

KG
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Py Observations of Tempels Comet
May 19 - July 22 1873 and of
Asteroids Nos. 109 112 121
+331 May 18 to Dec 22 1873

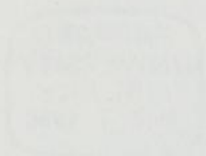
Periodicity of Ruling Machine
Series April 1877 to May 10 1877

1873phae.proj..429R

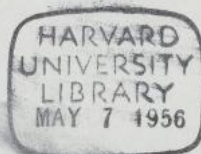
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Observation of Lempels Comet May 4 1873



Observation of Tempel's Comet - May 5 A 23

1879phae.proj.: 429K
Observation of Pempel's Comet May 6. 1913

Observation of Bessel's Comet May 18 1873
Comparison #

Observation of Pimples Comet May 19 1873

Companion # m. about 6^m supposed to be Lac. 30.055 $\delta = -15^{\circ} 46'$

Position of Scale, # and #

Order of observation # 1-2-3 δ # 1-2-3 δ

#	14	57	58	97.5	139.5	57	348
δ	57	20.9	25.7	29.8	57	36.2	
δ -#	+6	15.9	16.0	15.9			

S.T.T.	δ -#	
m	m	s
14	57	26 -6
15	14	34
15	22	01
15	29	13

#	16	8	131	177	223	8	429
δ	14	29.3	34.0	38.5	14	45.2	
δ -#	+6	16.2	16.3	16.2			

S.T.T.	15	15	48	-6	16.00
	3	49	40		
	11	26	08		

#	16	15	411	456	50.1	16	11.1
δ	21	59.0	1.1	5.0	22	10.7	
δ -#	6	15.9	16.5	14.9			

perhaps hit telescope. δ 11 24 29 = M.C.O.M.T.

T	#(1- δ)	δ (1- δ)
	6	1.53
	29.8	15.9
	29.8	13.7
	30.0	15.0
	29.8	14.98

#	16	22	526	568	1.5	22	22.2
δ	29	8.3	13.5	18.4	29	23.3	
δ -#	+6	15.7	16.7	16.8			

Comet covers star - i

Nucleus = star 11-12 May.

log	29.80	1.47422	log	14.98	1.17551
log	15	1.17609	log	15	1.17609
log	15	9.98334	log	15	9.98334
log	F	2.63365	log	II	2.33494
I	430.18		II	216.24	
			I	430.18	
				213.94	

Lac 30055 $\delta = 16^{\circ} 21' 46.5''$ da $\delta = 13.408$

P.D. = 10532.30 δ d $\delta = +8.88$ App. δ of F = 16 31 39

App. δ of 18730 16 25 23

$\delta = -15^{\circ} 43' 43''$

$\delta = -15^{\circ} 47' 17''$

Error of Seeliger's Ephemeris = $4a = -8^{\circ} 41'$ daily change = $6.2'$

$\delta = +0^{\circ} 35'$ " " = $1.2'$

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May 24 1873 J. W. Lys. Comet. Temple.

Comp. # = Altin. 15776 $\lambda = 16\ 30\ 20$ (1873.9) $\delta = -16\ 3'$

Apparent-appearance of scale σ and # \times $\#_2$
 Order, σ - σ - $\#_2$ - $\#_2$ ✓

σ	15	27	12.2	27	28.9
$\#_2$		28	50.0	29	6.2

σ	29	56.8	30	11.2
$\#_2$	31	33.6	31	49.6

σ	32	33.2	32	47.7
$\#_2$	34	89.1	34	38.2

σ	35	36	35	19.3
$\#_2$	36	39.7	36	53.6

σ	37	28.9	37	43.4
$\#_2$	39	5.2		21.0

σ	42	13.8	42	26.6
$\#_2$	41	50.5	42	6.4

σ	42	45.4	43	10
$\#_2$	44	23.0	44	39.1

σ	45	15.2	45	30.1
$\#_2$	46	57.8	47	7.9

σ	51	10.3	51	25.0
$\#_2$				

\times
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May 25 1873 W. & R. R. R. Kempel's Comet.

Comparison star $\#_1 = \text{Altin 15769}$

$\#_2 = \text{.. 15776}$

Apparent positions of scale σ and $\#$'s

I
 $\frac{\#_1}{\sigma}$

II
 $\frac{\#_2}{\sigma}$

Alt. $\sigma - \sigma$ $\#_1$ $\#_2$

$\sigma - \sigma - \#_2 - \#_2$

σ 15 19 18.8 19 38.0
 $\#_1$ 20 54.0 39.2
 - 1 35.2

σ 15 29 23.4 29 05.4
 $\#_2$ 31 36.5 32 2.4
 2 13.1

σ 21 40 21 29.9
 $\#_1$ 22 44.3 22 29.6

σ 32 38.4 32 20.4
 $\#_2$ 34 51.8 35 17.1

σ 22 55.8 23 15.8
 $\#_1$ 24 30.8 24 16.2

σ 35 51.2 35 33.3
 $\#_2$ 37 4.3 37 29.6

σ 24 42.7 25 2.6
 $\#_1$ 26 18.2 3.4

26 37.3 26 57.5
 28 12.8 28 57.8

29 5.4 29 23.5

May 30 1873 J. W. Lawrence Temples Comet
 Comparison star = Aclm. 15661 = R 21 25 - 19 43 1873.
 Apparent position of same comet and # $\times^{\#} \dots \sigma$

May 31 1873 W.A.R. of S. Tempel; Com 1-
 Comp. # = Oeltz 15661 162125-1743 (173)
 Apparent position of scale 0 and # \times 0
 0 apparently above # 65

June 1, 1873 P.W. observes Temples Comet.
 Companion stars. Alt^h 15661 = 162125 - 1743 17730

15661 16 2218 7759 - -

Apparent position of scale comet and stars.
 Order of observation.

June 18/1873

I. W. obs. Lempels Comet.

Assumed place of Comet = $16^h 17^m 30^s - 20^\circ 4'$

Comparison star = unknown.



	α	δ	α	δ	α	δ	α	δ	α	δ
#	15-52	53.3	53-13.8	54-4.4	55-2.9	56-36.9	56-57.6	58-25.4	59-45.6	
δ	53	58.1	54-18.9	55-47.6	56-7.3	57-42.3	58-34	59-31.1	59-3	
δ -#	+1	48		1-6.2	1-5.4	1-5.4		1-5.4		

S. W. & W. A. R. Obs. Tempels Comet -

June 17 1873

Comparison star = 15543 alpha = $16^{\text{h}} 15^{\text{m}} 27^{\text{s}} - 21^{\circ} 01' (1473)$

$\times^{\#}$

Difference of δ by scale = 9.4

Order of observation $\# \delta \times \# \times \delta \times$

By S. W.

By W. A. R.

July 13 1873

Supposed observation of Tempel's comet.

Apparent position of scale # and σ

Assumed place $\sigma = 16^{\text{h}} 18^{\text{m}} 13^{\text{s}} - 24^{\circ} 55'$ Comp # = α ~~15650~~ ¹⁵⁶⁵⁰

$\sigma = 2' 30''$ above comp # Too faint to discern for α estimated by scale. The comet was simply a nebulous, amorphous nucleus, not 1' broad

For α

$$\sigma = 17^{\text{h}} 51^{\text{m}} 57^{\text{s}} \quad \# \quad 53 \quad 40.5 \quad \} \quad 424 = 1^{\text{h}} 3^{\text{s}} \text{ fast-ll.}$$

$$\begin{array}{r} \sigma \quad 17 \quad 54 \quad 58.0 \\ \# \quad \quad 56 \quad 81.0 \end{array}$$

$$\begin{array}{r} \sigma \quad 18 \quad 01 \quad 55 \\ \# \quad \quad 2 \quad 50.0 \end{array}$$

$$\begin{array}{r} 1. \quad 430 \\ \quad 43.0 \\ \quad 44.5 \\ \quad 43.5 \\ \hline 1 \quad 43.50 \end{array}$$

$$\begin{array}{r} \sigma \quad 18 \quad 1 \quad 22.5 \\ \# \quad \quad 6 \quad 6.0 \end{array}$$

Aug 22 1873 Suppond Detection of Tempels Comet.
 First W&R, detected it: He then ~~plotted~~^{put it} in the field but not in
 the center and Mr. Cornet - immediately marked the same object
 as having nebulous. Prof. Winlock did the same, but all three
 observers agree that the nucleus (if it was a comet) was much
 brighter than it - apparently should be. It was estimated by W&R
 to be 14th mag.

Assumed place of $\sigma = 16^{\circ} 24' 28'' - 26^{\circ} 8'$
 Comp # precedes above. Apparent position $\sigma = 45^{\circ} - 5' 10''$
 Comp # does not seem to be in Altus though it is 8 mag.
 The finding comparison stars are $16^{\circ} 27' 09'' - 26^{\circ} 10' 11''$ & $16^{\circ} 27' 28'' - 26^{\circ} 12'$
 The first finding, the Comp # about 1st 48th and opp. below.

Chart -

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Am Arbor 1873 Dec 15

My dear Sir

I succeeded last night in the intervals of passing clouds in finding *Hermione* (121) an ephemeris of which I sent you.

Its place was as follows:

N. A. M. J. (121) α (121) δ
 1873 Dec 15th 7^h 45^m 21^h 53^m 4.6 -19° 58' 30"

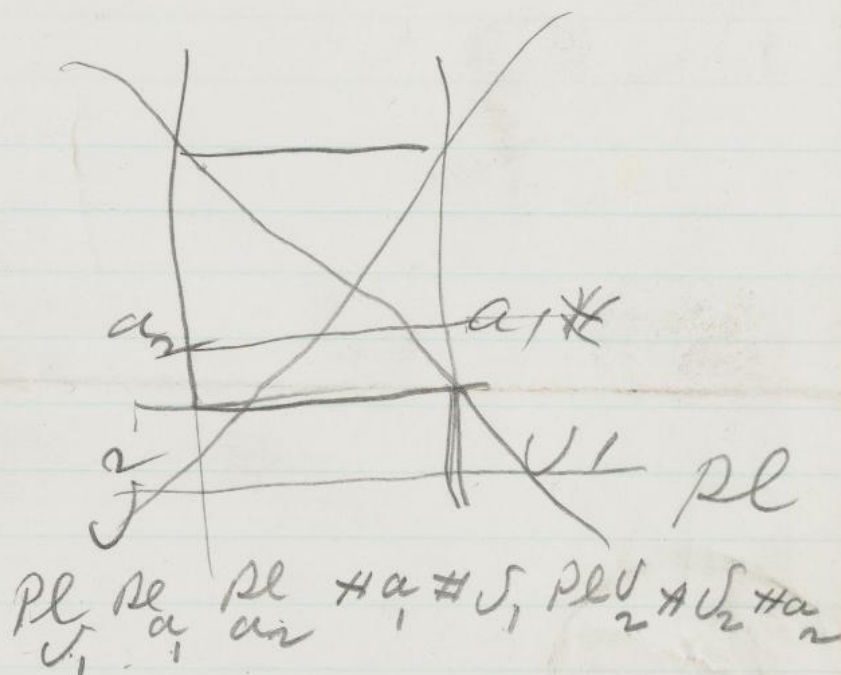
The correction of the ephemeris is therefore

$$\Delta\alpha = -56^s \quad \Delta\delta = -6.0$$

It was about 13th magnitude as seen low down, & dimmed by the vapors near the horizon. I hope you may be able to observe it.

Yours very truly
 James C. Watson

Prof. Joseph Winlock
 Cambridge
 Mass



If you shall be favored with clear
nights after the full moon I shall
be specially obliged if you will find
& observe these two planets. I
hope to see them myself & I will
find them if I can have a few
clear nights.

Yours very truly
James C. Watson

Professor Joseph Winlock
Director of Lick Observatory
Cambridge
Mass

		10	11	5.6	
14.5	21 38 42	10 39.8	11.5		
18.5	21 45 12	10 14.5			
22.5	21 51 48	9 47.7	11.6		
26.5	21 58 28	9 19.5			
30.5	22 5 13	- 8 50.0	11.7		

I think that this Ephemeris cannot be in error to exceed $\pm 2^m$

in R.A. The magnitude of the planet is about 12th.
The values given are derived from the estimated mag-
nitude when the planet was observed in 1872

1873 June 9
 July 31
 10 A.M.
 6 NE
 5 N
 9 SN
 2 NW
 3 NE
 4 P.M.
 6 SE
 3 SE
 7 W
 1 W
 4 SE
 34
 49
 48

Am Arbor 1873 Dec. 2

My dear Sir

On July 29th I found a planet which
 I have searched for since August 16th without suc-
 cess. In doing so I had to neglect
 the preceding of (119) and
 (121) since I have had so few clear nights.
 I desire to find them if possible before they are
 lost in twilight, but as it is quite uncertain
 in regard to clear sky I venture to ask you
 to help me find them. For this purpose
 I submit ephemerides as follows:

(119) Althara			
Berlin M.T.	(119) α	(119) δ	Mag.
1873 Dec. 6.5	21 ^h 26 ^m 0 ^s	-11° 25.9'	11.4
10.5	21 32 18	11 3.6	20
14.5	21 38 42	10 39.8	11.5
18.5	21 45 12	10 14.5	
22.5	21 51 48	9 47.7	11.6
26.5	21 58 28	9 19.5	
30.5	22 5 13	-8 50.0	11.7

I think that this ephemeris cannot be in error to exceed $\pm 2''$
 in R.A. The magnitude of the planet is about 12th
 the values given are derived from the estimated mag-
 nitude when the planet was observed in 1872

(121) Hermione

Berlin M.T.	(121) α	(121) δ	May
1873 Dec. 6.5	21 ^h 43 ^m 13 ^s	- 21° 2'	11.3
10.5	21 47 53	20 32	
14.5	21 52 42	20 1	
18.5	21 57 39	19 30 30	11.4
19	55	19 30 30	
20	55	19 30 30	
21	55	19 30 30	
22.5	22 2 42	18 58 8	32
26.5	22 7 52	5 10 18 26	
30.5	22 13 6	- 17 54	11.5

The elements from which this ephemeris is derived represent the observation 1872 May 12 to July 9th. I think that it is quite probable that the correction of the ephemeris in Dec. may be about +8' or +10', & that the right ascension is not far out. It would be safe I think to search within $\pm 2^m$ in R.A. $\pm 10'$ in Dec. in the case of both planets. The magnitude of (121) is probably about 12th. The values given are calculated from the estimates made at opposition in 1872.

Ann Arbor 1873 Dec. 12

My dear Sir

Dr. Peters succeeded on the
8th inst. in finding Althaea (119)
^{the} following place
1873 Dec. 8 7^h 30^m $\alpha = 21^{\circ} 28' 15''$ $\delta = -11^{\circ} 14'$

So that the correction of the ephemeris is about
 $\Delta\alpha = -59''$ $\Delta\delta = -0.7$. — I have not
yet had a clear night. I hope you
may get an observation of it. He says
it is 12.13 mag. Please if
possible get me one or two places
of Harmonie (121) also. I
presume you have received the
ephemerides which I sent you for
three planets.

Yours very truly
James C. Watson

Prof Joseph Winlock
Cambridge Mass

Formulas for Reduction from 1850 to 1873.

$$d\alpha = \sqrt{10.63 + 1.48783 \sin a_m \tan \delta_m}$$

$$d\delta = 2.66892 \cos a_m$$

May 18

μ μ	μ' μ_a	μ''	μ'''
-62.46	+27.	+182.6	+27
1.79560	9.43136	1.26150	.43136
-1.998	-01	+38.1	
<u>-20.01</u>		<u>+1</u>	
45.67	47 15	38.2	0
		7.1	32.24
c 23.6	647 15	28.9	31.24
o 25.11			
c-o 0.576			

~~-2.65~~
~~-1.3~~
~~2.68~~
~~45.67~~
~~23.99~~ μ'' μ
~~24.19~~ μ μ'
 1.20

+63.3
~~63.3~~
~~7.1~~
 0.35 31.24

Observation (112) May 18/1872 U.S.R.

