1857phae.proj..1768

KG
11365
176

H. 22

Equatorial

From May 13th

1857.

To Sept. 1st

Vol VI.

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54 20
68 42
10 22

35 0 30

0.08

nearest to focus gives largest angle

Increased of dist from object glass = 0.08 divisions. The angle by $\frac{25}{1022} = \frac{1}{41}$

Chromatic

1857 May 22nd have fitted up a single lens of short focus in front of the Micrometer of the great Refractor. so as to measure the images of the photographic plates with that Micrometer

For results of measurements see some pages in advance

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New foci for each set

I

Mizar	Comp
~~55.95~~	60.00
~~56~~.00	59 96
01	92
05	98
04	95
~~56~~.01	59 96
	~~56~~ 01
	3 95

IV V not quite round ○D

Comp	Mizar round
60 39	64 54
45	58
48	55
46	57
52	61
45	60
60.46	~~64~~.57
	60.46
	4.11

I.

Mizar	Comp
32	28
46	32
39	36
27	34
33	33
31	
55.35	59. 33
	55. 35
	3.98

Plate I Image of Mizar is not round ○○

VII ~~C~~ B

Mizar	Comp
07	99
13	98
12	97
04	99
02	97
07	66. 98
63.08	63.08
	3.90

VII ~~D~~ C

Comp very minute	Mizar round
86	92
89	92
89	90
61.88	57.91
57.91	
3.97	

VII B A

Mizar	Comp
99	97
00	01
02	98
04	97
60.04	~~63~~.98
	60.01
	3.97

VII B A

Comp	Mizar
10	21
14	24
10	27
10	25
64 11	24
60.24	
3.87	

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100

Zero of pos 72° 46'
129 12

72.46 before means
72.35 after
72.30
72.40

Ang Pos on C
Mean of Comp

	C	B
	129° 12'	129.20
	129.15	129.34
	129.13	129.27
Zero	72.40	72 40
	56 33	56.47
		56.33
		56.40
		90
Angle of Pos		146.40

I

Comp	Mean
21	31
16	9
9	10
8	13
54.16	10
54.14	50.16
50.16	
3.98	

VII B A

Mean	Comp
73	.73
74	.75
77	74
78	74
66.	70.74
66.77	66.77
	3.97

V

Comp V	
33	30
23	33
31	34
31	33
30	29
59.30	63.32
	59.30
	4.02

V

Comp
29
33
32
59 31

33
38
38
33
63 36
59 31
4.05

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Castor $1''.35 = 5''.0$

$\frac{146}{400}$ $4)\overline{146}\,|\,\overline{365}$ $\frac{365}{91}$ 4.56

~~Sirius~~

VI	comp	Comp	IV
59.45	63.42	85	55.87
47	44	83	90
~~44~~	40	82	92
59.43	63.42	85	89
	59.43	59.84	55.90
	3.99	55.90	
		3.94	

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1857 May 23rd Measures of Photographs of Nixes taken May 8d
No 1 of May 8d

A.	Comp	Nixes	B	Comp	of No 1
too long ex	77	73		.07	00
posure. Nixes	75	80		.05	08
not quite	60.72	64.76		.03	08
round	60.75	64.76		63.05	67.05
		60.75			63 05
		4.01			4.00

Zero of Pos
71° 30'
71.28

Nixes & comp
129-29
131 16
130.22
71.29
58.53
90
Ang of Pos- 148.53

A Nixes No 3

47	65
67	67
68	60
63	68
51.61	55.65
	51.61
	4.04

B remarkably good

97	99
96	06
94	
Nixes	Comp
43	40
56	46
47	43
57.49	53.43
53.43	
4.06	

Zero of Pos
72° 05'
30 00
57 55
147-55

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N° 4 is very large = 4″ in diam.

N° 2 A.		B	N°2	B	
				Comp	
32	22	12	94	62	65
28	27	15	05	.66	57
30	30	41.14	07	.68	62
40.30	44.26	.10	45.02		58.62
	40.30	08	41.10		54.65
	3.96	12	3.92		3.47
		41.10			

~~208.~~ 40
~~44.~~ 55

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Results of Measurements of Photographic images of Mizar & companion

May 22nd and 23rd 1857

Plate I April 27th
Too long exposed so that the image is slightly distorted ⊙.

Dist. = 3".95
3.98
3.98
3.97

Plate II April 28th
Good image - round
Sent to Humboldt by Mr Whipple.

Plate IV April 30th
Small.
3".94

Plate V Distortion as in I
4".11
02
05
4.06

Plate VI April 27th
3".99

Plate VII May 6 - Short & very minute

A	B	C
3.97	3.90	3.97
3.87		
3.97		
3.94		

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1857phae.proj..1765

Plate No 1 May 8d
A B
Distortion as in I
4".01 4.00

Plate No 3 May 8d
A B good
4".04 4.06

Plate No 2 May 8d
A B
3".96 3".92
3.97
3.94

To find the angular value of 1" it will be more accurate to use ~~that~~ ~~obtained~~ derived from the mean of the measures of ~~April~~ May 7d viz 14".48 as our object is principally to ascertain the errors of the different images ~~obtained~~ from each other.

Hence Mean of all above measures
or 3".98 = 14".48 1" = 3".637

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Final Results

Plate I	April 27d	Dist. = 14".44	Angle of pos. =	----
IV	" 30	" = 14.34		----
V	" 30	" = 14.77		----
VI	" 27	" = 14.52		----
VII A	May 6	" = 14.34		----
" B	" 6	" = 14.19		----
" C	" 6	" = 14.44	"	= 146°.40'
No 1 A	" 8	" = 14.59		----
" B	" 8	" = 14.55	"	= 146°.53
No 2 A	" 8	" = 14.41		----
" B	" 8	" = 14.35		----
No 3 A	" 8	" = 14.70		----
" B	" 8	" = 14.77	"	= 147°.55
		Mean 14.49 ±		147°.49'

Prob of 1 obs = ±0".12

The angles of position have been measured from the Zero of position read off from the plates.

The principal source of discrepancy seems to be the slight distortion of the image of the brighter star

by which the side next to the companion is truncated

It will perhaps be obviated by giving a very short exposure. It would seem to be least evident in the images of least exposure, and it appears to be the case that the smallest angles pertain to the shortest exposures though this needs confirmation.

Spots of dust &c on the plate near the images also serve to give a false estimate of the true centre.

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e^2

.02
23
78
01
23
90
03
10
04
06
20
44
78

12) 39 2
32

$\sqrt{32} = 18$
6
12

"

A more complete discussion is given in Astr. Nach.

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1857phae.proj..176B

ζ Hercules $17^h.19^m$ Dec $+37°.17'$
Dist 3".6 A 4th and 5/6
Pos 308°

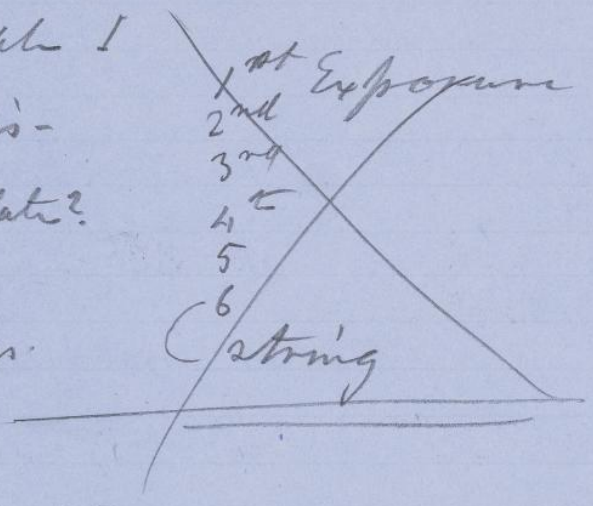
* π Bootis $14^h.34^m$ Dec $+17°.01'$
Dist 6".0 3½ and 6th
Pos 99°
(comp. follows)

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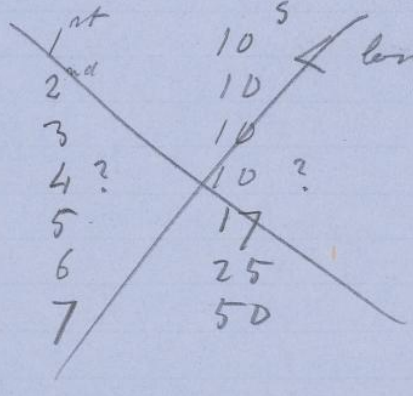
Plate I

Clock disturbed in moving plate?



