29.876

21.9  
63.1

U.C. 19h 53m 0s  
S.C. 19 35 0s

U01=257

U02=255



1871 Aug 18

$\alpha$  Scorpio

16 21 47.0  
16 21 31.51  
- 15.49  
24  
- 15.73

$\alpha$  Aquilae

19 44 43.0  
45.1  
42.2  
49.3  
57.5-  
36.8

19 44 47.22  
19 44 31.39  
- 15.83  
108  
- 15.75

1871 Aug 19

19 44 10m

d.M. Obs & Rec all the f.c.\*

w Draco 19 37 44

u Hercules 19 41 26

$\beta$  Draconis 19 50 20

30 4 21.0 20.2 <sup>35</sup>-0 12.2 12.2

30 4 52.1  
57.8 35 0 46.2  
52.1

25 4 33.5- 30 0 32.8  
36.7 35.3

$\gamma$  Draconis

17 53 38

~~17~~ 58 0

~~18~~ 1 0

$\beta$  2900

19 29 22

$\alpha$  Cygni 14 32 58

15 Cygni

19<sup>h</sup> 39<sup>m</sup> 37<sup>s</sup>

$\lambda$  Her. Min. mid yr

19 59 0

20 7 0  $\lambda$  6  
20 8 0 S.C.



50 2 42.7 3 357.7  
49.2 373

---

0 3 20.3 3 52.2  
19.1 50.8

---

25 0 0.3 1 38.1  
4.3 40.8

---

20 0 16.3 20 0 50.2  
22.0 56.8

---

W.P. 71.2 30.056 -  
N.C. 64.0 67.5  
58.4

NO1 = 256

NO2 = 257

17h 8m Aug. 22 —

A.m. obs - H.G. rec.

X Herculis - 17.23

$\beta$  Draco - 17.28

Some G. b. stars lost

no sheet - wt. m -

2m late - (Correct it.)