Comp. # = Celn. 15070

Position of scale $\frac{1}{11}$ Re.

$$\alpha = 15^{\circ} 49' 35.6'' - \delta = -24^{\circ} 23' 37.8''$$

Reduction formulae from 1850.0 to 1873.0

$$d\alpha = +1'' 10.63 + 1.48883 \sin \alpha \tan \delta$$

$$d\delta = 2.66392 \cos \alpha$$

$$\alpha_m = 237^{\circ} 33' 30'' \quad \delta_m = -24^{\circ} 25' 27''$$

$$\begin{aligned} \log b &= 1.48783 & \log b &= 2.66392 \\ \log m &= 9.92631 & \cos \alpha &= 9.72952 \\ \log \sin &= 9.66785 & &= 2.39344 \\ &= 1.08199 & & \\ &= 12.08 & & \\ &= 1 10.63 & &= 44.4 \\ &= 1 22.71 & &= 24 23378 \\ &= 15 493565 & &= 24 27452 \\ &= 15 505836 & &= 9.6 \\ &= 4m + 1.225 & &= 24 27548 \\ &= 1873.0 1551 008 & & \end{aligned}$$

$$\begin{aligned} 1873.0 & \quad \checkmark \\ \text{Celn.} & 14 50 58.36 - 24 27 45.2 \\ \text{N.C.O.} & 58.14 \quad 27 45.2 \end{aligned}$$

$$\begin{aligned} \text{Adopt.} & 14 50 58.14 - 24 27 45.2 \\ & 1.72 \\ & 58.86 \quad 27 54.8 \end{aligned}$$

Observations.

Par	Pl. #	h	m	s	h	m	s	Pl. #	h	m	s	Pl. #	h	m	s	Pl. #	h	m	s
D	17 42.65				Pl.	18 33 28.0	33 38.5	3	36.0	-10.5	-2.50	Pl.	15 50 58.86	-24 27 54.8					
#	45 41.0	-33 45			#	37 04	33 28.0	3	36.0	-10.5	-2.50	#	15 50 58.86	-24 27 54.8					
	46 57.0	34.0			Pl.	40 28.5	41.0	3	36.0	-6.5	-3.15	Pl.	15 47 24.99	-24 31 53.5					
	50 28.0				#	44 45	36.0	3	36.0	-10.0	-2.30	Pl.	15 47 24.99	-24 31 53.5					
	57 13.0	34.5			Pl.	47 46.5	56.5					#	15 47 24.99	-24 31 53.5					
	54 47.5				#	51 22.5	45.5						15 47 24.00	-24 31 53.5					
	58 40	34.5				18 40 34							15 47 24.00	-24 31 53.5					
	1 38.5					18 40 58							15 47 24.00	-24 31 53.5					
	2 10.0	35.0											15 47 24.00	-24 31 53.5					
	5 45.0												15 47 24.00	-24 31 53.5					
	6 34.0	35.5											15 47 24.00	-24 31 53.5					
	10 19.5												15 47 24.00	-24 31 53.5					
	10 46.0	35.0											15 47 24.00	-24 31 53.5					
	14 21.0												15 47 24.00	-24 31 53.5					
	15 32.0	35.5											15 47 24.00	-24 31 53.5					
	19 25												15 47 24.00	-24 31 53.5					
	20 57.0	35.5											15 47 24.00	-24 31 53.5					
	24 32.5												15 47 24.00	-24 31 53.5					
	15 02 04	-3 34.89											15 47 24.00	-24 31 53.5					
	18 02 28												15 47 24.00	-24 31 53.5					

W. R. Sles (112) May 19 1873

Comparison # = Celn 15070 $\alpha = 15^h 49^m 35.5^s$ $\delta = -24^{\circ} 23' 37.8''$ (150)

Observed with glass micrometer.

Position of micrometer. apparent ~~III~~^{IV} Pl. #

Order of observation Pl. 1-2-3-4 # 1-2-3-4

Planet appears a little higher in the field. Red. to 13.56^h

Pl. 13	31	20.0	25.4	29.8	31	45.8		
# 13	35	45.5	50.4	54.9	36	14.0		
Pl-#	4	25.5	25.0	25.1	2	13	31	23-4 25.20 - 26.20

Pl. 13	37	10.7	15.6	19.9	37	36.3		
# 13	41	36.3	45.0	45.6	42	4.6		
Pl-#	4	25.6	25.4	25.7				
							13 37 13 4 25.57	26.21

Pl. 13	42	43.5	48.0	52.9	43	9.0		
# 13	47	9.1	14.0	18.7	47	37.6		
		25.6	26.0	25.8				
							13 42 45-4 25.80	26.42

Pl. 13	48	22.1	27.0	31.3	48	48.1		
--------	----	------	------	------	----	------	--	--

Pl. 13	59	34.6	39.6	44.0	60	0.7		
# 14	4	0.6	5.8	10.3	4	30.1		
		26.0	26.2	26.3				
							13 59 37-4 26.17	26.03

Pl. 14	7	55.4	0.8	5.0				
--------	---	------	-----	-----	--	--	--	--

Pl. 14	9	6.7	11.6	16.4	9	35.3(?)		
# 14	13	33.7	38.6	43.2	14	4.3		
		25.0	27.0	26.8				
							14 9 9-4 26.93	26.36, ^{hi telescope}

Pl. 14	14	31.6	36.7	40.8	14	59.1		
# 14	18	58.5	3.4	8.2		29.0		
		26.9	26.7	27.4				
							14 14 34-4 27.00	26.19

Pl. 14	20	18.9	23.9	28.5	20	47.0		
# 14	24	46.3	57.0	56.0	25	17.0		
		27.4	27.1	27.5				
							14 20 21-4 27.33	26.25

Mean 13 56 26 - 4 26.29 26.24

Hourly rate in α from obs. of May 19 = $-\frac{2.7}{2}$

Hourly rate from B.S. = 2.57

Pl-# = -4 26.27

15 51 0.09

Pl. 15 46 33.80

May 19 11 13 obs. 21121
 obs. for

T	$P_i - P_j$	$\# - \#$	$\#$	h	u	v
13 31 20	-25.8	-28.5	Pl-#	15 50 54.86	-24	27 54.8
13 37 11	25.6	28.3	Pl.	-4 26.29	-	39.6
13 42 43	25.5	28.5	Pl.	15 46 33.84	-24	28 34.4
13 59 35	26.1	29.5	Pl.	15 46 33.36	-24	28 29.7
(14 9 10	28.6	30.6)				
14 14 22	27.5	30.5				
14 20 19	28.1	30.1				
13 55 57	26.43	29.33				
mean.	26.43	29.33				

$$\log 26.43 = 1.4210 \quad 29.33 = 1.4673$$

$$\log 15 = 1.17609$$

$$\log 10 = 1.0$$

$$\log \text{Red.} = 2.59819$$

$$\log \text{Red.} = 2.55914$$

$$\log \text{Red.} = 6.3646$$

$$\log \text{Red.} = 2.55733$$

$$\log \text{Red.} = 6.009$$

$$\log \text{Red.} = 6.009$$

$$\log \text{Red.} = 6.009$$

$$\log \text{Red.} = 6.009$$

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$$\log \text{Red.} = 6.009$$

$$u_a \quad u'a \quad u'' \quad u'''$$

$$-6262 - 0.6 + 187.9 + 2.6$$

$$1.79671 - 9.77815 - 2.27393 - 0.41497$$

$$-292.0 + 27.60$$

$$-29.21 + 28.15$$

$$15 46 43.11 - 24 28 33.7$$

$$15 46 33.90 - 24 28 33.7$$

$$15 46 33.36 - 24 28 29.7$$

$$15 46 33.36 - 24 28 29.7$$

$$15 46 33.36 - 24 28 29.7$$

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$$15 46 33.36 - 24 28 29.7$$

$$15 46 33.36 - 24 28 29.7$$

$$N.C.M. 10.65 20$$

$$-5-11 54$$

$$9 53 26$$

$$+5 38 6$$

$$15 31 32$$

$$14690$$

$$9.16702$$

Observation of (112) May 20 1973 N.R.
Comp. # same as May 19

apparent position of scale Pl. and # H.R.*

Planet - 2.9 dia. below # Order Pl. 123-5 # 123-5

Pl.	13	4	10.9	15.0	19.3	40.8	(Pl-#)	TT	Pl-#
#	9	36.6	41.6	46.2	57.1				
Pl-#	(5	25.7)	26.6	26.9	53	5	26.75	13	4 15-5 26.75

Pl.	13	10	41.4	46.3	50.9	(11) 11.8			
#	16	8.8	13.7	18.3	28.7				
Pl-#	5	27.4	7.4	27.5		5	27.43	13	10 46-5 27.43

Pl.	13	58	18.1	22.8	27.5	42.8			
#	58	46.9	51.3	56.2	60.2				
Pl-#	5	28.6	28.5	28.7		-5	28.60	13	58 23-5 28.60

Pl.	13	59	47.9	52.4	57.0				
#									

Pl.	14	07	47.9	52.9	58.5	(8) 13.8			
#	13	18.3	22.9	27.8	31.7				
Pl-#		30.6	30.0	29.8		-5	29.97	14	07 38-5 29.97

Pl.	14	14	34.2	38.7	44.6	59.0			
#	20	04.0	9.0	13.9	17.1				
Pl-#	5	29.8	30.3	29.1		-5	29.73	14	14 35-5 29.73

Pl.	15	57	48.0	52.8	57.5	58.130			
#	16	3	22.2	27.0	31.5	35.2			
Pl-#		34.2	34.2	34.0		-5	34.13	15	57 48-5 34.13

Pl.	16	3	58.7	4.2	8.0	(4) 24.8			
#	9	34.1	38.7	43.5	47.0				
Pl-#		38.4	34.5	34.5		-5	34.47	16	3 58-5 34.47

Pl.	16	10	5.0	9.4	14.6	29.0			
#	15	39.9	44.8	49.2	51.8				
Pl-#		34.9	35.4	34.6		-5	34.97	16	10 50-5 34.97

Pl.	16	16	33.0	37.6	42.1	(18) 3.8			
#	22	7.8	12.6	17.0	26.0				
Pl-#		34.8	35.0	34.9		-5	34.90	16	16 33-5 34.90

Pl.	16	28	4.1	8.8	13.6	35.0			
#	28	39.6	44.3	49.1	58.0				
Pl-#		38.5	38.3	38.3		5	35.50	16	28 41-5 35.50

Pl.	16	29	21.6	26.6	31.3	49.4			
#	34	57.1	62.3	67.9	12.4				
Pl-#		35.5	35.7	35.6		5	35.60	16	29 21-5 35.60

Pl.	16	37	0.6	5.2	10.1	20.9			
#		36.6	41.3	46.2	52.0				
Pl-#		36.2	36.2	36.2		5	36.07	16	37 06-5 36.07

Reduction of declination observations

Pl.	#						
$T_m - T_s$	$T_m - T_s$						
21.5	10.9	$\log 21.30 = 1.32888$	$\log 10.65 = 1.02435$	$\log \tan 45 = 1.00000$	$h - 5$		
21.1	10.4	15.12 1.17955	3.52 0.54654	15 1.17609	13 4 19		
21.30	10.65	21.56 1.33365	8.95 0.95182	15 9.95914	10 50		
		18.10 1.25768	5.50 0.74036	$\log 6 = 2.13523$	13 7 34		
15.3	4.0				13 53 27		
15.3	3.9				13 55 57		
14.4	3.4	3.46361	3.16258		14 7 58		
15.5	3.7	3.31498	2.68187		14 14 44		
15.8	3.0	3.46888	3.08705		15 57 57		
14.4	2.6	3.39291	2.87559		16 4 10		
15.12	3.52				16 10 15		
					14 55 30		
21.7	5.0	Pl. 4' 50.8	3' 26.4	4' 54.4	4' 9.1		
21.4	8.8	# 2 25.4	48.0	2 2.2	1 15.1		
21.56	8.95	Pl-# 2 25.4	2 38.4	2 52.2	2 52.0		
16.1	5.5						
18.10	5.50						
15.5	3.7	1.19083	0.56821				
15.8	3.5	1.19866	.54405				
14.4	2.6	1.15836	.41497				
		3.32556	2.70344				
		3.33889	2.67930				
		3.29359	2.55020				
Pl.		3' 30.2	3' 25.7	3' 16.6			
#		50.5	47.8	35.5			
Pl-#		2 39.7	2 37.9	41.1			
u	u	u	u				
-62.70		+193.1	+2.5				
1.79727		2.28578	0.39794				
-15.14		+46.6					
-15.14		46.8					
15 45 40.43	-24 25 51.2						
15 45 25.29	-24 25 4.9						
24.83	-24 25 4.4						
0-0 = +.48	+2.8						

15 57 52	+2 39.7						
16 4 4	37.9						
16 10 9	41.1						
16 16 38							
16 23 9							
16 29 27	52.2						
16 37 05	52.2						
Pl-#	+2 44.6						
#	-24 27 54.8						
Pl	-24 25 10.2						
	+5.4						
	-24 25 7.8						
Refine	+4						
	-24 25 4.6						

Observation (112) (N.R.) May 25-1873

Comparison stars

$$1 = \text{Celt. } 14840 = 15^h 36^m 54.9^s - 24^d 14' 21.0''$$

$$2 = \text{.. } 14841 = 15^h 36^m 59^s - 24^d 04' 57.8''$$

Position of scale Hand and Stars =

$\times \begin{smallmatrix} \#1 \\ \#2 \end{smallmatrix}$

.Pl.

R = about 70" below #2 (apparent)

Order of observation $\#1 - \#2 - \#2 - \#2 - \#2 - \text{Pl.} - \text{Pl.}$

#	h	m	s	Pl. #	Pl. #	T	# (1-5)	# (1-5)	Pl (1-5)
#1	13	35	12.9	39	50.7				
#2	35	14.0	35	36.8					
Pl.	37	15.0	37	40.6	+2	21	+1	58.0	13 37 15 + 22.2 # 19.6 - 25.6
					18	57.7			21.6 19.4 25.1
#1	38	14.9	37	53.3	20	57.8			21.6 19.6 25.3
#2	38	14.0	38	38.4	20	57.8			19.3 21.4 27.2
Pl.	40	16.7	40	41.8	19	57.6			24.7 16.0 21.7
					16	57.3			25.0 16.3 22.0
#1	41	19.0	40	57.4	15	57.3			24.9 16.0 21.7
#2	41	23.2	41	42.8	12	57.1			24.8 15.9 21.5
Pl.	43	21.0	43	46.3					
					+2	1.76	1	57.58	13 47 54 + 23.01 - 18.05 - 23.78
#1	44	41.0	44	21.7					
#2	44	15.2	45	6.6					
Pl.	46	43.0	47	10.2					
#1	47	48.5	47	23.8					
#2	47	52.8	48	8.8					
Pl.	49	50.4	50	12.1					
#1	50	67.0	50	26.1					
#2	50	55.3	51	11.6					
Pl.	52	52.6	53	14.6					
#1	53	54.6	53	29.7					
#2	53	58.8	54	14.8					
Pl.	55	56.1	56	17.8					
#1	56	55.9	56	31.1					
#2	56	60.0	57	15.9					
Pl.	58	57.1	59	18.6					

$$u \quad u' \quad a \quad w \quad i$$

$$-61.81 + 20 \quad +214.6 + 1.8''$$

$$1.79106 \quad 9.30103 \quad 2.83163 \quad 0.25527$$

$$-7.71 \quad +26.8$$

$$15.402819 \quad -24.8288$$

$$18.402048 \quad 20.48 \quad 24.8 \quad 22.0 \quad 22.0$$

$$19.88 \quad 19.74 \quad 15.8 \quad 14.5$$

$$+0.66 + .80 \quad 1.78 \quad 1.5$$

$$6.0 \quad 7.4 \quad 7.6 \quad 7.4$$

$$\text{Pl. } \#1 = +2.176 \quad \text{Pl. } \#2 = +1.5758$$

$$\# 15.381831$$

$$\# 15.382232$$

Pl.

$$\text{Pl } 15.402007 \quad 15.401990 \quad \log 15.40 = 1.2564 \quad \log 23.78 = 1.37621$$

$$\log 2.301 = 1.36192 \quad \log 15 = 1.17609 \quad 1.17609$$

$$1.17609 \quad \log 23.78 = 1.37621$$

$$7.96016 \quad 7.96016$$

$$2.48818 \quad 2.39272$$

$$5.71499 \quad 4.95298$$

$$4.070 \quad 5.254$$

$$\text{Pl. } \#1 \quad 9.21910 \quad 40.3$$

$$\text{Pl. } \#2 \quad 1.184 \quad 1.184$$

$$2.47615$$

$$31.34$$

$$32.39$$

$$339070$$

$$257044$$

$$32.39$$

$$\text{Pl. } \#1 \quad 62.3 = 10.403 \quad 10.373$$

$$\text{Pl. } \#2 \quad 7.0 \quad 1.184 \quad 1.184$$

Reduction to apparent place.