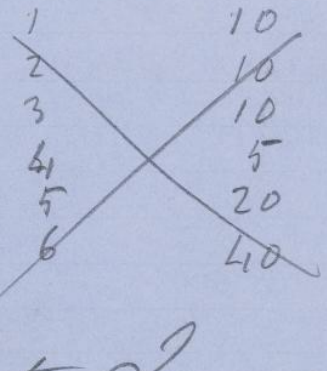
15
25
30
20
15
10 & blurred

Plate II



< long space

Plate III



< long space

Clock at Lunar motion

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Photography

1857 May 26d Mizar

Plate I

Clouding up

		Counts	s	
1st	image	10	=17	exposure
2	"	10	=17s	"
3	"	10	=17s	"
4	"	5	8s	"
5 (b)	"	20	34s	"
6 (a)	"	40	= 68	" very fine image grain coarse

Plate II

Clouds

		Counts	
1	image	25	exposure
2		25	
3		25	These show very plainly the diffusion of light caused by the clouds
4		50	

The exposure 50 in = 175 beats of Eq. Clock

88

Our labor was spent in vain this evening. In the first place we could not explain the action of the clock & spent more than an hour before we found out that it was adjusted to Lunar motion. Our next plate was spoiled by our not observing that the light of the Object glass was cut off by the Dome. After getting all right it clouded up.

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June 2nd 1857

EC 15 19 00
236 15 21 27.3

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Different coatings & Chemicals employed for some of the plates

Photography

May 29 2 Mizar

Ex

Very good but not quite better

Plate I — Ex work well +10 = 5s = beats of Dy Clock 100 beats = 51s

comp. took ×25 = 13s

(a) 50 = 25s Fine images Comp with took well.

Plate II (a) 75 = 38s

100 = 51

125 = 63

150 = 76

Plate III (a) 75 = 38s Alcor takes but ∠ comp

(b) 100 = 51 comp at (a) > Alcor at (b) . a little

(c) 125 = 63

(d) 150 = 76

Plate IV — No sign of image

Ex took strong

10	(a)	= 5s	very good round images
15	b	= 8s	But the whole plate
×20	c	= 10s	shows light action very
25	d	= 13s	strongly -
30	e	= 15s	
Comp. took? ×35	f	= 17s	
40	g	= 20s	
50	h	= 25s	
75	i	= 38s	

2d? 3d different coating?

Plate V

3m.00s	by watch
0.30	All Alcor & comp took
0.45	
1.00	

The telescope is always moved so as to bring the star further

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Excellent - the 3rd of a clear image just formed.

Mizar

Eve

Plate VI (a) 1m.00s by watch

Great deal of stray light action on plate. (b) .30

(c) 5, (15²) (Note Oct 31 1857 I doubt the correctness of this exposure the comp. is visible

Comp took well!!

My connection of the original record is evidently by measure of time between the first & second image. I suppose moderately good. Think our guide differs from the star plate

Plate VII 3m.00 " Fair strong images

2m.00 " good chance for 8th mag stars

ξ Bootis

The companion is n.p ←

Plate VIII 1m.00

1..00

2..00 < double interval

Plate IX (took

3m.00 < large interval

1..00

1..00

The long exposure took perfectly well the molecules very fine in grain - the companion not detected -

X Arcturus

Fair took *1 seconds by watch

6 beats of clock = 3 "

5 "

8 "

12 "

15 "

30 "

Arcturus was taken by this plate in 1s.

NB what appears to be the image of 1s exposure at first sight is a speck on the glass. But an undoubted light action is visible near it in the direction away from the longer exposures. it is about

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May 29th (Cont.)

Arcturus 9/10 Clouded suddenly

s
1.5
2.2
4.3
9.5
15
24
33

---

half way ~~from this spo~~ between the spot & a spot curved thus

false spot

curved thread like spot

Arcturus in 3s

Arcturus in 1s

The 3s image is amply strong for micrometer measurement

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Measurements of Photographs of Mizar

May 29th

The image on each plate taken after the longest exposure will be lettered A the next B &c

Fair two large. quite round.
A. Plate VI

Mizar	Comp	
05	07	
95	10	
05	12	
59.02	55.10	
55.10		
3.92		

Perfectly symmetrical
VI B

	Comp	
.59	74	
64	75	
64	78	
62.62	58.76	
58.76		
3.86		

Fine - (was this the Comp?) comp. small
VI C

59	Companion
57	two faint for
60	the apparatus.

could be measured with a proper instrument
(Afterwards read easily with a reading microscope)

Left B. measuring being dissatisfied with the Micrometric apparatus. Its principal imperfection is the want of a good achromatic object lens. & the want of illumination

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NB To ask Mr Black to prepare a plate in the dark & expose it to a star & then another plate with the usual lamp light & see if both are similarly covered with specks.

It seems as if the action of extraneous light is too sensible on our plates

M.T.C	8	00 00.0
236	12	47 08.5
M.T.C. fast		18.0
	7	59 42.0
Spica Inf comp.	9	11 09
Em		
Em	9	39 36
	1	11 27
	1	39 54
		12
		16
Sid Int	1	11 39
	1	40 10
	12	47 08
Cal. time of Inf by 236	13	58 47
Em " "	14	27 18
		28 31

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June 2nd 1857 Photography

Occultation of Spica

Marked with Diamond

At 13h .. 32m Spica was 4' Sp. below the large crater C

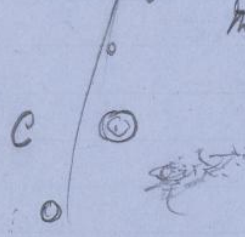


Plate I

236 = 13h .. 35m .. 22.3 Opened (exposed) plate
38.4 cut off

Plate II.

13 41 .. 55.7
42 .. 03.7

Night June 2 clear pretty good definition.

Plate III

13 45 .. 3.6
13.5

Before Immersion

Plate IV

13 .. 47 .. 38.2
47.7

Plate V

13 .. 50 .. 32.7
42.2

Plate VI

13 .. 53 .. 10.6
18.6

Plate VII

13 .. 55 .. 21.4
28.7

Plate VIII

13 57 14.2
33.6

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June 2nd 1857. Photography

Im. of Spica. G. P. Bond.

236.. 13.. 59.. 40.0 - 4 beats

Very fine - Perfectly clear
images steady

1.0 - 5

Em of Spica

236 14.. 28.. 11.0 - 5 beats

El 15.. 19.. 00.0
236 15 21 27.3

Immersion

236 - 13.. 59.. 40.0 -
2
13.. 59.. 38.0 Sid. El.