$\delta$  Cygni - 19.41 -

$\angle$  Aquilae - 19.44

$\lambda$  Urs Min - 19.53

5 wires. 3 <sup>or</sup> 4 breaks



668 W.P.  
620 N.C.  
585 W.P.

30.44

630 P

0 0 56.4  
54.9

1 44.4  
41.6

55 4 17.4  
15.0

5 3.2  
2.9

by current broken -

30 4,01,0  
0.8

4 54.5  
539

50 0 37.4  
41.3

1 290  
33.1

25 4 10.0  
2.9

No 1 = 258  
No 2 = 269



1871 Aug. 28.

17 40 0

19 41 0

~~New Hunt~~

19 44 0

---

$\lambda$  Urs Min 19.53  
R after 5 ind fr

---

$\alpha$  Aquila

20 9 34

---

$\gamma$  Cygni

20 17 36

---

$\alpha$  Cephei

20 27 20-

---

$\beta$  Delphini

20 31 30

---

$\alpha$  Cygni

20 37 2

---

W P 74.2  
 W. 6. 65.1  
 W 4 62.8  
 Bar 30.12  
 68.0

25 4 6.1  
 57.2

0 2 10.3 46.1  
 6.8 42.2

30 2 9.1 3 12.8  
 2.8 12.5  
 lost last were mid 9

45 4 39.3 50 0 26.8  
 38.3 24.4

10 3 31.2 4 23.8  
 35.1 27.2

30 3 48.9 4 28.3  
 46.1 26.9

W 1 = 260  
 W 2 = 261



1871 - Aug. 29 -

4 E Lyrae - 18.40

---

B Lyrae - 18.45 -

---

Last on 18.47 -

---

1871 Aug 31

172 2m



MR 70° 8  
WB 71° 0

50.0, 41.2 40.0

wt 6 wires -

10.0. 35.2 35. mid gr - df -

W 4 720 dV 1 = 262

Bar 29.95-

+ 720

1871 - Aug 31 -

31° Cygni - 20.9 -

---

Y Cygni 20.17 -

---

WP 73.2

NC 66.0

W4 61.5 -

Bar30-08

At 680

55 2.34.8  
31.6

3 16.9  
14.0

30 2 14.1  
11.3

2.61.0  
61.8

last m - 20.19 -

$$Uv1 = 263$$

$$Uv2 = 264$$



7871 Sept 1 Lt

17 32 -

18 19 -

18 22 -

---

310' Cygni 20 9 34

---

$\gamma$  Cygni 20 17 36

---

20<sup>L</sup> 19<sup>m.s</sup>

W1 = 265-

W2 = 266

W P 69.2

W G 59.7

W 4 58.8

30.25

AT 860

f-b before 1 wire last

55-	2	22.8	3	19.1
		27.2		19.1

30	2	10.2	2	55.0
		10.2		58.1

Sept. 2 —

17 58 0

last 19.54

1st 19.57

~~θ Cephei~~ - 20 - 27  
lost on chro -

---

β Delphinī 20. 31

---

λ do 20 33 -

---

λ Cygni. 20 . 37 -

---

ε Cygni - 20.41

---

η Cephei - 20-42

20 44 0



W.P. 6708  
 A.G. 65.00  
 W.L. 6300  
 Bar 30.17  
 Ther 68 f

W1 = 267  
 W2 = 268

45, 4, 40, 3      50, 0 22.1  
                     40.1      22.1

10 3 37.4      4 33.8  
                     40.8      38.0

50 4 53.7      5 45.5  
                     58.0      48.8

30 3 41.0      4 34.8  
                     40.2      34.0

50, 3, 21.4      4 17.0  
                     24.3      17.5

0 3, 1, 7      3, 46, 3  
                     0.0      45.1

1871 Sept 3

See you bat list

16 40 0

E hrs Min

16 54 40

---

2 Horendis

17 8 50

---

18 44 0

---

Runs 6

A

8.2	8.6	12.9	13.8
8.0	8.8	12.2	13.2
7.8	8.8	12.8	13.7
8.3	8.3	13.0	13.1
8.0	9.2	12.3	13.0

---

5 0 0 9.7  
11.8

---

MP 69° 4  
U. 66° 0  
W 4 64° 2  
Bar 30.25-  
A 71.3

Uv1 = 269



Sept. 6 1871 / W. P. R. S.

56.

W. P. 731

Nb. 208

Nov 68.1

Bar 29.93

W. P. 744

Circum broken for some,

W. P. = 240





26.145  
26.200  
26.090  
26.200  
26.120  
26.151

Made wine at 25.92 all hours  
to right of Barber's hole

26.125  
26.125  
26.125  
26.125  
26.125  
26.125

~~26.090~~  
Barber's hole

Made wine to adjacent left of  
Barber's hole. when microscope  
reads 25.92



34







1871phae.proj.1643W  
Sept. 7 1871 WAPR

Bab 6062 17 47 47

Aurora 7<sup>h</sup> 30<sup>m</sup> MT

18<sup>h</sup> ~~56~~ 56

19 0

L. leysni 20 37 2

E. leysni 20 40 59

η leysni 20 42 39

ν leysni 20 52 21

No 1 = 271

2 = 272



$$1 \text{ m h } \times = 1751$$

20 2 110  
9.2

~~69.8~~  
63.3

30 3 44.0 4 29.9  
43.2 24.1

50 3 31.9 4 11.2  
34.8 14.8

0 3 0.3 1 3 44.5-  
0.0 43.5

40 2 39.8 3 34.8  
40.0 35.9

WP 658  
NB 63.2  
NO 55.5  
3004  
643

343 343 343

4 Cassiopea  
Σ 1937  
Smith 340  
Rich 116  
Elements by Villanovian, Kerschul, Haller,  
class

44 Boetia  
Σ 1909  
Smith h 333  
Rich 115  
minimum Boetia  
highly interesting

3 Boetia  
Σ 1888  
Smith h 328  
Rich 113  
Boetia  
interesting

Regulus very distant companion no relation  
clearly made out  
these companion discovered by H. H.

4 Capellae  
Σ 1911  
Smith h 19  
Rich 56  
Boetia  
Elements frequently



710 MP 1891 Sept 8<sup>th</sup>

56.46

18 23 0

49.5-MV

20. 11 0

30.44 Bar

20 13 0

64.5 At

1 Leysing 21-9-38 50 3 34  
6.1

2 Leysing 21 15 30 20 0 55.2  
56.2

3 Leysing 21 26 59 20 3 50.9  
46.0

21 30 0

A

B

23.8 25.7  
23.7 24.9  
23.9 25.0  
23.8 25.6  
24.2 24.9

31.2 32.8  
31.3 32.7  
31.8 32.2  
32.0 32.2  
31.2 32.9

M.1 = 273

2 = 274

1871 1871

$$\begin{array}{r}
 7 \quad 116 \quad 27 \\
 1 \quad 25 \quad 53 \\
 \hline
 8 \quad 41 \quad 80
 \end{array}$$

.00009

.00.0262

0

18 180

$$\begin{array}{r}
 256236 \\
 7 \quad 162696 \\
 1 \quad 255772 \\
 \hline
 8 \quad 417968
 \end{array}$$

8.418932

$$\begin{array}{r}
 .0261799 \\
 0262381 \\
 \hline
 .0000582
 \end{array}$$

.0000582