	λ	μ	ν	ξ
λ_m	15 36 28 = 234 07	15 36 28 = 234 38	15 36 28 = 234 38	15 36 28 = 234 38
λ_m	- 24 16	- 24 03	- 24 03	- 24 03
$\log \cos \lambda$	1.48783	1.48783	1.48783	1.48783
$\sin \lambda_m$	9.90860	9.90860	9.91028	9.91028
$\tan \lambda_m$	9.65231	9.64960	9.65400	9.65096
$\log I$	1.04874	1.04603	1.05207	1.04908
I	+ 11.19	+ 11.12	11.27	11.79
$\cos \lambda$	1 10.63	1 10.63	1 10.63	1 10.63
4α	1 21.82	1 17.5	1 21.90	1 21.82
$\log \cos \mu$	9.76800	9.76800	9.76488	9.76488
$\log \cos \nu$	2.66392	2.66392	2.66392	2.66392
$\log 4\alpha$	2.43192	2.43192	2.42880	2.42880
4α	- 4 20.3	- 4 30.3	- 4 28.4	- 4 28.4

[Handwritten notes and calculations, mostly illegible due to blurring.]

Peter's observation of (112) May 19 1873

W.C. M.T. 14^h 22^m 29^s $\alpha = 15^{\circ} 46' 21.04'' + 4\alpha$ $\delta = -24^{\circ} 27' 57.8'' + 4\delta$

Comp # = 1573.0 $\alpha = 15^{\circ} 45' 59'' - 24^{\circ} 29' 00.4''$

14 20 33
5 55 12
20 15 45
34424 9.53680

179671 8.77815 2.27383 0.41457
-6262 -06 +1879 +26
-21.57 +1.60
15 46 43.11 24 29 1.8
15 46 21.54 24 27 56.8
15 46 21.04 57.8
+50 +1.0
-6242 +10 +2069 +21
179582 231576

Kell's observation of (112) May 23

W.M.T. 11^h 14^m 19^s $\alpha = 15^{\circ} 42' 18.70''$ $\delta = -24^{\circ} 15' 6.8''$

11 2 28
1 47
17 4 04
21116
9.32461

15 42 32.52 -24 15 10.6
15 42 19.35 -24 15 6.6
15 42 18.70 -24 15 6.8
+65 +0.2

The inclination of the declination line in the brass bars will be assumed 45° 8'

Inclination from N.C.D. observations for δ

$\Delta(\#1 - \#2) = 59.5''$ $\log \delta_{\text{mean}} 2.77453 - 2$ $\log \tan L = .00048$ $L = 45^{\circ} 2'$

$\Delta(\#2 - \#3) = 450.5''$ $\log \delta_{\text{mean}} 2.65041$ $\log \tan L = .00228$ $L = \frac{45^{\circ} 13'}{45^{\circ} 8'}$

By reducing both towards the angle which satisfies the observation seems to be 44° 52'. Investigate.

$$\begin{array}{cccc} \mu^* & \mu^1 & \mu_{\text{J}} & \mu^1_{\text{J}} \\ \mu & \mu & & \end{array}$$

$$-61.39 \quad +23 \quad +218.0 \quad +1.6$$

$$1.98810_{\text{m}} \quad 9.36173 \quad R.33846 \quad 0.20412$$

$$\begin{array}{cc} -15.35 & +5.45 \\ +1 & +1 \end{array}$$

$$-15.34 \quad 5.46$$

$$53926.07 - 24 \text{ } 05 \text{ } 12.4$$

$$103911.23 - 24 \text{ } 4 \text{ } 17.8$$

$$7.74 \quad 24 \text{ } 4 \text{ } 10.1$$

$$49 \quad -7.9$$

Oles. (112) May 29 1873 (mini bars)
Comparison stars

celtn. 1873. $\#_1$ $h \ m \ s$ 15-33 40 - 23 58 celtn. 14764
 $\#_2$ 15-34 25 - 23 53 14778
 $\#_3$ 15-35 25 - 23 57 14795
 $\#_4$ 15-36 43 - 23 59 14813

Apparent position of stars, planet and scale.

$\times \#_1 \quad \#_2 \quad \#_3 \quad \#_4$

For $\sqrt{\quad}$ $\#_1 = +3.7$ $\#_2 = -0.9$
 $\#_4 = +3.8$ $\#_3 = -3.1$

$\times \#_1 \quad \#_2 \quad \#_3 \quad \#_4$

$\log 15 = 1.17609$
 $\cos 23.5^\circ = 9.96101$
 1.13710

Order of observation $pl = -1.4$

	$\#_1$	$\#_2$	$\#_3$	$\#_4$	$\#_1$	$\#_2$	$\#_3$	$\#_4$	$\#_1$	$\#_2$	$\#_3$	$\#_4$					
$\#_1$	16	55	57.4	55	44.8	59	39.7	59	27.0	3	84	2	53.7	8	49.1	8	32.0
$\#_2$		56	40.2	56	53.4	0	22.6	0	36.0	3	51.3	4	47	9	32.0	9	40.3
$\#_3$		57	41.2	58	3.6	1	23.7	1	45.0	4	52.7	5	14.1	10	33.5	10	49.8
pl		58	0.18	58	36.4	2	3.8	2	18.5	5	32.8	5	47.3	11	13.1	11	22.4
$\#_4$		58	59.4	58	45.9	2	41.7	2	28.1	6	10.6	5	54.1	11	51.4	11	32.8
$\#_1$	17	12	27.7	12	10.8	16	100	16	27.0	20	13.6	19	57.0	25	19.6	25	17.6
$\#_2$		13	10.4	13	19.1	16	48.8		1.9	20	56.4	21	5.6	26	2.6	26	11.2
$\#_3$		14	11.6	14	28.4	16	53.7			21	57.7	22	14.5	27	4.1	27	20.9
pl		15	51.2	15	01.2					22	36.8	22	47.6	27	42.8	27	53.9
$\#_4$		15	29.6	15	11.1					23	57.2	22	57.3	28	21.7	28	3.5

pl- $\#_1$	pl- $\#_2$	pl- $\#_3$	pl- $\#_4$	TP	$\#_1$	$\#_2$	$\#_3$	$\#_4$
+2. 29.4	+1 41.6	+0 40.6	-0 37.6	16 58 22	+12.6	-13.2	-21.4	-14.6 +13.7
24.1	41.2	40.1	37.9	17 02 4	+12.7	-13.4	-21.3	14.7 13.6
24.4	41.5	40.1	37.8	05 33	+12.7	-13.4	-21.4	14.5 13.5
24.0	41.1	39.6	38.3	11 13	+17.1	-8.3	16.3	9.3 18.2
23.3	40.6	39.4	38.6	14 51	+16.9	-8.7	16.8	10.2 18.5
23.2	40.4	39.1	38.9	22 07	+16.6	-8.2	16.8	10.8 18.4
23.3	40.3	38.8	38.8	27 43	+17.2	-8.6	16.8	10.3 18.2

+2 23.81 +140.96 +0 39.67 -0 38.27 17 11 46 +12.6 -13.33 -21.37 -14.60 +13.60
 -16.95 8.70 16.68 10.47 18.22

(V) pl- $\#_1$ 6' 13.5
 pl- $\#_2$ 19.5
 pl- $\#_3$ 1 30.3
 pl- $\#_4$ 6 29.3

17 11 46
 +23
 17 12 09
 4 29 06
 12 43 3
 -2 5
 12 40 58
 -11 50
 12 29 8
 5 38 6

log. 1.10277 1.12483 1.32980 1.16435 1.13357
 1.12716 1.10710 1.10510 1.10710 1.10710
 1.22917 0.93952 1.22220 1.01157 1.26293
 2.23887 2.26193 2.46680 2.30145 2.27064
 2.36627 2.07662 2.30930 2.14869 2.40003
 17.37 18.28 29.30 20.62 18.65
 23.24 11.9.2 22.84 14.08 25.1.2

18 07 14 = 2.5502 9.40657

May 29 observation of 1125 with glass scale.

#1	17	51	53.5	54.5	54.2	52	52	120	17	45	38.4	41.2	43.9	45	57.4	17	42	0.3	24	4.8	42	68.8
#2		52	38.1	40.3	42.9	52	57.3			46	22.1	24.3	26.6	46	34.1		42	43.0	45.2	47.4	42	55.2
#3		53	39.1	41.7	44.0	54	0.4			47	23.0	25.6	27.9	47	43.6		43	44.3	46.4	48.8	44	4.3
DL.		54	17.5	19.4	22.2	54	32.5			48	1.6	3.9	6.3	48	16.1		44	22.3	25.1	27.2	44	36.3
#4		54	57.6	59.8	2.2	55	15.8			48	41.1	43.4	46.0	48	60.3		45	2.4	47	16.9	45	22.0

T	PL-21	PL-22	PL-23	PL-24	T
+2	22.37	39.67	38.37	39.80	17 54.20
	22.43	39.60	38.43	39.57	17 48.04
	22.07	39.43	38.20	40.07	17 44.25
					17 48.56

$T_2 - T_1$	$\#_1$	$\#_2$	$\#_3$	R_1	$\#_4$
-13.8	8.6	16.4	10.3	13.6	
13.5	7.5	15.7	9.8	14.3	
14.0	7.8	15.8	9.1	15.1	
<u>13.77</u>	<u>7.97</u>	<u>15.97</u>	<u>9.78</u>	<u>14.33</u>	
1.13898	0.90146	1.20330	0.98811	1.15625	
1.13710	1.13710	1.13710	1.13710	1.13710	
2.27603	2.03856	2.34040	1.12521	2.29335	
1.888	1.093	2.180	1.334	1.965	

Pl-# 2 2229 1395 3833 3981
 # 15 23 4502 342792 32910 36 4709
 Pl 15 36 731 748 743 728
 Day 5.18 5.18 5.18 4.17
 Al(C) 7.68 7.68 7.68 7.43
 Al(C) 8.18 8.18 8.18 8.18
 +80 +50 +58 +88
 17 49 19
 4 29 06
 13 20 13
 - 2 11
 10 18 02
 - 8 11 50
 13 6 12
 5 38 6
 18 44 18
 6 44 18 = 28076
 9 44834

Pinibau.

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8	#1019	#1020	#1021	#1022	#1023	#1024	#1025	#1026	#1027	#1028	#1029	#1030	#1031	#1032	#1033	#1034	#1035	#1036	#1037	#1038	#1039	#1040	#1041	#1042	#1043	#1044	#1045	#1046	#1047	#1048	#1049	#1050	#1051	#1052	#1053	#1054	#1055	#1056	#1057	#1058	#1059	#1060	#1061	#1062	#1063	#1064	#1065	#1066	#1067	#1068	#1069	#1070	#1071	#1072	#1073	#1074	#1075	#1076	#1077	#1078	#1079	#1080	#1081	#1082	#1083	#1084	#1085	#1086	#1087	#1088	#1089	#1090	#1091	#1092	#1093	#1094	#1095	#1096	#1097	#1098	#1099	#1100	#1101	#1102	#1103	#1104	#1105	#1106	#1107	#1108	#1109	#1110	#1111	#1112	#1113	#1114	#1115	#1116	#1117	#1118	#1119	#1120	#1121	#1122	#1123	#1124	#1125	#1126	#1127	#1128	#1129	#1130	#1131	#1132	#1133	#1134	#1135	#1136	#1137	#1138	#1139	#1140	#1141	#1142	#1143	#1144	#1145	#1146	#1147	#1148	#1149	#1150	#1151	#1152	#1153	#1154	#1155	#1156	#1157	#1158	#1159	#1160	#1161	#1162	#1163	#1164	#1165	#1166	#1167	#1168	#1169	#1170	#1171	#1172	#1173	#1174	#1175	#1176	#1177	#1178	#1179	#1180	#1181	#1182	#1183	#1184	#1185	#1186	#1187	#1188	#1189	#1190	#1191	#1192	#1193	#1194	#1195	#1196	#1197	#1198	#1199	#1200	#1201	#1202	#1203	#1204	#1205	#1206	#1207	#1208	#1209	#1210	#1211	#1212	#1213	#1214	#1215	#1216	#1217	#1218	#1219	#1220	#1221	#1222	#1223	#1224	#1225	#1226	#1227	#1228	#1229	#1230	#1231	#1232	#1233	#1234	#1235	#1236	#1237	#1238	#1239	#1240	#1241	#1242	#1243	#1244	#1245	#1246	#1247	#1248	#1249	#1250	#1251	#1252	#1253	#1254	#1255	#1256	#1257	#1258	#1259	#1260	#1261	#1262	#1263	#1264	#1265	#1266	#1267	#1268	#1269	#1270	#1271	#1272	#1273	#1274	#1275	#1276	#1277	#1278	#1279	#1280	#1281	#1282	#1283	#1284	#1285	#1286	#1287	#1288	#1289	#1290	#1291	#1292	#1293	#1294	#1295	#1296	#1297	#1298	#1299	#1300	#1301	#1302	#1303	#1304	#1305	#1306	#1307	#1308	#1309	#1310	#1311	#1312	#1313	#1314	#1315	#1316	#1317	#1318	#1319	#1320	#1321	#1322	#1323	#1324	#1325	#1326	#1327	#1328	#1329	#1330	#1331	#1332	#1333	#1334	#1335	#1336	#1337	#1338	#1339	#1340	#1341	#1342	#1343	#1344	#1345	#1346	#1347	#1348	#1349	#1350	#1351	#1352	#1353	#1354	#1355	#1356	#1357	#1358	#1359	#1360	#1361	#1362	#1363	#1364	#1365	#1366	#1367	#1368	#1369	#1370	#1371	#1372	#1373	#1374	#1375	#1376	#1377	#1378	#1379	#1380	#1381	#1382	#1383	#1384	#1385	#1386	#1387	#1388	#1389	#1390	#1391	#1392	#1393	#1394	#1395	#1396	#1397	#1398	#1399	#1400	#1401	#1402	#1403	#1404	#1405	#1406	#1407	#1408	#1409	#1410	#1411	#1412	#1413	#1414	#1415	#1416	#1417	#1418	#1419	#1420	#1421	#1422	#1423	#1424	#1425	#1426	#1427	#1428	#1429	#1430	#1431	#1432	#1433	#1434	#1435	#1436	#1437	#1438	#1439	#1440	#1441	#1442	#1443	#1444	#1445	#1446	#1447	#1448	#1449	#1450	#1451	#1452	#1453	#1454	#1455	#1456	#1457	#1458	#1459	#1460	#1461	#1462	#1463	#1464	#1465	#1466	#1467	#1468	#1469	#1470	#1471	#1472	#1473	#1474	#1475	#1476	#1477	#1478	#1479	#1480	#1481	#1482	#1483	#1484	#1485	#1486	#1487	#1488	#1489	#1490	#1491	#1492	#1493	#1494	#1495	#1496	#1497	#1498
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 a \quad a \quad v \quad v \quad a \quad a \\
 -5.960 + .26 \quad +226.2 + .11 \quad +16.73 \quad -3 \\
 1.77525 \quad 9.05630 \quad 2.35449 \quad 0.04139 \quad +3 \\
 -152.0 \quad +54.8 \\
 +3 \quad +1 \\
 -15.17 \quad +54.8 \\
 15.52 \quad 25.44 \quad -23.59 \quad 0.2 \\
 C-14 \quad 5.52 \quad 9.71 \quad -23.52 \quad 0.74 \\
 U-15 \quad 36.901 \quad 36.18 \\
 C-0 \quad +.40
 \end{array}$$