2.. 02.83

13.. 57.. 35.17 Sid. time Immersion Spica
4.. 44.. 23.03
9.. 13.. 12.14
1.. 30.63

Observed 9.. 11.. 41.51 G.P.B
Cal - 9.. 11.. 09.00
32.51

1.30.596
035
1.30.631

El. 15.. 19.. 00.0
24.47
15.. 19.. 24.47 Sid.
236 - 15.. 21.. 27.3
2 02.83

Emersion -

14.. 28.. 8.5
2.. 02.87
14.. 26.. 05.63 Sid. time of Emersion
4.. 44.. 23.03
9.. 41.. 42.60
1.. 35.30
9.. 40.. 07.30 Camb. m Solar time of Emersion by G.P.B

1.35.143
115
1.35.258

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Photographs of Spica & Moon—

After Emersion

Plate IX

236 14h 28m 30.7
39.5

Plate X

14h 30m 01.0
13.5

Plate XI

14 31m 40.4
53.8

Plate XII

14h 34m 01.8
25.5

Plate XIII

14h 35 23.8
39.4

After examination of the plates I find that the shortest exposures were longer than necessary to exhibit a large number of spots on the Moon besides the limb suitable for measurement to an accuracy of ±0".5—

Plate III Missing

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By R. F. Bond.

June 2.

Observed occultation of Spica by R. F. Bond.

Chro. Dent No. 7986. Im. — $9^h\ 12^m\ 24^s.0$ — 10 beats

saw the star with the naked eye at $9^h\ 07^m = 5^m$ before the immersion. thought the star had a greenish tinge in the telescope

1/4 or 1/2 a minute before it went behind the moon.

time of R. F. B's. immersion, noted by W. C. B. with

Chro. No 239 — $9^h\ 11^m\ 57^s.5$

Dent — $9^h\ 14^m\ 0^s.0$

239 — $9^h\ 13^m\ 37^s.9$

22.1

EC — $14^h\ 06^m\ 0^s.0$

239 — $9^h\ 20^m\ 43^s.7$

$4^h\ 45^m\ 16^s.3$

Emersion observed by R. F. Bond.

Chro. Dent No. 7986 — $9^h\ 40^m\ 49^s.5$

	1 Comp	2 Comp
Comparison of Dent 7986 — dent fast of Camb. m. solar time	36.65	36.60

M C — 8. 50. 00 — M C — 9. 20. = — M C — 9. 46. =

7986 — 8 50 01.0 = 7986 — 9. 20. 00.95 = 7986 9. 46. 00.9

Immersion by R. F. B — Dent Chro. 7986 — $9^h\ 12^m\ 24^s$

10 beats = 04

$9^h\ 12^m\ 20^s$

36.65

$9^h\ 11^m\ 43^s.35$ Immersion

m solar time

Emersion R. F. B — $9^h\ 40^m\ 49^s.5$ — 10 beats

10 beats = — 4 —

$9^h\ 40^m\ 45^s.5$

36.60

Mean Solar time $9^h\ 40^m\ 08^s.90$

239 $9^h\ 11^m\ 57^s.5$

32.9

$9^h\ 12^m\ 29^s.6$

20.0

0.4

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By P.S. Coolidge.

June 2d 4h

f.6. observation of Emersion of Spica. by Spring-governor and E. Clock at 14h 25m 40s.5

Sidereal Clock

June 2d 8h 57m E.C. Slow – 24.49

June 3d 8.39 —" —" — 24.26

23 gain in 24 hours

Mean Solar Clock

4 P.M. June 2d M.C. fast of Boston 19.64 – fast of Cam — 35.64

4 P.M. June 3 —" —" —" — 20.44 —" —" — 36.44

June 2d.

E.C. – 14h 25m 40s.5

24.49

14h 26m 04s.99 Cam. Sid. time of Emersion of Spica, obs by f. 6.

4 44 23.03

9 41 41.96

1 35.29

9h 40m 06s.67 Mean Solar time of Emersion of Spica obs. by f.6.

9 39.36 R.T.P. Cal time

30.67

W.C.B – sat down beside of R.T.B, and watched the start which he made at the moment of disappearance of the Star, and noted the time by Chronometer No. 239 = 9h 11m 57s.5

6hro – 239 slow of Dent 7986 22.1

By this immediate comp. of 239 with R.T.B's 6hro – it was found that the instant of Immersion was, by 7986 = 9h 12m 19s.6

7986 fast 36.65

m.s.t of Immersion of star – 9h 11m 42s.95

The time given by R.T.B. in the usual way 9h 11m 43.35

Diff. .40

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June 2d. Occultation of Spica

Immersion. observed with 5 ft Equatoreal in West Dome.

by R. T. Paine – Chro. No 151 – marked – $9^h\ 10^m\ 46^s.4$

Emersion – do —— do – $9^h\ 39^m\ 11^s.6$

Chronometer No 151. Slow of Mn. 6. $1^h\ 30^m.5$ at $8^h\ 37^m$ } rate losing $1^s.5$
—"— —"— —"— – $1^h\ 30^m.7$ " $9^h\ 20^m$ }

151 – $9^h\ 10^m\ 46^s.4$ — $1^h\ 30^m.6$

$54^s.9$ — $35^s.7$

$9^h\ 11^m\ 41^s.3$ m. Solar time of Immersion – by R T Paine — $54^s.9$

$9^h\ 39^m\ 11^s.6$

$54^s.9$

$9^h\ 40^m\ 06^s.5$ – m. S. t of Emersion by R. T. Paine

Test of R. F. B's time

June 2d – EC – $14^h\ 06^m\ 0^s.0$ — EC – $14^h\ 6^m\ 0^s.0$

$24^s.4$ — 239 – $9^h\ 20^m\ 43^s.7$

Sid. time – $14^h\ 06^m\ 24^s.40$ — Dent – $9^h\ 14^m\ 0$

$4^h\ 44^m\ 23^s.03$ — 239 – $9^h\ 13^m\ 37^s.9$

$9^h\ 22^m\ 01^s.37$

$1^h\ 32^m\ 07$ — 239 $9^h\ 13^m\ 37^s.9$

Mean solar time $9^h\ 20^m\ 29^s.30$ — 239 fast $14^s.4$

239 marked $9^h\ 20^m\ 43^s.70$ — $9^h\ 13^m\ 23^s.5$

239 fast $14^s.40$ — dent 7986 – $9^h\ 14^m\ 00^s.0$

7986 fast. $36^s.5$

7986 fast by R. F. B's time $36^s.5$

Diff. of times. $.15$

Hence it appears that not so much as two tenths of a second could be attributed to error of R. F. B's Chronometer or to his personal equation in marking the time of immersion of Spica

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Result of observation of occultation of Spica

June 2d - 1857.

Finder of	Immersion	Emersion
	h m s	
G.P.B. 23ft Equatorial.	9 .. 11 .. 41.57	9 .. 40 .. 07.30
R.F.B. 4½ft. Equatorial.	9 .. 11 .. 43.35	9 .. 40 .. 08.90
S.C. 4ft. Fraunhofer	not observed	9 .. 40 .. 06.67
R.T. Paine 5ft Equatorial	9 .. 11 .. 41.3	9 .. 40 .. 06.5
Mean of observed	9 .. 11 .. 42.05	9 .. 40 .. 07.34
Computed by R.T.	9 .. 11 .. 09.	9 .. 39 .. 36
Observed Duration	28.25.29	
Cal — — .. —	28.27.00	

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† Comparing the images of June 15th with the whole collection from April to Aug. they appear to me on the whole among the very best we have taken. grain very coarse & images small but intense. Comp. for exp. of 9s perfectly strong & definite.

1967

265.8
206.0
63.8

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1857 June 15th 8h.30m to 10h.30m m s t

Photography Fine image intense & very Compact

Have had no favourable evening since June 2nd. To night nearly clear - calm & fine

Got a fine set of Mizar & Alcor for specimens

Mr Black † see opposite page was not satisfied with his collodion nor with the clamps of the plates. Gave to each plate the same exposure viz

(e)	5 counts	=	9.5
(d)	10	=	18
(c)	15	=	27
(b)	20	=	36
(a)	30	=	54 by Clock. 2s pendulum.

There were however one or two mistakes as one in which 4 images only were taken - another where either 1st image had 10 counts instead of 5 & a third where at the last image the clock stopped at 27 counts & may have disturbed the image.

On inspecting the plates it is found that all the impressions took, even the exposure of 5 counts = 9s took perfectly both for Alcor and for the comp. of Mizar.

However the clock did not go at true sid. rate as is shown by a slight elongation of the longer exposed images. The effect of too fast or slow rate of clock is to give a conical brush or tail to the Mizar thus  instead of a regular & symmetrical oval

as if on the first few seconds of exposure the plate was undergoing a change fitting it for the action of light but not making an image. & the latter is seen after suddenly formed

Thus I take a in the above figure to be the part of plate first exposed.

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I think it would be well to try on the Moon the following experiment.

Expose the plate to the Moon & keep the telescope in motion for a few seconds then by the slow motion screw in R.A. ~~then cut of light for a moment~~ & then take the image & see if it takes quicker than it otherwise would.

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130

1857 June 24th Photography

Focus scale 22.d5

A fine clear sky. But slight gusts of wind may have disturbed the telescope at times.

Messrs Black & his assistant Drummond took a large number of photographs of Mizar & Alcor. Each of the plates had the following exposure

2½ counts	=	4s
5 "	=	8
10 "	=	16
15 "	=	25
20 "	=	33

(a) (e)
(b) (a)
(c) (c)
(b)
(a)

The 20 counts were always checked by the beats of the Standard Pendulum in transit room. & the mean was taken 20 counts beats = 33s.

We must think ε Lyræ (four stars of from 5th to 6/7th magt.) cannot tell whether there took or not without a daylight examination. The exposure of this plate was

(a)	20 counts	=	33s
(b)	40 "	=	67
(c)	60 "	=	100

For (a) one pair took finely, the companion of the 2nd pair did not
(c) The companion of the 2nd pair took in this
Under Microscope (b) shows no trace of comp. of 2nd pair.

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We then took a Lyræ at following

exposures

A fine plate for engraving

Plate —— 16.[illegible]
0.
16.
0.
16.
de
last we

Plate —— 8.
0.
8.
0.
8.
0.
8.
0.
16.

h 118
test

h 119
June 2
Occultation of Spica
photographed

All these took

no doubt from this

star with trace a line

being dampened in R.

NB Since the 15th the clock was carefully adjusted to go at the rate of Mizar. West of Meridian On June 23rd it was watched with power of (250?) (2 Mach angular microm) & for 18m not the slightest deviation from an exact rate. should have noticed a change of 0.s1 instantly.

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We then took a Lyrae at following

exposures

A fine plate for engraving

Plate —— 16.^{s}
0.
16.
0.
16.
&c
last wa

Plate —— 8.
0.
8.
0.
8.
0.
8.
0.
16.

All these took

no doubt from this

star will trace a line

being dampedin R.

NB Since the 15th the clock was carefully adjusted to go at the rate of Mizar. West of Meridian On June 23rd it was watched with power of (250^2) (2 Mak angular microm) & for 18m not the slightest deviation from an exact rate. should have noticed a change of 0.^{s}1 probably.

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We then took a Lyrae at following exposures

A fine plate for engraving

Plate ——

16.s0
0.3
16.0
0.5
16.0
de
last was 8.s0 instead of 16.s

Plate ——

8.0
0.3
8.0
0.3
8.0
0.2
8.0
0.3 ?
16.0 last

All these took distinctly, I have now no doubt from this experiment that this star will trace a line on the plate the telescope being clampedin R.

NB since the 15th the clock was carefully adjusted to go at the rate of 1sec. fast of Meridian On June 23rd it was watched with power of (250?) (1 Mark another microm) & for 18m not the slightest deviation from an exact rate. should have noticed a change of 0.s1 instantly.

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34

25th June 1857

Occultation of 34 Leonis

Occultation with 23 foot equatorial
G.P.B Sts

EC 15h 28m
236 15h 30m 50.6 ✱ 6
2 50.6

Cor. of EC = 0.00

6 14 17.14
4 6.74
6 15 3.88

236 Immersion at 14h 59m 10.0 — 4 beats
14 59 8.0
Sid Time = 14 56 2 50.6
6 15 17.4
8 41 3.88
Camb. m.t. 8 39 1 13.52
25.39
48.13

Occultation of Star 9th mag

with 23 foot equatorial
G.P.B Sts

EC 15h 28m 0
236 15h 30m 50.6
2 50.6

Imm. 15h 04m 50.0 — 4 beats
15 4 48.0
Sid Time = 15 2 50.6
1 57.4

This star is 4' north of 34 Leonis

15 1 57.4
6 15 3.88
18 46 53.52
1 26.82
Camb. m.t. 8 45 27.20

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25th June 1857

Occultation of 34 Leonis
with 5 foot equatorial
S. C. D.

EC 14h. 49m. 26.7 Mutton packet 199 8h. 34m 00.0
28.75 34 2 0
30.75 34 4.0

Occultation with 199 at 8h. 41m 0s — 26 beat
2.5 beat = 1 second

8 40 49.6 (10.4) 26 / 52 / 10.4

EC 15h. 00m. 28.70
~~30 25~~ bad
34 55
36 55
38 60

8h 45m 00.0
6s. 0
8s. 0
10s. 0

EC	14,	49,	28.73	15.	00.	34.60	14	49	28.73	15 00 34.60
199	8,	34.	2.00	8.	45.	6.00	6	15	3.88	6 15 3.88
	8	33	0.58	8	44	4.63	8	34	24.85	8 45 30.72
199 fast		1	1.42		1	1.47		1	24.27	1 26.09
							8	33	00.58	8 44 4.63

Imm at 8 40 49.6 by 199
1 1.45
8 39 48.15

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1857phae.proj..176

136

Photography

June 27th Calm & a fine clear night

Focus scale 22.5d

Mizar Plate I Mizar Ambrotype (Good)

(b) 3 counts = 5s Mizar took
(c) 6 " 10
d 9 " 15 No companion
c 12 " 20s Comp. Took decided
b 15 " 25 " Took
(a) 18 " = 31 " "

Better than the collodion.?

" Plate II 3 counts = " Collodion decidedly finer but plate spotted
6 " = 10
9 " = 15
12 " = 20
15 " = 25 Comp Took
18 " = 31

Not a good surface on plate

" Plate III 6 counts = "
7
8
9 15
10 16
11 17
12 counts = 18s by Clock

Do not understand this plate. There are 7 images of a star very distinct. but no companion! plate very much spotted except perhaps the last

" Plate IV 3 counts =
4
5
6 10 Comp Took ?
7 12 " Took ?
8 14 " Took sure
9 = 15s " "

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60^s

The 4th star on close examination decidedly out of action in exposure of 40 counts

ε Lyrae

ε Lyrae Plate V very fine

40 counts =
70 " = 120^s
100 " =

A fine plate
Very fine all but 4th star
All the images distinct over time

On plate V the 70 counts gives the 6/7 mag star. a. the 40 counts separates the brighter pair -

" Plate VI 40 " = faintest did not take
80
Distances of images 120 = 208^s by clock
1/3 of mutual dist

" Plate VII Space a 80 close 80^s By watch
Space equal to 60 together 80 "

double of Space a 80 / 80

The distances in Plate VII - ~~per~~ of 1st two images was half as large as dist of last two "
and the dist- ~~from~~ from 1st to 3rd image was equal to that of five of the marks ruled on the stone exactly - (referring to rough Scale marked on pier.

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Plate VIII

α Lyræ

3 counts = 4.0 / 0.2

4.0	4.0
0.2	0.2
4.0	4.0
0.2	0.2
4.0	4.0
0.2	0.2
4.0	4.0
0.2	0.2
4.0	4.0
0.2	0.2
4.0	4.0

Will took last one

The exposures 0.2 were as short as it was possible

1857 Sept. 26th Plate IX. Sent to Mr Airy.

Plate IX The Clock was stopped and the star α Lyræ passed over the plate by its diurnal motion. marking a single line.