a

	1	2	3	4	1	2	3	4
α_m	15 33 05	15 33 45	15 34 45	15 36 03	-23 55	23 50	23 48	23 56
α_m	233 15	233 25	233 42	234 01				
$\log \sin \alpha_m$	9.90877	9.90471	9.90630	9.90805	9.77694	9.77524	9.77283	9.76904
$\log \tan \alpha_m$	9.64688	9.64517	9.64449	9.64722	2.66392	2.66392	2.66392	2.66392
$\log \rho$	1.48783	1.48783	1.48783	1.48783	2.44086	2.43916	2.43625	2.43296
$\log I$	1.03848	1.03771	1.03862	1.04310				
I	+10.93	+10.90	+10.93	11.04				
$\log I$	1 10.63	1 10.63	1 10.63	1 10.63				
I	1 21.56	1 21.53	1 21.56	1 21.67	-4 36.0	-4 34.9	-4 33.0	-4 31.0
	1532 21.65	33 4.80	34 5.70	35 23.75	-23 54 37.7	23 48 42.8	23 46 52.4	23 54 54.3
$\log \rho$	1533 43.21	34 26.33	35 27.26	36 45.42	-23 59 13.7	-23 53 17.7	-23 51 25.4	-23 59 25.3
$\log \rho$	43.16	26.11	27.33	45.26	6.6	17.9	25.2	25.5
$\log \rho$	1533 43.19	34 26.11	35 27.29	36 45.26	-23 59 10.2	53 17.8	57 25.3	59 25.3
$\log \rho$	+1.83	1.81	1.81	1.83	-10.7	-10.7	-10.7	-10.7
$\log \rho$	1533 45.02	34 27.92	35 29.10	36 47.09	-23 59 20.9	53 25.5	57 36.0	59 36.1

g 295 51
 a 233 26
 h 199 35
 h 169 27
 h 73 11

$\log g$ 7.553
 $\log h$ 9.2627
 $\log \rho$ 9.6482
 $\log I$ 9.6672
 $\log h$ 1.3060
 $\log \rho$ 9.9810
 $\log \rho$ 0.392
 $\log \rho$ 0.3764
 $\log I$ 4.686
 $\log \rho$ 9.9608
 $\log \rho$ 4.289
 I -5.62
 h -2.38
 h -2.69
 -10.69

May 31 1873 U.S.R. obs. 112

Companion stars. = #2 and #3 for May 29.

Apparent position of scale stars and planet:

 $\frac{\sqrt{m}}{PL}$ #2 #3

 $\frac{\sqrt{m}}{PL}$ #2 #3
Order #2 \sqrt{m} PL #2 \sqrt{m} #3 \sqrt{m}

5 Observations of Planet:

3 observations of the four comp. stars of May 29 (for inclination)

4 observations of Planet

	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}	\sqrt{m}
Pl. 16	34.548	36.167	37.446	37.564	39.233	39.346	42.437	42.568	44.494	45.26	
#2	36.191	35.568	37.569	37.367	39.367	39.147	42.587	42.370	45.48	44.428	
#3	37.201	37.67	38.699	38.462	40.379	40.240	43.599	43.461	46.58	45.525	
Pl-#2	-14.3		14.4		14.4		14.8		15.4		
Pl-#3	-15.3		15.3		15.6		16.0		16.4		
Pl (m-T)	-11.9		-11.8		12.2		12.9		13.2		
#2	+22.3		22.1		22.0		21.7		21.9		
#3	+13.4		13.7		13.9		13.4		13.3		
Mean = -12.40											
+22.00											
+13.54											

Pl 17	28.357	29.483	32.431	32.561	35.523	36.53	38.537	39.72		
#2	29.523	29.328	32.598	32.406	36.90	35.496	39.108	38.572		
#3										

Pl. 17	06.399	6.58.2	8.314	8.44.9	10.59	10.19.5	11.40.4	11.54.4	13.14.2	24.4	15.14.4
#2	6.55.6	6.34.3	8.47.0	8.26.0	10.21.6	10.10	11.56.2	11.35.6	13.30.2	9.2	14.3.32
#3	7.56.8	7.43.8	9.48.1	9.35.3	11.22.6	11.10.1	12.57.4	12.45.0	14.31.3	14.7	15.37.233
Pl-#2	-15.7		15.6		15.7		15.8		16.0		15.7
Pl-#3	-16.7		16.7		16.7		17.0		17.1		17.3
Pl (m-T)	-13.3		-13.5		13.6		14.0		14.2		14.2
#2	+21.3		+21.0		20.6		20.6		21.0		20.4
#3	+13.0		+12.8		12.5		12.4		12.6		12.4

16	36.05	-14.3	-1	15.3	17	06.40	-15.7	-1	16.9
37	59	14.9		15.3	8	31	15.6		16.7
39	27	14.4		15.6	10	06	15.7		16.7
42	48	14.8		16.0	11	40	15.8		17.0
47	49	15.4		16.4	13	14	16.0		17.1
		23.3		28.6	15	18	15.9		17.3
16	40.12	-14.66	-1	15.72	17	10.55	-15.78		16.95

Mean = -13.80
+20.82
+12.67

1240	+22.00	+13.54	-13.50	+20.82	+12.62
1.09343	1.34242	1.13162	1.13988	1.31848	1.10106
9.96129	9.96129	9.96129	9.96129	9.96129	9.96129
1.17609	1.17609	1.17609	1.17609	1.17609	1.17609
9.99798	9.99798	9.99798	9.99798	9.99798	9.99798

222879	247778	226698	2,27524	2,45384	2,23641
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169.3	300.5	184.9	188.5	284.3	172.4			
300	169.3	169.3	188.5	188.5	188.5			
469.8	354.2		402.8	360.9				
+7 49.8	+5 54.2		+7 52.5	+6 0.9				
-23 53 28.5	51 36.0		-23 58 28.5	53 36.0		+1466 - 1	15.72	15.78 11695
-23 45 38.7	45 41.8		23 45 38.7	45 38.7		15 34 27.93	35 29.11	34 27.93 29.11
+7.7	+7.7		+7.6	+7.6		15 34 13.27	34 13.39	34 12.15 12.16
-23 45 31.0	34.1		45 28.1	27.5		+13	+13	+19 +19
Refroc + .8	+1.7		+1.9	+8		15 34 13.40	13.52	12.34 12.35
23 45 30.2	30.4		45 27.2	26.7		+2	+2	2 2
36.4	36.4		31.5	31.5		13.42	13.54	12.36 12.37
-6.2	-3.0		43	-48		14.01	14.01	12.79 12.79
+2.3	+2.3		+2.3	+1.3		+5.8	+4.7	+4.3 +4.2
-3.9	-4.21		+2.0	-2.5		+4	+4	+6 6
T						64	57	49 48

1640 35	17 11 18
-11 51	-11 51
1628 44	16 58 27
+288 6	+10 38
1640 35	17 11 18
4 36 59	4 36 59
1203 36	12 34 19
-1 58	-2 4
121 38	12 32 15
-11 51	-11 51
1149 47	12 20 24
5 38 6	5 38 6
17 27 53	17 58 30

222770	24896
9.35436	9.39613

u	u ¹⁰⁰	u	u ¹
u _a	u _a	u ₁₁	u ₁₁
-58.01	+4.3	+228.9	+0.7
1.76350	9.63347	2.36154	9.84510
-	13.21	+52.3	
+	2	0	
-13.19		+52.3	
15 34 27.20	-23 46 28.7		
15 34 14.01	-23 46 36.4	14.01	36.4
13.40	45 31.0	13.52	34.1
+6.18	-5.4	+4.9	-2.3

-14.44	57.2
3	
-14.41	+57.2
15 34 27.20	23 46 28.7
15 34 12.79	1279 -23 46 28.15
12.34	31.5
+4.45	27.5
+4.44	-3.4 -4.0

Reduction of Star 14513 to Apparent Place for June 26 1873

$$w_m \begin{matrix} h \\ 15 \\ 16.06 \end{matrix} \begin{matrix} m \\ 16.06 \\ 5m = -22.13 \end{matrix} \\ = 229.1'$$

$$\begin{array}{ll} \log b & 1.48783 \\ \log \sin \delta & 9.87789 \\ \log \cos \delta & 9.61112 \\ \log I & 0.97684 \\ I & + 9.48 \\ b & 110.63 \\ da & 120.11 \\ a \sin 15 & 27.04 \\ \alpha \sin 16 & 47.15 \end{array} \quad \begin{array}{ll} \log b & 2.66392 \\ \log \sin \delta & 9.81680 \\ \log \cos \delta & 2.48072 \\ - & 30250 \\ = & -5.250 \\ \log \sin 22.11 & 67 \\ - & 22.16 \quad 9.2 \end{array}$$

Per 1073.0

$$\begin{array}{llll} \log g & .8378 & \log h & 1.3103 \\ \log g & .8378 & \log h & 1.3103 \\ \log i & 9.8965 \\ \log \sin \delta & 9.1092 & \log \sin \delta & 9.8426 \\ \log \cos \delta & 9.6122 & \log \cos \delta & 9.8562 \\ \log I & .8378 & \log I & .8378 \\ \log II & 1.1965 & \log II & 1.07450 \\ I & + 6.88 \\ II & - 5.56 \\ III & + .73 \\ I' & - 4.896 \\ a' & + 26.13 \\ = & + 174 \\ a_0 & 15 \quad 16 \quad 47.15 \\ \alpha & 15 \quad 16 \quad 48.89 \end{array} \quad \begin{array}{ll} \log g & .8378 \\ \log h & 1.3103 \\ \log i & 9.8965 \\ \log \sin \delta & 9.1092 \\ \log \cos \delta & 9.8426 \\ \log I & .8378 \\ \log II & 1.07450 \\ I & + 6.88 \\ II & - 5.56 \\ III & + .73 \\ I' & - 4.896 \\ a' & + 26.13 \\ = & + 174 \\ a_0 & 15 \quad 16 \quad 47.15 \\ \alpha & 15 \quad 16 \quad 48.89 \end{array}$$

$$\begin{array}{ll} \text{Pl. \#} & \begin{matrix} h \\ 15 \\ 16 \end{matrix} \begin{matrix} m \\ 48.89 \\ 48.89 \end{matrix} \\ - 2.67 & \begin{matrix} h \\ 17 \\ 33 \end{matrix} \begin{matrix} m \\ 11 \\ 11 \end{matrix} \\ - 3.03 & \begin{matrix} h \\ 17 \\ 50 \end{matrix} \begin{matrix} m \\ 32 \\ 32 \end{matrix} \\ - 3.10 & \begin{matrix} h \\ 17 \\ 58 \end{matrix} \begin{matrix} m \\ 08 \\ 08 \end{matrix} \\ - 2.93 & = 174717 \\ & + 9 \\ & 174726 \\ & 61930 \\ & 112756 \\ & - 153 \\ \text{N.C. M.T.} & 11 \quad 26 \quad 03 \end{array}$$

$$\begin{array}{ll} \log 1.206 & = 1.08135 \\ \log 2.25 & = 1.37107 \\ \log \sin \delta & 9.86250 \\ \log \cos \delta & 1.17609 \\ \log I & 2.12024 \\ \log II & + 13.19 \\ \log III & 2.40996 \\ \log IV & + 259.0 \\ & 131.9 \\ & 125.1 = 2.49 \\ & 70 \quad 2.051 \end{array}$$

Comparison of (112) with Ephemeris

Date	4d(0-0)		4d(2-0)		with correction applied	
	4d(0-0)	4d(2-0)	4d(0-0)	4d(2-0)	4d(0-0)	4d(2-0)
May 18	+44	—	+44	—	+56	—
19	+54	-6.8	+54	-7.0	+48	+4.9
20	+46	-2.0	+46	-2.3	+48	+0.0
Kam. Cal. 19	+50	+6.5	+50	-6.5	+50	-4.5
Nash 23	+65	+7.5	+65	-7.5	+65	-5.5
25	+62	-6.4	+66	-7.8	+60	-4.2
25	+79	-7.5	+80	-7.7	+74	-4.5
29	+62	—	+61	—	+70	-5.34
29	+44	—	+43	—	+50	-3.7
29	+50	—	+49	—	+58	-6.4
29	+65	—	+64	—	+73	-5.9
29	+70	-7.6	+69	-8.2	+75	—
29	+65	-6.0	+65	-6.0	+70	—
29	+76	-8.7	+76	-8.7	+81	—
29	+71	-8.2	+70	-8.8	+76	—
31	+61	-5.4	+59	+6.2	+64	-3.9
31	+49	-2.3	+47	-3.0	+51	-0.7
31	+48	-3.4	+43	-4.3	+49	-2.0
31	+94	-4.0	+42	-4.8	+48	-2.5
May 26	+58	-5.9	+52	-6.8	+61	-3.9

$$1539 \quad 26.57 - 2405'12.4 = C \quad \text{BM } 12^h$$

$$1539 \quad 26.96 - 2405'8.6 = 0 = \text{Normal.}$$

$$\text{May } 25.5 - a = 15 \ 40 \ 28.19 - 24 \ 08 \ 48.8$$

$$-4d(0-0) \quad -61 \quad +3.8$$

$$0 \quad 15 \ 40 \ 27.58 - 24 \ 08 \ 45.0$$

Comparison Stars for 1873.0

$$1 \text{ Altin } 14760 \quad \alpha = 15^h 33^m 43.2^s \quad \delta = -23^\circ 59' 13.7''$$

$$2 \text{ Altin } 14773 \quad \alpha = 34 \quad 26.33 \quad \delta = -23 \quad 53 \quad 17.7$$

0

$$3 \text{ Altin } 14795 \quad \alpha = 35 \quad 27.26 \quad \delta = -23 \quad 51 \quad 25.4$$

$$4 \text{ Altin } 14813 \quad \alpha = 36 \quad 45.42 \quad \delta = -23 \quad 59 \quad 25.3$$

$$5 \text{ Altin } 14840 \quad \alpha = 38 \quad 18.47 \quad \delta = -24 \quad 19 \quad 1.1$$

$$6 \text{ Altin } 14841 \quad \alpha = 38 \quad 22- \quad \delta = -24 \quad 09 \quad 37.9$$

$$7 \text{ Altin } 15070 \quad \alpha = 50 \quad 58 \quad \delta = -24 \quad 27$$

Lay.

$$(B+a) \quad (M+a) \quad \sin(B+a) \quad \cos(B+a) \quad \sin(M+a) \quad \cos(M+a) \quad \tan \delta \quad \sin \delta \quad \cos \delta \quad \sec \delta$$

$$5 \quad 183^\circ 25' \quad 53^\circ 37' \quad 8.7752 \quad 9.9992 \quad 9.9058 \quad 9.7782 \quad 9.6550 \quad 9.6147 \quad 9.9596 \quad 0.404$$

$$\alpha' - \alpha = 9.84 + 1.8 + 17.80 = 18.3$$

$$\delta' - \delta = -6.60 - 4.99 + 10 = -11.49$$

$$(6) \quad 185^\circ 37' \quad 49^\circ 15' \quad 8.9928 \quad 9.9979 \quad 9.8979 \quad 9.8148 \quad 9.6516 \quad 9.6186 \quad 9.9652 \quad 0.3978$$

$$\alpha' - \alpha = +10.40 + 30 + 16.96 = 18.4$$

$$\delta' - \delta = -6.85 - 5.54 + 72 = -11.67$$

$$(7) \quad 189^\circ 01' \quad 52^\circ 39' \quad 9.1967 \quad 9.9946 \quad 9.9005 \quad 9.7828 \quad 9.6580 \quad 9.6171 \quad 9.9591 \quad 0.409$$

$$\alpha' - \alpha = +10.40 + 31 + 17.85 = 19.0$$

$$\delta' - \delta = -6.80 - 5.13 + 72 = -11.21$$

July 21 1873

Observation of (81)

comp# follows (81) of 6^m 14^s and dist - 4' 20" (apparent)
= 4 moy.