A strongly marked line was taken on the Plate

Plate X as 3 lines as above

" XI " "

" XII 3 lines. The "middle one was irregularly interrupted by cutting off the light.

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Plate XIII Polaris & neighbouring stars

1st Exp. (b) 2m.00s by Watch
2nd " (a) 3 .00 "

Plate XIV Polaris (a) 3m.00 by Watch
(b) 3 .00 "

Will it do to warm the plates before exposing in Bath.

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NB To try the Ambrotype again and to get the relative magnitudes of Alcor & Mizars comp.

The images of Mizar 3 counts exposure are stronger than those of its companion at 18 counts & comp. is also brighter than Alcor.

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1857 June 29th

Occultation of ν Geminorum

by

Saturn

Lost by clouds

covering the whole

western sky

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142

July 8th 1857. Photography

Mizar- June & clear 16h Sid. to 17h

Plate I Mizar for magnitudes

Exposures 0m 32s l

2 k just took ~~but~~ ~~not~~ full sun with Microscope

Mizar pole 4s = comp at 20s 4 j Mizar took strong

Surface action very 6 i

irregular in size of molecules 8 h

10 g comp took ? ? = image of Alcor

12 f comp took but faint ∠ image e of Alcor

Alcor Pure 16 e " " strong

Alcor took certain 20 d "

24 c "

28 b "

32 a " took stronger than 1st 32s

Plate II like plate I

N B. on the plate are but 11 images equidistant & the 2s exp. probably took as there is a decided image in its place. But it does not appear which was omitted

0m 32s

2 Mizar took pretty certain

4 j strong

6 i

8 h

10 g barely

12 f comp took ? pretty certain

16 e " " pure

20 d

24 c

28 b

32 a not quite as strong as 1st

This image is like 30 exposure of Plate IV

Alcor took ? ?

Alcor took certain

By a micrometric measurement of the diameters of all the images on I & II I find they will agree well if we suppose 8s Exp. to have been omitted in II.

NB The times were taken carefully by Chronometer

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15
1 5
7 5
1 5
2 2 5

Mizar for Magnitude

Plate III

Aperture reduced to 8 3/4 inches

All of Mizar took

60s g
10 g
20 e — Alcor did not take — comp took ?. H. pretty sure
30 d — Alcor took faint — comp took sure
40 c
100 b
60 (a) — 1st & last images equally well take

Plate IV

Aperture 8 3/4 inches.

10s 8 IV 50s 3s 8 11

50s (h)
5 (g)
10 (f)
15 (e) — Alcor not found
20 (d)
30 (c) — But may have taken at 40 or 50
40 (b)
50 (a)

Mizar took pretty sure ~~fine grain~~
Mizar took sure

comp took ?. very faint ? = Mizar at 5s
Comp took sure
grained
Plate III is not very fine ~~grained~~ though IV is

N B The small aperture seems to give ~~a fine grained~~ as the fainter images are distinguishable.

Plate V

Full aperture At 17h Sid.

32
2
4
6
8
10
12
16
20 (d) — comp took
24 (c)
28 (b)
32 (a)

Bad plate Collodion or silver is branching & like frost on window pane.

Fine grain

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At 17h 15m sid. July 8th (continued)

Plate VI Arcturus clock stopped to see whether it will make a line on the plate i.e take instantaneously- 3 lines take-

Plate VII As above but first the clock was in for 24s & then clock was stopped & star suffered to pass over the plate.

Not a trace of a line on plates VI or VII- & only a faint image of Arcturus was stained in 24s exposure! Something wrong surely- as the star was not at a very much lower altitude than Mizar-

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NB Our Photographic Experiments thus far this year have commenced usually about dusk. & have been concluded by 11 o'clock or rarely continued a half an hour. longer.

It appears that the minimum times in which the images with a double were are for

Mizar between 2ˢ & 4ˢ = 3ˢ
Companion = 12
Alcor = 15 ?

(By examination of plates not specially intended for the object I had before the experiments of July 8th taken 4ˢ 12ˢ and 24ˢ.2 for these times.)

On Plate I the image of Mizar at 4ˢ was just equal to that of the companion at 20ˢ

On Plate IV the image of Mizar (reduced aperture) at 30ˢ was like that at 10ˢ on plate II. also 10ˢ of IV was a little less strong than that of 4ˢ on plate II or 10ˢ of IV = 3ˢ of plate II showing that by reducing the aperture from 15in to 8.in75 Mizar required three times as long exposure to take with the same intensity in the image or.

Within certain limits the time of exposure to produce similar images is proportional to the ~~light of the star~~ quantity of light of the star.

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146

Co 10th July 1857

Connection with Quebec

Telegraphic Completed

Portland says current very weak

Portland says clock signals have gone through tonight to Quebec but cannot get Quebec now (9h. 55m)

Portland cant get Quebec Cannot Put on a Layer Battery and try it

17h 25m by 236 = 10h 6m mean time

17h 30m 236 =
10h 11.5 mean time
7.14

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10h 26m Portland says he has doubled his battery and can't do anything with it

Cambridge Is it Quebec not reaching P. or Portland not Q.

Portland Can't say ~~Quebec~~

10h 43m

Portland says that with all the battery she can put on it cannot get Quebec and that it is useless to continue

Cambridge has Boston ground put on does not materially strengthen the current. Boston says it is not stronger than from Portland

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Programme for Photography

Mizar To be taken first with full aperture

0m.32s

2s &c as on July 8th

Then put on aperture of 5in Light = 1/9

Mizar should take in 0m.30s
Comparison " 1.48

2m.00s Mizar & comp should both take
0.25
0.30 Mizar should take
0.35
1.30
1.40
1.50 Mizar & comp?

Full aperture again.

0.32
2
4
6
8
0.32

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Programme (continued)

α Lyræ Full aperture

0m 20s
0 .. 01
.. 02
3
4
5
6
7
8
9
0 10

α Lyræ Aperture reduced to 5in Light = 1/9

0m .. 30
1
2
3
4
5
16
7
8
9
10
20
0 .. 30

should all take but this?

Another Plate Aperture

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Programme continued

α Lyræ Aperture 5 inches

	63^s
$2 \times 9 =$	18
$3 \;\; " \;\; =$	27
$4 \;\; " \;\; =$	36
$5 \;\; " \;\; =$	45
$6 \;\; " \;\; =$	54
$7 \;\; " \;\; =$	63

α Lyræ - Focal Aperture

$0^m \;\; " \;\; 10$	
	1
	2
	3
	4
	5
	6
	7
	8
	9
$0 \;\; " \;\; 10$	

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Some Aurora

Friday July 16th 1857

Mizar Full aperture - Counting nucleus - 51m

I

0.. 32s	Fine images	Plate scratched
2	seems to have taken?	
4	took strongly	
6		
8		

Alcor took ~~sure~~? 10 d companion took ~~pretty sure~~

" took ~~sure~~? 12 c " took

" " " 16 b "

0.. 32s a

Mizar

II. Aperture 5in

~~h m~~		
~~6..51~~		
x 1m.. 50		
x 0 25	Plate not	
x 0 30	returned from Boston	
x 0 35		
x 0 40		
x 1 .. 30		
17h.. 20m Sid. x 1 .. 40		
~~1 .. 50~~		

18.54
1 30
20 20

20 31
1 40
22 11

Mizar III Aperture 5in

1 .. 30		~~Companion did not take at all~~
10		All of Mizar except 16' took well
4s each of plate I = 20		but the interval between
30		1m 30s & 10s is nearly
40		double (& perhaps one
1 .. 20		between was taken?) not
~~1 — 20~~		seen on plate

On examination with a microscope & measurements it seems probable that the companion just took at 1.. 30 & gave traces of action at 1.. 20

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IV a Lyrae 5-in Ap. Plates not returned from Boston

0m 20s all well timed

1
2
3
4
5
6
7
8
9
10

0 = 20

~~0 = 30~~

V a Lyrae 5-in 0 = 20 well timed

Thin clouds gathering - but none seen over the star -

1 did not take
2 took ? doubtful
3 took strong
4 = Exposure 4s of Plate I
5
6 = 8s exposure of plate I
7
8
9

VI a Lyrae ~~5-in~~

~~5~~ 2 × 9 0 = 45
2 × 9 18
3 × 9 27
4 × 9 36
~~5 × 9~~ = 0 = 45
~~6 = 7~~

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VI

ε Lyrae

Full aperture

	0ᵐ.20	Probably lost by clouds
Clouds	1ᵐ.00	
"	0ᵐ.00	
"	0ᵐ.25	

This evenings work incomplete from loss of plates II (very important) and IV Also the plate II has an uncertainty as to times of exposure. Finally VI was lost by clouds.

Focus as usual at 22.5

My this was used I cannot ascertain but in July 6 1858 it was found that 21.5 would have been better

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1/54

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July 30th 1857

The work of July 16th was unsatisfactory from some unknown conditions of plates or coating.

There have been two good evenings since but Mr. Black has gone away.

We have fitted up a screen &c for the purpose of photographing the Sun

Examined the Sun July 28th but not a spot was to be seen. We shall not probably attempt the Sun till some spots appear but take the first opportunity to determine the aperture necessary for giving impressions in a given time

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Aug. 1st Yesterday I went to Messrs Whipple & Blacks & Bought out a Voightländer Camera of 1½ 1 6/10 in. aperture (A) and two Achromatic objectives - One of 1in Solar focus and 38/100 in. aperture (B) Another of ½ in focus and ⅓ in aperture By Grunttow (C)

Neither of these will give us the whole Moon at once but I think (A) & (B) can be tried to advantage.

Perhaps eventually it may be best to introduce an achromatic concave lens between the object glass & the focus

All Returned in 1857-58.

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Aug 3rd 1857

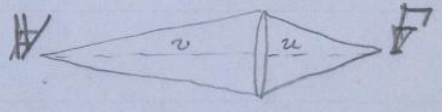
Have fitted lens (B) so that it can be used with our usual Camera box for the plates and magnify say 4 times

Have examined the Sun often of late to see if there were any spots but none of any size whatever could be distinguished with the reverse

If we disregard the thickness of the compound lens (B) we have

$$\frac{1}{v} = \frac{1}{u} - \frac{1}{f}$$

f = solar focus = 1 in (German?) . u = distance of point of divergance from lens v = dist. of new focus . v being negative for convergent rays



Magnifying power = $\frac{-v}{u}$ on the image at F'

" = 2 u = 1 1/2 inches

" = 3 " = 1 1/3

" = 4 " = 1 1/4

" = 10 " = 1 1/10

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Photography (For Magnitudes)

Very fine & clear Mizar approaching the 6h circle.

Aug 6 1857

I Mizar. Full ap-

18h 21m 0m 32s

1s	(j)	
2s	(i)	— no trace of Mizar
	(h)	Mizar took sure < (b) of comp decidedly $\frac{2}{3}$ as much area
4	(g)	— Mizar took strong
6	(f)	
8	(e)	
10	(d)	Possibly a
12	(c)	Trace of Comp. ?
16	(b)	Comp took sure
~~20~~ 32	(a)	
~~24~~		
~~28~~		
~~32~~		

Fine Evebra Plate (R)
3 Exp of 40s
And another (R)
4 Exp of 20s Sent to R. Y. 13. Sept 30th 1857.

Beautiful images

Plate II Ap. 5in

1m 50	(a)	Comp took strong — Good plate
25	(b)	
30	(c)	
35	(d)	
40	(e)	Possibly a trace of Comp. but doubtful
1m 30	(f)	Comp took sure & strong
~~2m 00~~		
~~1m 50~~		

Images beautifully round.

Images of Companion are fully as diffuse with ap 5in as with 15in. Mizar is a little more compact

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Plate III. Mizar Ap 5m

perhaps took as there are indications of an image at Mizar

1.. 20	~~1.. 30~~	Comp ~~did not take~~	Plate spotted more than usual & not so good
5	40		
7	20		
9	30		
11	40		
e 15	~~1 200~~	Mizar took	
d 20			
c 30			
b 40			
a 2.. 00		Companion took about as strong as Mizar at 15^s	

Plate IV Mizar Full Ap-

0.. 32	j	
1		did not take
2		~~Mizar?~~ very doubtful -
4		Mizar took sure
6		
8		
10		
12	(c)	Comp possibly a trace -
16	(b)	comp took sure

At 19h.. 13m. 0 .. 32 (a)

Images diffuse [on acct. of low altitude ?]

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Plate V a Lyræ Full Ap

0 m 20^s ? very large
1 ---- almost black diameter about
2 1/6 of that of 20^s exposure
3
4
5
6
7
8
9
10 --- 2/3 diam. of 20^s exp.
20 very large

Plate VI a Lyræ 5^m Ap.

20
1 all took strong
2 very fine images
3
4
5
6
7
8
9
10
20

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15 5 2 9

Plate VII 5in Ap α Lyræ

6 × 9	54s
2 × 9	18
3 × 9	27
4 × 9	36
5 × 9	45
6 × 9	54

Plate VIII 5in Ap α Lyræ

Perfect images all Took

20s	
3	
3	
6	
9	
12	
15	
20	

Plate IX 1inch Ap α Lyræ

Probably 2m.30s as the image is somewhat intenser than (a)

2m.30s or 1.30	(e)	
20	(d)	perhaps a trace
40	(c)	Took some strong.
60	(b)	
2 00		
1.30	(a)	

Images at longest exposures 4" in diam outline is sharper than with full ap. but not more so than that of the comp B Mirzan with full ap

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Plate X Aperture 1 in a Lyrae

60 s
20
30
40
15 50
~~60~~

XI Full aperture a Lyrae
Magnified with eyepiece B magnifies 4.2 times

0 .. 20 s
2.5
4
~~5~~
20

1/48 Spaces on plate ~~Time~~ on Sky plate in arc.

No adjustment for Focus -
no images

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The plates of this evening were very good- & the grain of the light action unusually* fine to judge from recollection of the star plates

* Not unusually fine
& the images of stars were unusually diffuse through cyanometrical-

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Aug 14th

Aug 15th

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1857 Aug 12

Occultation of Pleiades

lost by Clouds –

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1857 Aug 14

Comp. γ Lyræ to Alcor By Mr Clarke
double image micrometer

At 9h 00m	m.s.t	14° 266.2
5		262.
10		257.5
23		261.2
32		253.0
37		260.2
42		257.3

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1857 Aug 15 By Dorth eye piece Micrometer

δ Aquila (nearest of the pair which is that following in R) to star of 8th mag following

8″.283°.5	none rejected.
282.0	
281.0	
280.5	
282.0	

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1857.

August $\frac{23}{24}$ – W. P. Tuttle discovered a Comet near AR 9^h – North dec – 79° – between the hours of midnight and 2 Am. first seen at $0^h.40^m$

Places of Comet from Circle readings
No good star of Comparison.
Augr – 25th – Observations made by R. F. Bond
The comet was placed in the centre of the field

at – 20 .. 38 .. 40 by Sid. Chro No. 236.
236 – fast of Sid. time 4 .. 42.2
Camb. sid. time 20 .. 33 .. 57.6
AR Circle read off. 9 .. 21 .. 55.0
AR of ☄ approx. 11 .. 12 .. 02.8 = at – $10^h .. 16^m .. 44^s$ – mean Solar time

Vernier 3 — 257 .. 17 .. 12 Vernier No 2 — 347° .. 13' .. 40" ?
Polar reading – — 270
N. P. D of ☄ 12 .. 42 .48 = N dec – 77° .. 17' .. 12" same time

---

Comet in centre of the field. R. F. B's. 2d set.