+ .22 #

Pl = 18 ^h 25 ^m 19 ^s	18 32 27.0	18 39 37.5	424 = 1 ^m 5 ^s fast of sle.
# 31 33.5	38 41.5	52.0	
Pl-# - 6 ^m 14.0	6 14.0	6 14.5	

No des. for

comp# for Oct. 21 = 20 56 18.34
23 18.36

- 6 ^m 14.0	18 25 19
14.5	32 27
14.5	89 37
- 6 14.23	18 32 28
	- 1 05
	18 31 23
	- 8
	18 31 15
	7 58 03
	10 23 12
	1 42
	10 21 30

Observation of (109) Pelicetus July 21 1873

Comparison star = $\alpha_{\text{H}} = 21364 = 21^{\text{h}} 16^{\text{m}} 25.74^{\text{s}} - 26^{\circ} 48' 45.9''$
 $+ 3.10$
 $+ 10.7$
 $+ 20.5$
 $+ 5.47$
 $21^{\text{h}} 17^{\text{m}} 46.2^{\text{s}}$
 $40 = \text{Dist} - 30'' \pm 10''$

$\frac{+}{*}$ "d.

	h	m	s	h	m	s	h	m	s	h	m	s
#	19	30	25.5	19	34	5.5	15	9	26.0	20	3	32.0
Pl		33	10.5		36	57.0		2	10.0		6	16.0
Pl-#		2	45.0		2	45.5		2	44.6		2	44.6
											2	44.6
											2	44.6

By chron. 424 = 1^m 5^s fast of S.C.

Aug 22 1873 W.R. Lins. (109)

Comp. the same as Aug 21

Apparent position \times .Pl.

Wini four micrometer Pa & only.

#	1	2	3	27	27
Pl.	22 15.9	35.0	53.7	25 38 23.0	42.0
Pl-#	24 8.5	27.6	46.7	26 56.3	15.4
	1 52.6	52.6	53.0	52.5	52.4
	1 52.73			1 52.43	
				52.2	52.5
				1 52.38	

#	19	52	41.8	0.8	20.0	55	28.8	47.8	70	58	9.7	28.8	41.0
Pl	54	33.4	52.4	11.5	57	20.0	39.2	58.3	0	0.7	20.3	39.0	
	51.5	51.5	51.5		51.2	51.4	51.3		51.0	51.5	51.0		1 51.32

Wini bars. Bars in reverse position from the usual one.
Notches may interfere.

#	20	4	50.3	8	50	10	8.7	11	55.6	12	10.7	13	56.2	14	11.2
Pl.	9	40.6	9	31.8	11	44.3	35.7	13	45.6	13	36.6	15	46.9	15	37.9
Pl-#	1	50.3				50.6			50.0			50.7			= 1 50.40

#	20	16	3.8	16	14.1	18	4.8	18	14.8	20	5.4	20	16.0	22	5.7	16.2
Pl.	17	54.4	17	39.9	19	54.8	19	40.5	21	55.7		23	55.8	41.1		
	50.6				50.0				50.3			50.1				1 50.25

Gauss scale	Pl-#	Wini	Pl-#	Wini	Pl-#	Wini	Pl-#	Wini
19 24 28	-1	52.73	20 9 40	-1	50.30	14.7	8.8	
26 15		52.43	11 44		50.60	15.0	8.6	
29 04		52.33	13 46		50.00	15.1	9.0	
54 52		57.50	15 47		50.70	15.0	8.5	
57 39		57.80	17 54		50.60	10.3	14.5	
60 26		57.20	19 55		50.00	10.0	14.3	
			21 56		50.30	10.6	14.7	
			23 58		50.10	10.5	14.50	
19 42 06	1	51.91	20 16 50	-1	50.33			

log 14.95 = 1.17464 8.85 = 0.94694
10.35 = 0.01499 14.50 = 1.16137

2.29992 2.07222
2.14022 2.28665
+ 3.195 + 1.571 = 5.176
2 15.1 + 3 13.5 = 5.31.6

Prob. on notch.

July 22 1873 (H. R. L. 109)

Comparison star same as Aug 21 - 2

Apparent position of scale, Pl. # X Pl.

Order #2 #5 Pl. Pl. &

Observation for min. stars scale.

#	h	m	s	2	3	m	s	m	s	2	3	m	s	2	3
#	19	9	19.3	384	576	11	9.6	284	474	12	4.5	238	428		
Pl.		10	17.1	368	562	12	7.7	270	461	14	2.1	21.9	405		
Pl-#			584	584	586		581	583	584		582	581	58.8		
			584	584			58.27				58.10				
#	19	15	51.6	107	288	18	42.8	2.0	20.8						
Pl.			49.2	84	27.3		40.8	0.2	19.0						
1			57.6	57.7	57.6		58.0	58.2	58.2						
			58.67				58.13								

19 10 37 - 58.47

12 27 58.27

14 22 58.00

16 08 57.67

18 00 58.13

19 14 31 - 58.22

Mini Bars.

#	h	m	s	2	3	2	3	2	3	2	3	2	3	2	3
#	19	25	0.1	25	22.0	26	14.5	36.2	27	27.3	44.7	28	42.5	37	
Pl.		25	58.4	25	39.0	27	12.7	58.3	28	25.3	58		40.6	20.7	
			58.8				58.2			58.0			58.1		
#	19	30	2.2	28.8		31	17.1	44.0	32	29.2	56.0	33	49.6	7.0	
Pl.			0.1	45.8			15.4	0.5		27.5	13.0		47.6	23.6	

#	19	35	3.0	20.5	36	8.7	26.8
Pl.			1.0	36.8		7.3	48.4

log 2005 9.95116
log 15 1.17609
log 13458 00202
1.12927

#	h	m	s	Pl-#	(T _m -T _u)	(T _m -T _u)	Pl.
19	25	58	58.3		21.9	19.4	
27	12	58.2			21.7	19.4	
28	25	58.0			21.4	19.5	21.67 19.43
29	41	58.1			21.2	19.9	21.55 19.55
31	00	57.9			21.6	19.3	
32	15	58.3			21.9	19.8	
33	27	58.3			21.8	19.5	26.77 14.57
34	47	58.0			17.4	24.0	
36	1	58.2			17.5	24.2	
37	58.07				17.1	23.9	17.33 24.03
193635							

log A 21.55 1.33346 log 19.55 1.29115
26.77 1.42765 14.57 1.16346
17.33 1.23880 24.03 1.38096
246273 2.92042
255692 2.29273
236807 2.51003
+ 4' 50.2" + 4 23.3 = 9 13.5
+ 6 0.5 + 3 16.2 = 9 16.7
+ 3 53.4 + 5 23.6 = 9 17.0
9' 15.1"

Jul 26 1878 W.R. obs. Polychymnia.
Comp # = 19895 $19^{\circ}34'38.19'' - 25^{\circ}04'$

Assumed place of Planet = $\alpha = 19^{\circ}40'24'' S = -25^{\circ}4' = \#1$

Apparent position of scale Planet - α star

$\#$ is unknown = 80 mag.

\times $\#$ \dots $\#2$

Uini stars scale.

#1	18 8 21.6	40.6	89.4	10 43.1	20 20.9	13 2.2	21.1	40.0
Pl.	9 50.6	9.7	28.0	12 11.7	31.1	50.0	14 30.8	49.9
Pl-#1	-1 28.0	29.1	28.6	12 28.6	29.1	29.1	28.6	28.8
		28.90			28.93		28.73	

#2	18 10 10	-1 28.90
	12 31	28.93
	14 50	28.73
	18 12 30	-1 28.85

#1	18 15 41.6	7.6	26.5	20 53.6	12.6	30.3	26 9.8	28.4
Pl	18 18 58.2	17.1	35.8	25 2.5	21.9	40.9	30 18.9	38.0
	- 4 09.6	9.5	9.3	8.9	9.1	9.4	9.1	9.3
	4	9.47			9.13		9.20	

18 19 17	-4 9.47
25 22	9.13
30 38	9.20
18 25 05	4 9.27

#1	18 18 29.3	48.4	7.4	23 34.5	53.4	12.3	28 50.6	9.4
Pl.	18 18 58.2	14.1	35.8	25 2.5	21.9	40.9	30 18.9	38.0
	1 28.9	28.7	28.4	28.0	28.3	28.4	28.3	28.6
		28.07					28.1	

18 19 17	-1 28.67
25 22	28.23
30 38	28.33
18 25 05	-1 28.41

Uini Bars.

#1	18 34 38.9	2.6	19.3	24.4	39 30.7	34.6	39 57.6	36.4
#2	37 39.9	43.7	16.8	21.3	42 11.9	15.4	41 48.7	53.1
Pl.	39 7.8	11.6	58.2	3.3	43 25.9	43.6	43 30.0	35.7
Pl-#1	-4 8.8	9.0	8.8	8.8	-41 9.2	9.0		
Pl-#2	-1 27.9	27.9			-1 28.0	8.2		

#1	18 39 09	-1 28.90	-4 8.95
	43.47	128.10	4 9.10
	18 41 25	-1 28.00	4 9.02

July 30 1873 W. R. Dawkins (109)

Comp #1 $\pi = \text{Bell's } \pi = 21309 \quad \pi_2 = 21311$

App. position of scale stars & Planet =

I Comp. of PL with x_1, x_2, x_3

II Comp. of PL with π_1 , position X_{PL}

	π	π_1	π_2
#1	19 23 24 81.4	25 50 26 19.6	
PL	23 49.1	26 26.2	36.8
#2	24 58.1 25.1	26 36.8	
#3	25 8.5 36.0		

#1	19 45 25.6 53.0	40 44 32.8	37 15.0 43.1	32 6.7 33.1	28 39.1 80	23 2.9 31.5
PL	46 28 9.7	40 41.6 49.6	37 52.7 08	32 44.1 51.8	29 17.2 25.1	28 40.9 49.1
#2	47 15.8 29.3	41 58.1 8.7	39 5.4 19.1	33 57.2 11.0	30 29.9 44.1	24 58.1 5.1
#3	47 31.3 58.0	42 10.6 37.5	21.1 47.0	34 12.4 39.9	45.3 54.0	25 8.5 36.0

PL-#1	π	PL-#2	PL-#3	PL-#4
PL-#3	19 23 41	5		
	29 17	38.1	1 12.7	28.1
	22 44	37.4	13.1	28.3
	37 53	37.7	12.7	28.4
	40 42	37.3	13.4	28.9
	46 04	37.2	13.0	28.5
	19 37 20	37.5	12.98	128.44

										17	PL-#1						
										4 ² 5 ⁸							
#1	19	50	42.0	51.6	51	41.6	50.8	52	24.4	36.7	53	14.9	24.1	19	51	19	87.3
PL	51	19.3	80		52.8	50.8		4.7	52.8		52.7	40.1		52.8		37.1	
PL-#		37.3			37.1			37.3				37.8				37.3	
																37.8	
																37.38	

July 30 1873 N.A.R. obs. (33) Polyhymnia

Orbit. #s $\#_1 = \text{alt. } 19575$ $\#_2 = 19595$ $\#_3 = 19699$

App. position of scale, $\#_1 - \text{Pl.} =$ $\frac{\#_1}{\#_2}$ $\#_3$ $\cdot \text{Pl.}$

Order = $\frac{\#_1 - \#_2}{a} - \frac{\#_2 - \#_3}{a} - \frac{\#_3 - \text{Pl.}}{a} - \frac{\text{Pl.} - \#_2}{a}$

July 30 1873 W.R. Liss. (81) Thompson.
 Assumed position of Planet - $19^h 41^m 10^s$ $\delta = -32^{\circ} 23'$
 Comp # fellows. $SR = 1^m 5^s$ nearly $\delta = -32^{\circ} 26'$ (8.8 mag)

Observation of 109 1873 Aug 10
Position of scale # = PL *# PL.

Ardur # # PL PL

Comp. # = Altin $\frac{21116}{20284}$ $\frac{1957}{4427}$ $\frac{-27}{38}$ $\frac{53}{53.3}$

$\frac{18}{18}$ $\frac{49}{51}$ $\frac{163}{51.8}$ $\frac{49}{50.2}$ $\frac{3.6}{2.7}$ $\frac{50}{51}$ $\frac{84}{101}$ $\frac{22}{210}$ $\frac{51}{52}$ $\frac{413}{167}$ $\frac{51}{52}$ $\frac{288}{279}$ $\frac{54}{36.0}$ $\frac{156}{46.6}$ $\frac{54}{56}$ $\frac{424}{54.3}$ $\frac{9.1}{9.7}$
 PL. $\frac{49}{51}$ $\frac{51.8}{101}$ $\frac{50.2}{210}$ $\frac{2.7}{2.79}$ $\frac{3.6}{46.6}$ $\frac{50}{52}$ $\frac{84}{167}$ $\frac{22}{210}$ $\frac{51}{52}$ $\frac{413}{167}$ $\frac{51}{52}$ $\frac{288}{279}$ $\frac{54}{36.0}$ $\frac{156}{46.6}$ $\frac{54}{56}$ $\frac{424}{54.3}$ $\frac{9.1}{9.7}$
 PL-H + $\frac{+35.5}{-10.9}$ $\frac{+13.0}{-10.9}$ $\frac{35.4}{-10.9}$ $\frac{+12.6}{-10.9}$ $\frac{+35.4}{+11.2}$ $\frac{+12.5}{-10.6}$ $\frac{+35.0}{-10.6}$ $\frac{+12.7}{-13.4}$ $\frac{+9.9}{-13.4}$
 PL-TJ # = $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$
 PL-TJ PL. = $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$ $\frac{-10.9}{-10.9}$

$\frac{18}{18}$ $\frac{49}{51}$ $\frac{52}{10}$ $\frac{+35.5}{+35.4}$ $\frac{+13.0}{+12.6}$ $\frac{-10.9}{-10.9}$ $\frac{(T_n - T_j) \#}{(T_m - T_j) PL}$

18 49 52 +35.5 +13.0 -10.9

18 51 10 +35.4 +12.6 -10.9

18 52 17 +35.4 +12.5 -11.2

18 55 36 +35.0 +12.7 -10.6 #270 -10.90

18 56 54 +35.3 +9.9 -13.4 +9.90 -13.40

18 53 10 +35.32

18 52 49

9 35 54

9 34 20

9 34 20

log 12.70 1.10380 log 10.90 1.03743

log 15 1.17609 1.17609

log 45.8 0.0202 0.0202

log 994734 9.94734 9.94734

2.22925 2.16288

-16.95

+14.55

315.0 = -5' 15"

log 9.99564 log 13.40/12.710

1.12545 1.12545

1.12109 2.25255

13.21

1.789

311.0 = -5' 11"

Mean -5' 14"

$\frac{20}{20}$ $\frac{58}{58}$ $\frac{22}{22}$ $\frac{5m}{5m}$ $\frac{-27}{-27}$ $\frac{53}{53}$

$\frac{20}{20}$ $\frac{58}{58}$ $\frac{22}{22}$ $\frac{5m}{5m}$ $\frac{-27}{-27}$ $\frac{53}{53}$

log 1.48783

log 5m 9.83840

log 5m 9.72262

log 1.4885

I 1.4885

I 1.4885

a-a 1.2214

a 20 58 28.30

x 20 59 50.45

20 58 54 50.67

2 07 50.56

log 2.66392

log 5m 9.64633

log 2.51315

log 2.36025

+ 2.25925

5.2475

3.492

-27 53 15.3

-27 49 49.4

50.4

This observation is quite doubtful
on account of moon.

h 321 14
 u 214 59
 h 133 55
 $h+u$ 276 636 13
 $h+u$ 8448 54

$\log g$ 9.864
 $\log(L/H)$ 9.9974
 $\log u$ 9.7220
 $\log T$ 0.7088

$\log g$ 9.864
 $\log(L/H)$ 9.9974
 $\log T$ 0.7088

h 1.2904
 $\log(L/H)$ 9.9998
 $\log u$ 0.533
 $\log T$ 1.3436
 I 17.84
 II 5.08
 III 22.06
 all 44.98

$\log h$ 1.2904
 $\log(L/H)$ 9.9998
 $\log u$ 0.533
 $\log T$ 1.3436

$\log u$ 0.7220
 $\log u$ 9.9467
 $\log T$ 0.7320
 I + 1.05
 II - .17
 III + 5.40

h 297
 u 50.55
 $h+u$ 53.52
 h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65

h 297
 u 50.55
 $h+u$ 53.52
 h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65

h 297
 u 50.55
 $h+u$ 53.52
 h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65

$\log 4 = 21480$
 $\log 49781.69705$
 $\log 11185$
 $h+u = 1336$

T 37294
 $\log T$ 9.57164
 h 21 00 28.85

u 21 00 28.69
 $h+u$ 28.65
 h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65

T 37294
 $\log T$ 9.57164
 h 21 00 28.85

h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65
 h 21 00 28.85
 u 21 00 28.69
 $h+u$ 28.65

Aug 11 1873 N.A.R. Obs. 11091

Comp. # same as Aug 10
Position of scale # and Planet

Order. I Pl. Pl. # α #

I II
X** X*

II Pl. Pl. # α #

Pl. 18	17.54.2	18.21.1	18.43.8	19.10.9	19.34.1	20.4.7	20.38.4	21.4.8	21.31.3	21.56.9	23.9.7	23.45.5
#	18.22.1	33.2	19.11.7	19.22.8	20.3.8	20.14.9	7.5	21.17.2	54.0	8.9	37.3	46.5
Pl-#	27.9	21	27.9		27.9		27.9		27.9		27.6	

Pl 18	44	23.0	28.1	27.6.7	12.8	28.7.5	16.3	29.2.7	28.1	26.23.7	30.3
#		50.2	41.6	35.0	26.9	35.4	29.3			51.8	48.1
Pl-#		27.2		28.3		27.9				28.1	

T	Pl-#	(T _m -T _s)	(T _m -T _s) Pl	log	log
18 18 22	- 27.9	- 26.9	- 11.1	1.42975	1.42975
18 19 12	27.9	27.1	- 11.1	1.42975	1.43286
18 20 4	27.7	26.8	- 11.1	1.42975	1.4248
18 21 07	27.9	25.4	- 9.7	0.98677	1.42975
18 21 59	27.7	25.6	- 9.9	0.99564	1.44248
18 22 37	27.6	24.8	- 9.2	0.88783	1.44091
18 22 35	28.3	5.1	+ 9.0	0.95424	1.45179
18 22 35	27.9	- 8.8	+ 6.1	0.78533	1.42975
18 22 34	- 27.79	66	8.7	2.12077	2.17077
18 22 21				2.05520	2.05520
18 22 13				2.05520	2.05520
9 20 51				2.05520	2.05520
9 01 22				2.11222	2.03028
9 1 29				2.12109	2.03369
8 59 53				2.08824	2.07990
- 23 42				2.07969	1.83302
8 36 11				1.91078	2.06993
- 13 36					
8 22 35 = W.M.T.					
24902					
9.54285					
18 22					
20 59					
2 37					

208.1
= 3.281
210.2
330.2

h m s
20 58 28.30 - 27 53 15.3
20 59 08 - 27 51
214 44'

Aug 13

321 30'	.9942	.9942
314 59	9.9972 _m	9.0527
131 00	9.7220 _m	
276 29	0.7134	.0469
85-59		

1.48783	2.66392
9.85112 _m	9.89784
9.60260 _m	2.51176
1.00844	324.9
96.157	
+ 1020	
+ 11.52	

1.28855	1.28855
9.9989	9.6687 _m
0.533	8.8452 _m
1.3407	9.8026
1772	8037
I + 5.16	9.9467
II 21.91	.7509
44.79	

20 58 28.30	+ 5 24.9
20 58 89.82	- 27 53 15.3
1 10.63	
20 59 50.45	- 27 47 50.4
2.98	+ 6.2
20 59 53.04	- 27 47 44.2
- 27.79	+ 8 20.2
20 58 25.64	28.1
20 59 25.85	- 27 44 16.0
- 29	+ 37.4
20 59 28.36	27 44 6.6
25.48	8.8
+ 11.1	+ 1.1
25.56	7.4

I + 111
II - 63
III + 5.63

2.99 for Aug 13 6.11

a) u - 6405	μ - 111.4	1.80652	2.04689 _m
u' + 08	u' + 45	8.90309	0.65321

I - 22.36	- 3888
II + 01	+ 54
- 2338	- 3834
20 59 52.31	- 2748 8.40
20 59 30.00	- 2743 48.4
20 59 25.46	27 44 6.6
4.66	+ 20.6
	+ 20.2

Observation of (109) (thin glass squares)

Aug 12 1873

Comp. #1

$$\#1 = 20 \ 58 \ 00 - 27 \ 45$$

$$\#2 = 20 \ 59 \ 40 - 27 \ 54$$

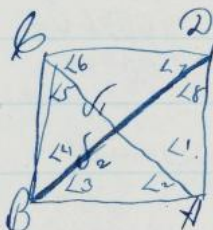
$$\#3 = 20 \ 59 \ 50 - 27 \ 48$$

For inclination of lines. App. position



heart.

#2



$\#1 a_1$	20	114	17	208	12	414	9	461	6	527	4	16	0	552	55	178	58	57
$\#1 a_2$	24	137	231	314	527	565	84	124	57	279	156							
$\#1 a_3$	24	505	552	89	293	336	405	496	431	59	53.3							
$\#1 a_4$	24	608	701	183	347	440	510	595	533	158	8.5							

$\#2 a_1$	25	413	21	504	14	203	246	8	817	400	342	560	39
$\#2 a_2$	25	516	22	08	100	303	347	418	507	946			
$\#2 a_3$	26	293	382	475	79	119	189	283	211	434	313		
$\#2 a_4$	26	394	483	577	182	227	284	382	320	524	420		

$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$	$\#(a_1 - a_2)$
10.9	47.80	37.1	58.9	47.1	10.1	37.0	47.7	10.3	10.3	47.8	2	38.5	38.6
10.5	47.8	37.3	8.3	47.0	10.1	36.9	7.6	10.4	10.9	47.5		38.8	38.2
10.6	47.6	37.0	8.2	46.9	10.2	36.7	8.1	9.9	10.4	47.7		38.3	38.4
10.3	47.6	37.3	7.9	47.0	10.3	36.7	7.9	10.0	10.4	47.9		38.9	38.5
10.4	47.3	36.9	7.7	47.5	10.8	36.7	7.5	10.1	10.4	48.0		38.5	38.7
10.7	47.2	36.5	7.9	47.6	10.5	37.1	7.8	10.1	10.5	47.6		38.0	38.4
10.8	47.3	36.5	8.1	47.1	10.9	38.2	8.0	10.7	9.9	47.5		38.4	38.7
10.5	46.9	36.4	7.4	47.6	10.9	36.7	7.9	10.4	10.2	47.4		38.0	38.7
10.1	46.8	36.4	6.9	47.9	11.0	36.9	8.1	10.7	10.9	47.1		38.8	38.6
10.5	47.4	36.9	7.9	47.9	10.7	37.2	48.2	10.4	10.2	47.7		38.8	38.5
10.53	47.39	47.36	10.55	36.81	47.88	10.30	10.31	47.62	38.70	38.03			

$$\sqrt{0} = 27^{\circ} 50'$$

lay

38.61

$$\log 10.5 = 9.94660$$

$$\log 1.5 = 1.17609$$

$$\hline 1.12269$$

$$\delta - \delta' = 4937''$$

$\#(a_1 - a_2)$	$\#(a_1 - a_2)$
5.80	58.1
8.5	79
8.5	76
8.3	79
7.9	81
8.3	77
7.9	82
8.1	8
8.0	78
8.4	87
58.19	57.91

$$58.05 = 12' 58''$$

778"

1850 #1, $\sqrt{27'50.31''}$	#2, $\sqrt{27'58.472''}$	#3, $\sqrt{27'53.153''}$	$a_2 20'56.407a_2$	$a_2 20'58.1912$	$a_3 20'58.2880$
$\log m 27'48$	$27'56$	$27'51$	$m 20'57'20$	$20'58'59$	$20'58'08$
$\log \cos \delta 9.94674$	-9.94620	-9.94654	$314'20$	$314'45$	$314'47$
$\log 2.66392$	2.66352	2.66352	$\log 1.48783$	1.48780	1.48712
$\log 27.84437$	9.84718	9.84784	$\log 9.85448$	9.85137	9.85112
1.50829	1.51150	1.51176	$\log 9.72201$	9.72445	9.72223
$+ 2223$	3249	3249	1.06432	1.06365	1.06188
$+ 5'22.3$	$+ 5'24.9$	$+ 5'24.9$	1160	1158	1153
$- 27'50'31.1$	$27'58'47.2$	$27'53'15.3$	$20'56'40.26$	$20'58'19.82$	$20'58'28.30$
$27'45'8.8$	$27'53'22.5$	$27'47'50.4$	$20'58'24.9$	$59'41.88$	$59'50.46$
$8'13.7$			$+ 38.84$		

$\log 493.7 = 1.69346$ $\log 10.53 = 1.02243$ $\log 47.39 = 1.67569$
 $\log 488.9 = 1.68869$ $\log 1.12269$ 1.12269
 $\log 488.9 = 1.68869$ 2.14512 2.79838
 $\log 488.9 = 1.68869$ 139.67 $62862 = 488.9$
 $L_1 = 44^\circ 43'$

$\log BDA = \frac{Bb}{Bd}$

$\log 10.55 = 1.02325$ 47.36 1.67541
 1.12269 1.12269
 2.14534 2.79810
 139.67 628.2

$\log Bb/Bd = \frac{Bb}{Bd}$

$\log BDA = \frac{Bb}{Bd}$

$\log 47.88 = 1.68015$ $\log 10.30 = 1.01284$
 1.12269 1.12269
 2.80284 2.13553
 635.1 136.6

$\log 488.5 = 2.69767$ $90 - L_1 - L_2 = 45 - 17$
 $\log 4907 = 2.69346$ $L_{\text{mean}} = 45 - 18$
 $\log 488.5 = 2.69767$ $L_1 = 44^\circ 42'$
 $L_8 = 45^\circ 17'$

$\log 47.62 = 1.67779$ $\log 10.31 = 1.01326$
 1.12269 1.12269
 2.80048 2.13595
 631.9 136.8

498.5 494.9 $\log 2.69452$
 4937 $\log 2.68846$
 9998.94
 $L_7 = 45 - 04$ $L_8 = 45 - 10$

$Bdb = \frac{Bb}{Bd}$

494.9 $\log 2.69452$
 4937 $\log 2.68846$
 9998.94
 $L_7 = 44^\circ 56'$



$b = 2 \frac{3884 - 23861}{2} = 125 = 1.87$

$cd = \frac{77t}{2} = 389$

$t_g c = \frac{1.87}{389} = 16' 30''$ Hence $Bdb = 45^\circ 16' 30''$

Aug 12 Obs. 7(109)

Comp. # = #, and #₃

Position of scale for #

Order H_1 H_1 H_1 H_3 H_3 H_3
 α_1 α_2 α_3 α_1 α_2 α_3

Order #1

Order # second series

Order for third Series. *

a_2, a_1 Pl #3

Pl Pl Char. fucoid.

#1 #1 Pl Pl
✓ a ✓ a
+ #2 #2 Pl Pl
✓ a ✓ a

#, 18 24

Pla	34	243	18	36	360	18	39	206	41	387	44	96	46	28.3
#1a	24	43			55.2			39.9		55.1		29.3	46	47.9
#2a	38	55.5			38.78		43	8.4			45	42.2	48	0.4
#3a	36	15.5			38.27.3		43	27.4			46	1.7	48	20.0
Pla	34	21.7			33.2		13.7	41	27.1		44	5.8	46	24.2
#1	36	7.2			38.12.1			43	2.0		45	45.5	48	4.3
Pla	34	240			36	45.6		41	45.9		44	19.9	46	38.1
#3a	36	65.6			38	17.5		43	17.2		46	51.9	4	10.2
Pla-#3	1	21.6			1	31.9		1	32.0		1	32.0	1	32.1

Pla. 18	26	151	28	252	30	343	32	218
Pla	26	346	28	443	30	535	32	278
Xa	27	491	29	594	32	82	34	361
Xa	28	86	29	188	32	279	34	553
Pla	26	119	28	218	30	315	32	597
X	27	543	30	39	32	132	34	410
Pla	26	248	28	348	30	439	32	112
#2a	27	588	29	691	32	181	34	457
Pla-#	1	340	1	343	1	342	1	390

Heat	d	m	c	36	4.0	37	38.5	38	12	38	28.6	38	58.5	39	46.8
19	36	31	37	16.6	37	46.1	38	42.3	39	12.3	39	60.0			
20	35	58.7	36	58.2	37	20.0	37	59.3	38	23.8	38	54.6	39	41.3	
21	36	5.9	37	6.3	38	35.8	38	12.3	38	31.2	39	2.1	40	49.0	
22	5														
23	7	13.2		+12.6		12.6		12.7		12.5		13.1			

RR-#

19 36 16	13.2	19 38 12
27 16	12.6	21
27 46	12.6	19 37 51
38 42	12.7	<u>9 24 45</u>
38 12	12.5	10 13 03
<u>40 00</u>	13.1	1 40
19 38 12 + 12.78		10 11 23
		- 13 35
		9 57 48
		23 42
		9 34 06

From #1

T PL -#
 h m s m s
 18 34 29 1 31.8
 36 36 31.9
 39 27 32.0
 41 34 32.0
 44 10 32.1
 46 28 32.1
 18 40 38 1 31.92

19 26 15 18.40
 30 34 84.2
 38 10 34.0
 28 25 34.3
 19 29 36 1 34.12

18 05 07 1 33.02

-21
 19 04 46 18 40 38 19 29 36
 9 24 48 -21 -21
 9 39 58 18 40 17 19 29 15
 1 35 9 24 48 9 24 46
 9 38 23 9 15 28 10 04 27
 -13 35 -13 35
 9 01 54 9 01 54 9 50 52
 -23 42 -23 42
 9 24 48 8 38 12 9 27 10
 -23 42 -1 30 1 39
 9 01 06 8 36 42 9 25 31
 38 264 35882 35272
 37576 9.55458 9.55408
 9.57491 9 0 54 9 49 54

u -6385 u' $+1.2$
 u 100.28 u' $+4.6$

Log.