Augr – 25th – Chro. 236 – — $21^h .. 13^m .. 22$
236 fast of Camb. sid. time — 4 .. 42.2
21 .. 08 .. 39.8
AR Circle reading — 9 .. 55 .. 35
AR of ☄ approx. 11 .. 13 .. 04.8 at $10^h .. 57^m .. 18^s.1$ m. s. t.

Vernier No 3. Circle — 257 .. 14.40
270
N.P.D — 12 .. 45 .20 = N dec – 77° .14' .40"

Power of 140 was used –

E.C. – 23 .. 39 .. 0
236 – 23 .. 43 .. 22.1

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1857.

August 26th — R. F. B.'s observations — no star of comparison.

Comet placed in the center of the field. 236 fast. 4..45.2

Chro. 236 marked —	19h 12m 42s	
236 fast —	4.. 45	
	19 07 .. 57	
R. Circle reads —	7.. 19.. 59	
R of ☄	11 .. 47 .. 58	at — 8h 47m 00s m solar time.
Dec. Vernier No 3 —	254° .. 57' .. 0"	
	270	
N.P.D. of ☄	15 .. 09 .. 00	— Dec. North 74° 51' .. 00"
		— 2 .. 36
Dec. Vernier No 2 —	344 .. 57 .. 00	74 .. 48 .. 24
Polar reading	360 .. 00 .. 00	
	15 .. 09 .. 00 = — .. .. —	74 .. 57 .. 00

Chro 236 ——— 21 .. 06 .. 14.0

236 fast 4 .. 45.2

21 .. 01 .. 28.8

R Circle 9 .. 12 .. 19.0

R. R — 11 .. 49 .. 09.8 — at — 10 .. 40 .. 13.2 — m solar, t.

Dec Vernier No 3 — 254 .. 27 .. 0

270

N.P.D — 15 .. 33 .. 0 = Dec N — 74 .. 27 .. 0

Vernier No 2 — 344 .. 27 .. 0

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1857. August 31st – Observations on the Tuttle's Comet of 1857.

Chronometer 236 fast of Gam. sid time – 4h 55m 18s By Rate 2s.23

Comet preceds *s

Transit of Comet over Mic. wire – by 236 – 20h 11m 27s
" " " Star (a) " " " " – 20 12 57
" " " (b) " " " " – 20 13 32

Transit of Comet over mic. wire – by 236 – 20 14 17
" " " Star (a) " " " " – 20 15 46
" " " (b) " " " " – 20 16 20

R Circle reading at last observation – 6h 39m 22s

Transit of comet by 236 – 20 14 17
236 fast 4 55 2
20 09 21.8
R Circle reading – 6 39 22
13 09 59.8 at +9° 28' 35.2 m Solar t
−28.4
13 09 31.4

Dec. Circle Vernier No 3 – 239° 40' 48"
Polar point 270
N.P.D. of ☄ 30 19 12 = Dec N 59° 40' 48"
−2.58
59 37 50

Dec. vernier No 4 – 149 40 20
polar point 180
30 19 40 59 40 20
+18
59 40 38
−2 58
59 37 40

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1857. August. 31st

A new set of observations by. R. L. B. comparison of ♄ with adjacent stars (a') and (b'). See Diagram.

Star (a') 9 mag – Star (b') 8th mag.

Chron 236 fast. 4m 55s.3

Comet precedes ✳s.

	h	m	s
Comet passes mid. wire	20	41	10
Star (a')	20	44	00
" (b')	20	44	36

Passage over mid. wire, center of the field.

	h	m	s
Chron 236 – ♄	20	46	26
		4	55.2
	20	41	30.8
	7	31	43
R.A. of ♄	13	09	47.8 – at 10h 00m 38.9 m Solar. t

Comet in middle of the field 236

	°	′	″
Dec. Vernier No 3	23	32	8
Polar Point reads –	27		
♄'s N. P. D –	30	27	52 = Dec N – 5°.32′.08″

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1857 – Observations by R.L.B. on the "Tuttle," or 5th Comet of 1857

Sept. 2d – Comet placed in the centre of the field.

Chro. 236 –		$19^h\ 30^m\ 05^s$
11. fast		$-\ 4\ 58.4$
		$19\ 25\ 06.6$
AR Circle		$6\ 03\ 45$
& R.A.		$13\ 21\ 21.6$ – at – 8.36.35.4. m Solar t
		$-\ 28.4$
		$13\ 20\ 53.2$
Dec. Bonnie No. 3		$233^\circ\ 47'\ 12''$
		270°
N.P.D of ☄		$36\ 12\ 48$ = N Dec $53^\circ\ 48'\ 12''$

Second set of observations. comet placed as before

Time by – 236		$19^h\ 50^m\ 01^s$
236 fast		$-\ 4\ 58.4$
		$19\ 45\ 02.6$
AR Circle		$6\ 23\ 32$
		$13\ 21\ 30.6$
Dec. Bonnie No. 3		$233\ 44\ 16$
		-270
N.P.D of ☄		$36\ 15\ 44$ = N Dec $53^\circ\ 44'\ 16$

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1857.

For Right Ascension readings.

By observation on the stars η Urs. Maj.— Mizar and Alcor

the readings of the Equatorial seem to require the following corrections

The Observations on η Urs maj - 2d Mag — a minus correction of 2s.8 in Rt

" — " — " Alcor (2) 5th Mag — " — " — " — 28.4 — " — "

" — " — " — Mizar (1) 3d mag — " — " — " — 27.3 — " — "

The Declination, circle Verniers No. 1 – 2 and 3 are very nearly identical in their readings { Take No 3 for the reductions
No 2 − 90° = No 3
No 4 + 90° 00' 17".6 = No 3
No 1 + 89° 59' 39" + 90° 00' 17".6 = No. 3

Vernier No 4 requires a plus correction to make it agree with the others — — of 18"

Corrections for Declination Readings.

The observation on η Urs maj. require a minus correction of 3".27

" — " — " Alcor — " — " — 2".52

" — " — " Mizar — " — " — 2".36

9".15

2".38 2".58

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1857. Sept. 1st

Occultation of 28 Capricorni

By - R. F. Bond - Finder of 9" Equat.

66 - 21 .. 12 .. 00
176 - 21 .. 13 .. 03.7

Time of Immersion of * 28 Capricorni - by Chro. 176 - 9h .. 07m .. 20s - 10 beats
-05
9 .. 07 .. 15

Observed H. P. Tuttle.

MC - 10 .. 01 .. 00
1678 - 10 .. 00 .. 51.2

Immersion of 28 Capricorni. State Telescope
By Chronometer No. 1678 - 10 .. 22 .. 00 - 36 beats
7.4
10 .. 21 .. 52.6

Immersion of 28 Capricorni. h m s Equatorial, by J. H. C
By Spring Governor. - - - - - 9. 07. 15

In this observation the telescope was set upon the star at 8h 45m, the spider line bisecting the star - to my great surprise, keeping my eye constantly on the star for the 20 minutes preceding the observation, the bisection, by the micrometer wire, continued perfect up to the moment of the occultation. Such perfect precision in the clock movement regulating the telescope surpassed all my previous expectations.

Jos: H. Clinch
"

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To be reserved for entry of Comet
Observations from another book -

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To get the chemical focus exactly set a plate diagonally its centre nearly the focus & allow a Lyre to trace a line on it. The distinctness of the line will indicate the true chemical focus.