1.80516 2.04230 2.00126 -22.91 -25.08 -36.0 -31.3
 9.07918 0.66276 $.66276$ $+2$ $+2$ $+6$ $+8$
 -23.99 -41.42 20 58 48.38 48.38 -27 44 55.6 -354 -305
 $+0.2$ $+1.66$ $c=20$ 58 25.51 $=23.32$ -27 45 31.0 15.6 45 261
 -23.97 -40.88 $0=20$ 58 21.26 $=19.25$ -27 45 52.6 38 38
 20 58 48.38 -4.74 4.11 -27 45 52.6 28.7
 20 58 24.41 27 44 52.60 24.6 30.7
 -27 44 19.8

PL $\#3$
 T_m-T_v T_m-T_v
 $PL=7$ u

12.3 44
 12.4 44
 12.35 44.10
 18.8 10.9
 $+7.7$ 14.1 6.4
 13.9 5.9
 14.00 5.75

From #2

log 12.35 440
 log 1.09167 0.40037 12.80 10.90 14.00 6.15
 log 9.94660 9.94660 9.94660 9.94660 9.94660 9.94660
 log 1.17609 1.17609 1.17609 1.17609 1.17609 1.17609
 log 9.99541 9.99541 9.99541 9.99541 9.99541 9.99541
 log 2.20981 1.01851 2.39230 2.15557 2.26427 1.90701
 16.21 2468 183.8
 57.8 143.1 50.7
 104.3 103.7 $103.1 = 1$ 43.7

2nd Series

PL $\#3$
 T_m-T_v T_m-T_v

22.7 14.3
 23.0 14.9
 22.0 14.6
 22.0 14.3
 22.42 14.52
 log 1.35063 1.16197
 log 1.11214 1.11214
 2.46277 2.27411
 290.2 1840
 188.0 $"$
 $702.2 = 1$ 42.2

h m s c 1 $"$
 $\#$ 20 58 52.55 -27 47 44.2
 PL $\#$ -1 21.92 $+1$ 43.7
 $"$ -1 34.12 $+1$ 42.2
 PL 20 58 21.52 -27 46 0.5
 PL 20 58 19.32 -27 46 $+7.5$
 PL 20 58 21.27 27 45 36.0 52.6
 PL 20 58 19.25 27 45 59.2 53.8

#, 20 58 32.1 - 27 45 ft

20 58 2.99

PL-# 20 58 620

PL 20 58 12.78

PL 20 58 18.88

- 1.79

@ 20 58 22.96

20 58 15.86

+ 4.40

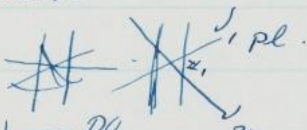
Aug 27 1873 N.A.R. Dr. (109)

Comp star = Uellhi. 20883

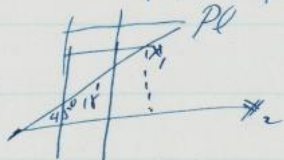
$$a_1 = 20 \ 41 \ 5.48 \ 27 \ 55 \ 77$$

$$a_2 = 20 \ 42 \ 34.81 \ 27 \ 87 \ 88.2$$

Ordu. and position


 $\# a_1 - x_1 \quad x_1 \quad x_2 \quad x_2 \quad PL \quad PL \quad PL \quad PL \quad PL$
 $\# a_1 - x_1 \quad x_1 \quad x_2 \quad x_2 \quad PL \quad PL \quad PL \quad PL \quad PL$

Ordu x position



#	J1	a1	a2	J2	a1	a2	J1	J2	a1	a2	J1	J2
21	58	46.7	59	6.1	58	50.6	59	1.1	22	0	29.6	48.6
PL	59	46.6	6.1	59	40.4	50	11.0	1	29.4	48.2	22.9	53.1
PL-II		59.9	60.0						59.5	59.6		
											59.8	59.7
22	3	6.6	16.2	0.8	11.3	6	7.5	6	27.0	6	12.6	62.1
PL		50.7	15.8	51.0	20.6	7	9.3	26.4	2.3	30.4	44.7	4.6
PL-II		59.8	59.6				59.8	59.7			59.4	59.4

		J_1	a_1	a_2	J_2	a_1	a_2	J	a_1	a_2	J	a_1	a_2
#	22	14	24.3	14	29.0	48.4	16	43.1	47.8	17	7.3	18	59.5
PL		15	13.8		28.3	47.6	17	32.8	46.6		6.3	19	48.4
#		16	28.4	15	58.1	16	17.2	18	44.9	17	16.6	20	2.8
(X-#)a													
PL-#k													

#1	24	46.1	50.4	25	8.6
PL	25	35.4	49.3	23	6.3
#2	24	47.3	49.8	23.6	
PL-II		59.6	58.8		
PL-II			29.0		

T	PL-II	PL-II	T	PL-II
22	15	38	+59.25	-30.30
22	17	56	58.90	-30.15
22	20	13	59.25	30.00
22	23	45	58.70	29.50
22	25	49	58.80	29.50
22	20	40	+58.98	29.95
22	19	43	52.23	
22	17	46	+59.13	-30.15

Obs. for

#1-S	#1-S	+8.9	3.6	2.9	3.9	6.7	4.6	=	+3.82	4.80
In-S	-5.2	5.0	5.2	4.9	5.9	6.2	=	-5.10	6.05	
Pl-S	-									
Pl-S	+6.2	6.2	6.1	5.9	5.0	5.0	=	6.05	5.00	
	+4.9	4.9	4.8	4.8	3.7	3.8	=	4.55	3.75	

#1-S	+4.9	4.9	3.8	=	+4.40
Pl-S	+14.5	13.8	14.4	=	+14.24
Pl-S	+27.3	28.1	27.6	=	+27.67

$$\chi_1 \text{ am } 20^h 41^m 45^s = 270^\circ 26'$$

$$\chi_1 \text{ sm } -27^\circ 03'$$

$$\chi_2 \text{ am } 20^h 43^m 15^s = 370^\circ 49'$$

$$\chi_2 \text{ sm } -27^\circ 45'$$

$$\#1 = 20^h 42^m 28.49^s - 27^\circ 50' 8.6''$$

$$+ 2.66'' + 37''$$

$$\text{Aug 27.5 } \#1 = 20^h 42^m 31.17^s - 27^\circ 50' 4.9''$$

$$\#2 = 20^h 43^m 57.74^s - 27^\circ 42' 56.7''$$

$$+ 2.66'' + 37''$$

$$\text{Aug 27.5 } \#2 = 20^h 44^m 0.40^s - 27^\circ 42' 53.0''$$

$$\text{Fm } \chi$$

S. T.	#1	#2
n	20 42 31.15	20 44 03.4
10 23 56		
log sin	9.88148	log b 2.66392
X1 log sin	9.72354	log c 2.66392
log b	1.44783	log c 2.66392
	1.09286	2.66392
	1.44783	2.66392
	9.87898	9.87898
	9.72109	9.72109
	1.07	1.07
	1.08790	1.08790

Aug 22

$$1238 \quad 12.24 \quad 2991 \quad 3015$$

$$10.63 \quad 10.63 \quad +4 \quad 591 + 5 \quad 15''$$

$$1 - 2301 \quad 22.87 \quad -27 \quad 55 \quad 77 \quad 41 \quad 56.2$$

$$2042 \quad 28.49 \quad 43 \quad 57.68 \quad -27 \quad 50 \quad 8.6 \quad 42 \quad 56.7$$

$$\text{Oct 20 } 20^h 42^m 28.49^s \quad 43 \quad 57.68$$

$$\text{NCO. } 28.54 \quad 57.79$$

$$28.51 \quad 57.74$$

g	322 13	322 13	log g	1.0156	1.0156	I	+1.50	1.50	322 34	1.0263	19.36
a	310 42	310 59	cur(g+a)	8.7066	8.7066	I	+ .55	+ .54	310 42	8.7057	.56
No	122 5	122 5	gT	9.7222	9.7222	II	20.73	20.70	117 01	9.7520	19.96
h+a	272 55	273 12				all a	40.08	40.04	27 3 16		39.885
h+a	72 47	73 04	log h	1.2831	1.2831	I	+2.67	+2.67	67 43	1.0803	+2.66
log	1.0156	1.0156	log(h+a)	9.4713	9.4713	II	+ .52	+ .52		9.5789	
h+a	9.9994	9.9994	log II	9.4405	9.4405	III	-2.65	-2.64		9.6692	+ .60
log	9.7222	9.7206	log III	9.4236	9.4220		+6.23	+6.25		9.9993	-3.38
log	9.7376	9.7356	log V	8.4800	8.4800		+4.11	+4.13		9.7222	+6.52
log(h+a)	9.9601	9.9601	log cur V	9.9466	9.9471					9.7482	+3.74
log h	1.2831	1.2831	log III	0.9951	0.9956					9.9663	
log	0.834	0.828								1.2803	
log II	1.3166	1.3160								0.8191	

Aug 27

g	322 13	322 13	log g	1.0156	1.0156	I	+1.50	1.50	322 34	1.0263	19.36
a	310 42	310 59	cur(g+a)	8.7066	8.7066	I	+ .55	+ .54	310 42	8.7057	.56
No	122 5	122 5	gT	9.7222	9.7222	II	20.73	20.70	117 01	9.7520	19.96
h+a	272 55	273 12				all a	40.08	40.04	27 3 16		39.885
h+a	72 47	73 04	log h	1.2831	1.2831	I	+2.67	+2.67	67 43	1.0803	+2.66
log	1.0156	1.0156	log(h+a)	9.4713	9.4713	II	+ .52	+ .52		9.5789	
h+a	9.9994	9.9994	log II	9.4405	9.4405	III	-2.65	-2.64		9.6692	+ .60
log	9.7222	9.7206	log III	9.4236	9.4220		+6.23	+6.25		9.9993	-3.38
log	9.7376	9.7356	log V	8.4800	8.4800		+4.11	+4.13		9.7222	+6.52
log(h+a)	9.9601	9.9601	log cur V	9.9466	9.9471					9.7482	+3.74
log h	1.2831	1.2831	log III	0.9951	0.9956					9.9663	
log	0.834	0.828								1.2803	
log II	1.3166	1.3160								0.8191	

Angle around 45°

[illegible]

$\log +4.40 = 0.14395$ $\log +4.24 = 1.15354$ ($\angle = 45^\circ$) $\log 1.424 = 1.15351$ $\log 27.87 = 1.44344$
 $\log 15$ 1.17609 1.17609 1.17609 1.17609
 $\cos 5$ 9.94660 9.94660 9.94660 9.94660
 $\log 45$ 1.76614 2.27610 2.27620 2.56783
 58.36 188.4 188.4 267.8
 19.10 58.4 118.9 158.4
 392.6 $130.5 = 270.5$ $130.5 = 210.5$ 558.6

	77		77
2	22 ^h 17 ^m 46 ^s	22	3 53
	22 17 19 ²⁷	10	23 58 ⁵⁷
	10 23 54		
	11 53 23	11	39 57
	1 57		1 55
	11 51 26	11	38 02
	-23 42		-23 42
	11 27 44	11	14 20
	-13 44		-13 44
	11 14 00	11	00 36
	46805		45875
9	67029	9	66158

N_2O M.T. = 11 14 20 Q 20 42 31.7 - 27 50 49
PL # + 89.82 - 2 10.8
DL 20 43 30.99 - 27 52 15.7
Lan - 10 + 9.8
DL 20 43 30.89 - 27 52 16.9

[illegible]

$$\begin{array}{ccccccc} & 8 & & & 8 & & \\ w + 6.8 & w + 6.8 & w + 46.9 & w + 5.0 \\ \wedge & \wedge & \wedge & \wedge \end{array}$$

1.71867 983251 1.67117 0.69020

[illegible]

Comparison of 109, with Ephemeris

Date	$4d(P_0)$	$4S(P_0)$
Aug 10	⁸ +4.11 4.01	¹¹ +26.1
11	+4.567	+28.2
12	4.10	
12	+4.14	+24.6
12	4.13	
12	+4.07	+30.7
27	+4.38	+26.5
27	+4.55	+26.8
27	+4.60	+28.0
Aug 17	⁸ +4.33 +4.27	¹¹ +22.8 +25.8

Dec. 21 1872.

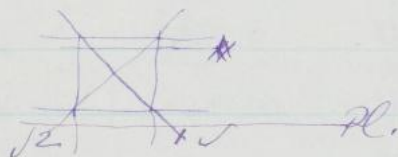
W.R. obs. 11211

Alt. 24869

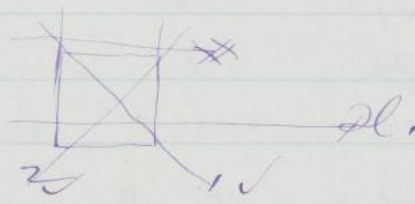
Comp. # = ~~22 0201~~ ^{0 1} 19 8' ^{2 1 5 9 11} - 19 21 for 1873

Position of planet, #, and scale

1st series

Chron = 49^s / alt. of Ho.

2nd Series



Order of observation

1st Series.

$$U1 \left(\begin{smallmatrix} \#a & Pl & Pl \\ \#a & \#u & Pl & Pl & w \end{smallmatrix} \right) \quad \begin{smallmatrix} \#u & \#u & Pl & Pl \\ \#u & \#u & Pl & Pl \end{smallmatrix}$$

1st Series.

Second Series

#	a ₁	a ₂	d ₁	d ₂	x ₁	x ₂	d ₁	d ₂
Pl. #	0 29 38.4	56.4	52.8	42.2	44 25.7	43.8	48.2	21.6
Pl.	31 14.4	31.7	100	35.1	46 16	19.9	55	16.0
+ 1	88.3	35.3			35.9	36.1		
#	0 31 46.3	22 40	32 04	50.2	46 37.4	55.6	59.8	33.2
Pl.	33 21.3	40.0	17.6	44.1	48 18.2	31.5	17.2	28.0
	35.0	35.3			35.8	35.9		
#	0 33 36.6	14.4	10.8	0.7	48 54.2	12.2	16.5	50.5
Pl.	35 31.8	49.9	27.2	0.1	50 30.6	48.5	33.9	40.7
	35.3	35.2			36.4	36.3		
#	0 36 11.4	29.1	29.9	15.5	51 0.5	23.0	27.7	1.7
Pl.	37 47.2	40	42.0	9.0	52 43.0	59.9	44.8	56.8
	36.8	35.4			36.5	36.4		
#	0 38 19.0	37.1	20.8	33.0				
Pl.	39 09.0	12.8	50.6	17.0				
	35.7	35.7						

#	α_1	α_2	α_1	α_2
0	40	279	460	418
Pl	41	35	219	588
	356	359		264

0	36	29	1	354	0	49	19
		51		51			51
0	35	38	1	3456	1	48	28
18	1	16	18	1	16	18	1
6	34	22	7	3340	0	47	12
		4					4
		33	18		6	46	8

1st Series

2nd Series

N.60.M.16

33 18

6 46 8

T	Pl-#	T	Pl-#
0	31 18 - 1	0	46 2 - 1
	35.30		36.00
0	33 21	45 13	35.85
	35.25		
0	35 32	50 31	36.35
	35.25		
0	37 47	52 32	36.45
	35.60		
0	39 55		
	35.70		
0	41 4		
	35.75		
0	36 29 - 1	0	49 19 - 1
	35.47		36.16

#	1st Series Pl	#	2nd Series Pl	#	1st Series Pl	#	2nd Series Pl
α_1	α_2	α_1	α_2	α_1	α_2	α_1	α_2
38	228	41	144	41	224	44	144
39	228	38	148	39	227	43	143
41	222	37	145	42	225	43	146
41	218	38	148	41	222	42	151
45	223			42	231		
47	229						
+4.19	+22.40	+3.85	+14.62	4.10	22.58	4.30	14.60

1st Series

2nd Series

#	Pl	#	Pl	#	Pl	#	Pl
α_1	α_2	α_1	α_2	α_1	α_2	α_1	α_2
141	37	228	39	143	41	222	39
142	47	224	40	140	42	224	35
135	52	223	33	136	45	217	39
140	41	222	28	136	42	218	31
139	47			134	45		
1394	488	22.47	3.50	13.78	4.30	22.00	13.48

Dec 21 1873

Reduction of Observations

187

1st series					2nd series		
x_1, y_1	x_1, y_1	x_2, y_2	x_2, y_2	x_1, y_1	x_1, y_1	x_2, y_2	x_2, y_2
# 4.19	1354	4.10	1378	3.85	2247	4.30	2202
Pl. 22.40	4.48	22.58	4.30	14.62	3.50	14.60	3.48
"							
ords. +593	+63.4	+319.6	+191.0	37.4	318.0	206.7	311.6
-317.8	+197.3	-58.0	+60.9	206.9	49.5	60.9	49.3
$\overline{0-v_1}$ 257.7	$\overline{+197.3}$ 260.7	$\overline{-58.0}$ 261.6	$\overline{+60.9}$ 255.9	$\overline{206.9}$ 261.4	$\overline{49.5}$ 267.5	$\overline{60.9}$ 267.6	$\overline{49.3}$ 262.3
* Pl.							

$$\begin{array}{r}
 257.7 \\
 261.6 \\
 \hline
 259.6 \\
 258.3 \\
 \hline
 259.0
 \end{array}$$

$$\begin{array}{r}
 260.7 \\
 255.9 \\
 \hline
 258.3
 \end{array}$$

$$\begin{array}{r}
 261.4 \\
 267.6 \\
 \hline
 90.0 \\
 264.5 \\
 264.9 \\
 \hline
 264.7'' = 4' 24.7''
 \end{array}$$