Photography

Stars. ζ Leonis
Polaris
40 & 41 Cephei
ζ Herculis
α Ophiuchi 4.9 6.6 38"
ε Bootis #5 and 6/7
4? Herculis
ξ "
ε Leonis
× γ " may 2.0 & 3.5 . 3"
κ Bootis 5.1 & 7.2 13"
ξ " 4.7 & 6.6 7"
5.2 & 6.1 5"
44 "
κ Herculis 5.0 & 6.0 , 30"
α Herculis 3 and 6.1, 5"
μ Draconis 5.0 " 5.1 2".5 Pos 180°

35 21
R 17h 03m Dec 54 ° 39

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July 8th

N B To get the following expoures for determining the relative magnitudes of Mizar - companion & Alcor.

1st Expoure	=	32s
2nd "	=	2
		4
		6
		8
		10
		12
		16
		20
		24
		28
		32

All at short distances on the plate.

Taken July 8

As Mizar will just take in 4s, its companion in 12s and Alcor in 24s? The above series should fix the times required to bring each out.

Next use an aperture of ~~12in~~ = 10in 8 3/4in giving half the light & try the expoures

60s	
10	
20	
30	
40	
~~60~~	100
~~100~~	60

To get expoures of α Lyræ very long - say 2m

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16 5
24

42
160
142
1

32..42
1 40
34..22

57 5
28
25

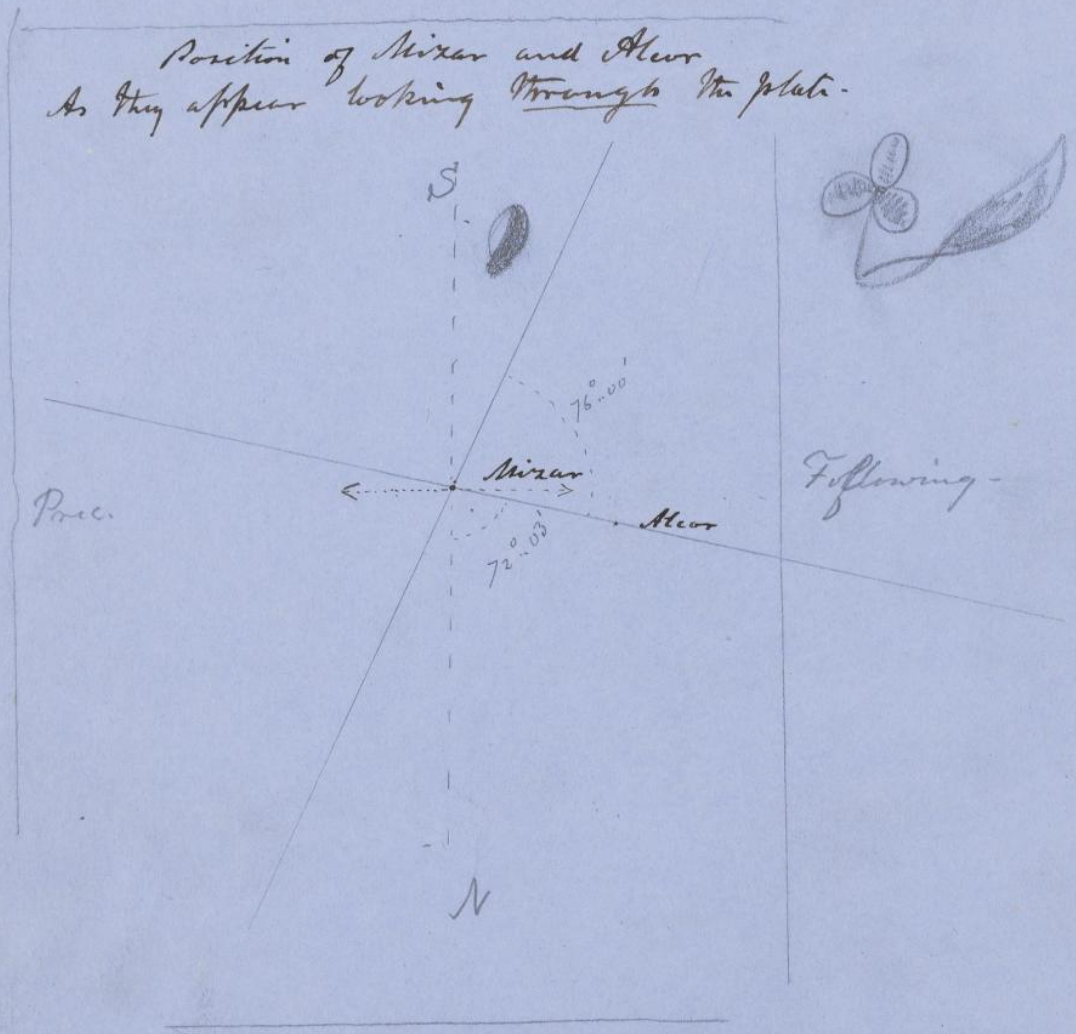
45
32
17

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26, 5
60

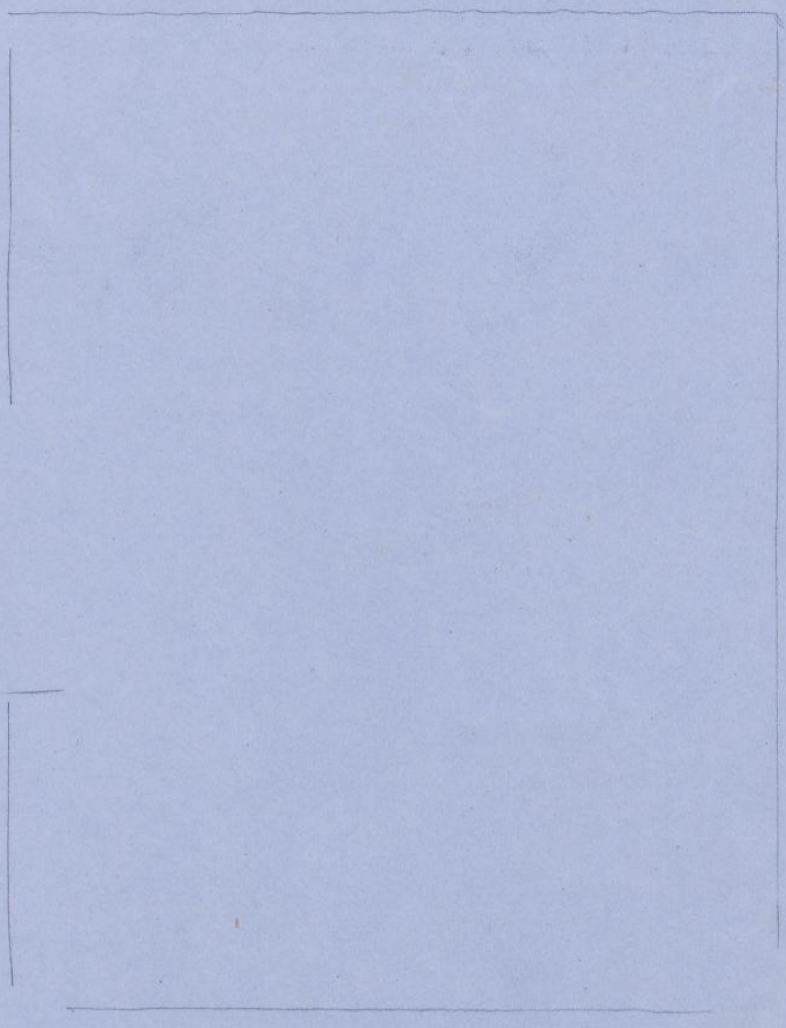
Position of Mizar and Alcor
As they appear looking through the plate.



Alcor ~~preceds~~ follows Mizar by 80^s
and is 3'.40" North of Mizar

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