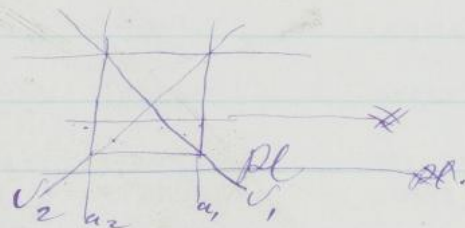
$$\begin{array}{r}
 267.5 \\
 262.3 \\
 \hline
 98.0 \\
 264.9 \\
 \hline
 264.9'' = 4' 24.9''
 \end{array}$$

Dec. 22, 1973 N.S.R. obs. (121)

Comp. # = Oeltin 21921

22^h 15^m 01^s - 1908

Position of Scale, # and Planet:



0	45	40	1	3	11
18	5	13	18	5	13
6	39	21	7	57	58
			7	56	52

Order, Pl. $\sqrt{1}$ - Pl. a_1 - Pl. a_2 - # a_1 - # $\sqrt{1}$ - Pl. $\sqrt{2}$ - # $\sqrt{2}$ - # a_2

1st Series

2nd Series

Pl.	$\sqrt{1}$	a_1	a_2	$\sqrt{1}$	$\sqrt{2}$
0	43	247	43	43.0	43.3
#	13	450	44	3.1	49.0
		-202	20.1		43.59.8
Pl.	44	304	487	18.8	45.07
#	44	307	89	54.3	5.2
		20.3	20.1		
Pl.	45	406	587	28.8	10.6
#	46	67	19.0	48	18.7
		20.3	20.3		
Pl.	46	424	06	30.5	12.1
#	47	20	207	6.2	17.6
		20.2	20.1		
Pl.	47	441	1.8	32.3	13.9
#	48	4.0	32.2	7.6	15.9
		19.9	20.4		

$\sqrt{1}$	a_1	a_2	$\sqrt{1}$	$\sqrt{2}$
1	17.6	35.3	4.4	49.2
	367	54.8	89.3	52.3
	19.1	19.3		
2	20.5	38.8	7.5	57.9
	39.8	58.0	42.6	53.7
	19.3	19.2		
3	42.8	0.8	83.0	10.6
	2.0	20.1	80	14.2
	19.2	19.3		
4	43.2	1.7	33.5	11.5
	2.6	20.7	8.4	14.9
	19.4	19.0		

Pl. #

$\sqrt{1}$	Pl. #	a_1	a_2	a_1	a_2
0	43	65	-20.20	Pl. 114	289
				# 40	14.8
44	40	20.20		Pl. 116	303
45	50	20.30		# 36	14.5
46	50	20.15		Pl. 118	300
47	54	20.15		# 36	14.8
45	40	20.20		Pl. 119	297
				# 36	14.5
				Pl. 118	298
				# 36	14.9

$\sqrt{1}$	Pl. #	a_1	a_2	a_1	a_2
1	1	28	19.20	Pl. 13.2	316
				# 2.6	15.6
2	30	19.25	13.0	314	81.3
				28	15.4
3	52	19.25			
4	53	19.20	9.8	278	278
				6.0	12.2
1	3	11	19.22	12.1	5.9
				97	283
				5.8	12.3
					12.5
					9.8
					5.8

log cos 19° 16'

$$\begin{array}{r} 9.51630999523 \\ 1.17609117609 \\ \hline 0.69238115732 \end{array}$$

Dro 22. Reduction of declination observations

1st series

2nd series

#	α_1	α_2	α_3	α_4
11.70	29.44	29.82	11.82	
3.68	14.82	14.46	3.34	

α_1	α_2	α_3	α_4
11.42	29.78	29.60	11.58
4.30	14.00	13.82	4.12

Pl. Log 106819 1.47625 1.47451 1.07262

0.56585 1.17085 1.16017 0.82375

1.0767 1.47393 1.47129 1.06371

.63347 1.14613 1.10823 1.14051 1.61490

Pl 2.21951 2.62957 2.62583 2.22394

1.71717 2.32217 2.31149 1.67507

2.20899 2.62525 2.62261 2.21503

1.78479 2.25795 2.25955 1.77622 2.29183

165.8 42.42 422.5 167.5

52.1 21.00 204.9 47.3

217.9 214.2 217.6 214.8

161.8 42.19 419.4 164.1

61.0 19.84 188.8 59.7

222.8 223.5 228.6 223.8

217.9 217.9 217.6

214.2 214.2 214.8

217.6

214.8

222.8 223.6

223.5 223.5

223.1 223.7 = 223.4

= 3' 43.4"

Mean 216.1 = 3' 36.1"

Periodicity of ruling machine screw.

Measurement of $\frac{1}{20}$ rev. with $\frac{1}{15}$ in. gage block.

Spacers.	Band I Div.	Band II Div.	Band III Div.	Band IV Div.	Band V Div.	Mean
5 1	35.8	35.6	35.5	35.7	35.7	35.60
10 2	.5	.8	.7	.8	.9	.74
15 3	.6	.7	.6	.8	.8	.70
20 4	.8	.9	.10	.8	.9	.88
25 5	.8	.7	.9	.9	.9	.84
30 6	.7	.8	.8	.6	.7	.72
35 7	.7	.7	.6	.7	.7	.68
40 8	.7	.5	.7	.8	.7	.68
45 9	.3	.4	.5	.6	.6	.48
50 10	.3	.6	.5	.7	.6	.53
55 11	.2	.4	.6	.8	.3	.32
60 12	.0	.3	.0	.1	.3	.14
65 13	.0	.0	.0	.1	.1	.04
70 14	.0	.0	.1	.2	.0	.06
75 15	.0	.0	.1	.1	.0	.04
80 16	.2	.3	.1	.1	.3	.20
85 17	.1	.0	.0	.1	.3	.10
90 18	.2	.2	.1	.2	.1	.16
95 19	.2	.1	.3	.2	.3	.22
100 20	.7	.4	.5	.7	.7	.60
Mean	35.375	35.420	35.425	35.475	35.445	35.487

 $\frac{1}{17010}$ in.

Approximate reduction
corrected for perspective error

Corr.
color

Dis.

Dis.	
-0.6	4.98
-30	9.94
-26	14.80
116-44	19.14
-40	24.78
-28	29.74
-24	34.70
116	39.67
24	44.66
14	49.60
-10	54.67
+12	59.71
30	64.77
+40	69.82
+34	74.87
40	79.91
24	84.96
34	89.99
28	95.02
322	10.000
846	

Approximate reduction
corrected for perspective error

Cor- rections	Dis.
Dis	
-0.16	4.98
-30	9.94
-26	14.80
-44	19.64
-40	24.78
-28	29.74
-24	34.70
-24	39.67
-04	44.66
-10	49.60
+12	54.67
+30	59.71
+40	64.77
+34	69.82
+40	74.87
+24	79.91
+34	84.96
+28	89.99
+22	95.02
-16	10.00

Note, Read by the settings on previous page. Objectum = $\frac{1}{6}$

5 bands. 20 lines each. Each space = $\frac{1}{480}$ in.

Div.	mic. dis.	I	II	III	IV	V
5		20.0	20.0	20.0	20.0	19.8
10		0	.0	.0	.0	-.1
15		.0	.1	.1	.0	.0
20		.0	.0	.0	.0	.0
25		.0	.0	.0	.0	-.1
30		.0	.0	.0	.1	.0
35		.0	.1	.0	.1	.0
40		.1	.0	.1	.0	.0
45		.0	.0	.0	.0	.0
50		.0	.0	.0	.0	.0
55		.1	.0	.0	.1	.0
60		.1	.0	.1	.1	.1
65		.1	.0	.0	.0	.0
70		.0	.2	.1	.1	.0
75		.0	.0	.0	.0	.0
80		.0	.1	.0	.0	.0
85		.2	.1	.0	.0	.1
90		.0	.0	.0	.0	.4
95		.5	.1	.0	.9	.0
100		<u>0</u>	<u>0</u>	<u>.0</u>	<u>.0</u>	<u>.3</u>

Plate II 5 bands. Measured with $\frac{1}{15}$ in objective. $\frac{17234}{24} = 717$

Secu Level. Dis.	I	II	III	IV	V	Means	Diffs	Summed
5	3476	3479	3477	3478	35410	35.80	+10	+10
10	.6	.9	.10	.9	.8	.84	+06	+16
15	.8	.9	.8	.9	.10	.88	+02	+18
20	.8	.7	.8	.9	.10	.84	+06	+24
25	.7	.6	.6	.6	.8	.66	+24	+48
30	.8	.9	.9	.10	.10	.92	-02	+46
35	10	10	.9	.9	.10	.96	-06	+40
40	8	9	9	10	10	.92	-02	+38
45	9	8	10	10	10	.94	-04	+34
50	9	10	8	8	8	.82	+08	+42
55	9	8	9	10	9	.90	+00	+42
60	8	9	9	10	10	.90	+00	+42
65	8	10	10	10	10	.96	-06	+36
70	9	10	10	10	10	.98	-08	+28
75	9	7	8	10	10	.88	+02	+30
80	10	10	9	10	10	.92	-02	+28
85	8	9	9	9	10	.92	-02	+26
90	8	10	9	10	8	.90	+00	+26
95	13	11	12	14	11	122-32	-06	
100	8	9	9	10	10	.92	-02	+00
	167	179	167	191	192	1808		
35.835	35.885	35.835	35.905	35.960		35.904		

.835
 .885
 .835
 .955
 .960
 4470
 35.894

35.904
 480
 2872320
 143616
 17.233920

$$1200 = \frac{1}{17234} \text{ in.}$$

Aug
New Adjustment - y & z

$$\text{Const} = \frac{296000}{9638} = 29.8$$

$$\text{Const} = 13.88$$

	$\frac{1}{6}$ Div.	space = $\frac{1}{450}$ in	$\frac{1}{15}$ Div. = $\frac{1}{9638}$
0	-00 00		-0 0
1	-17 -51		-40 -56
2	-16 -48		-75 -104
3	-04 -1.2		-80 -111
4	-01 -0.3		-135 -188
5	-25 -74		-160 -222
6	-49 -146		-180 -250
7	-54 -161		-200 -278
8	-51 -182		-215 -299
9	-73 -217		-210 -292
10	-5 -200		-190 -264
11	-74 -221		-185 -257
12	-68 -206		-185 -257
13	-63 -188		-180 -208
14	-55 -164		-125 -174
15	-47 -140		-100 -139
16	-39 -116		-85 -118
17	-29 -86		-60 -83
18	-21 -63		-40 -56
19	-08 -24		+10 -24
20	-00 00		+00 -00

$$\frac{1}{15} \text{ Div} = \frac{1}{17280}$$

$$1 \text{ Rev. } 1 \text{ Div} = \frac{1}{2400} \text{ in. } \frac{1}{15} \text{ in. } \frac{1}{15} \text{ in.}$$

Space x	Div.	Div.	Space	Div.	Space	Div.	Space	Div.	
1	8.0	26 7.1	51 7.0	76 .0	1	35.10 +.06 -6			
2	.0	27 .1	52 .0	77 .0	2	30 -24 -30			
3	.0	28 .0	53 .0	78 0	3	00 +04 -24			
4	.1	29 .0	54 -1	79 0	4	.40 -36 -60			
5	.0	30 .1	55 .0	80 .0	5	.20 -16 -.76			
6	0	31 .	56 0	81 -1	6	.30 -26 -1.02			
7	.1	32 0	57 0	82 .0	7	00 +04 -98			
8	.1	33 0	58 0	83 -1	8	00 +04 -94			
9	0	34 0	59 0	84 0	9	.10 +06 -1.00			
10	.1	35 -1	60 -2	85 +1	10	00 +04 -96			
11	.0	36 0	61 0	86 -2	11	.10 +06 -1.02			
12	-1	37 0	62 0	87 -1	12	00 +04 -98			
13	.1	38 0	63 -1	88 0	13	34.80 +14 -84			
14	0	39 0	64 -1	89 -1	14	34.80 +24 -60			
15	.0	40 0	65 0	90 +1	15	34.60 +44 -16			
16	.	41 0	66 -3	91 0	16	34.90 +14 -02			
17	.0	42 0	67 0	92 0	17	35.00 +04 -06			
18	.1	43 0	68 0	93 0	18	35.90 +14 +08			
19	.2	44 0	69 -1	94 0	19	35.00 +04 -04			
20	.0	45 .1	70 .0	95 0	20	35.10 +06 -10			
21	.0	46 0	71 0	96 -1		35.04			
22	.0	47 -1	72 0	97 +1					
23	.1	48 0	73 0	98 +1					
24	.1	49 0	74 0	99 +0					
25	.0	50 0	75 -1	100 +0					

15 Obj.

Div = $\frac{1}{16776}$ in $\frac{240000}{16776} = 14.31$ $\frac{240000}{16776} = 14.3$

14.3 X 200 div.

	Div				Div E.P.	Div III Semi-Mend	Div II I	Mean Div. Corr May 10	Mean Div. Corr May 10
1	350	-14	-14	-06	-10	-14	-57	-56	-40 +1.3
2	352	-34	-48	-30	-39	-56	-48	-104	-69 +1.8
3	349	-04	-52	-24	-38	-54	-12	-111	-62 +1.5
4	352	-36	-88	-60	-74	-106	-03	-188	-99 +1.7
5	351	-24	-112	-76	-94	-134	-74	-222	-153 +0.8
6	351	-24	-136	-102	-119	-171	-146	-250	-189 -20
7	348	+06	-130	-88	-114	-161	-161	-278	-200 -30
8	349	-04	-134	-94	-114	-161	-182	-289	-214 -46
9	350	-14	-148	-100	-124	-177	-217	-292	-229 -43
10	349	-04	-152	-96	-124	-177	-200	-264	-214 -40
11	347	+16	-136	-102	-119	-171	-221	-257	-216 -32
12	347	+16	-120	-98	-109	-157	-206	-257	-207 -21
13	348	+06	-114	-84	-99	-142	-188	-208	-179 -27
14	350	-14	-128	-60	-94	-184	-164	-174	-157 -26
15	347	+16	-112	-16	-64	-92	-140	-139	-124 -22
16	345	+36	-76	-02	-39	-56	-116	-118	-97 -22
17	348	+06	-70	-06	-38	-84	-56	-83	-74 -17
18	343	+56	+14	+08	-03	-04	-63	-56	-41 -16
19	346	+26	+12	-04	+04	+06	-24	-14	-11 -08
20	350	-14	+00	-10	+00	+00	+00	+00	0.0 -01

3486

8495
48
27960
13980
167760

Corrections adopted Apr. 9 1877

$$\text{Div} = \frac{1}{240000} \text{ in.}$$

Space Div	Space	Div.	Space Div	Space	Div.
0 - 0	26	19	51	21	7 1/2 - 12
1 - 1	27	19	52	-21	77 - 14
2 - 2	28	19	53	-21	78 - 11
3 - 3	29	20	54	-21	79 - 11
4 - 3	30	20	55	-21	80 - 10
X 5 - 4	31	20	56	-21	81 - 9
6 - 4	32	20	57	-21	82 - 8
7 - 5	33	20	58	-21	83 - 8
8 - 5	34	20	59	-21	84 - 7
9 - 6	35	21	60	-21	85 - 7
X 10 - 6	36	21	61	-20	86 - 6
11 - 7	37	22	62	-20	87 - 5
12 - 7	38	22	63	-19	88 - 5
13 - 8	39	23	64	-19	89 - 4
14 - 9	40	23	65	-18	90 - 4
X 15 - 10	41	23	66	-18	91 - 3
16 - 11	42	23	67	-17	92 - 3
17 - 12	43	22	68	-17	93 - 2
18 - 13	44	22	69	-16	94 - 2
19 - 14	45	21	70	-16	95 - 1
X 20 - 15	46	21	71	-15	96 - 1
21 - 16	47	21	72	-14	97 - 0
22 - 17	48	21	73	-13	98 - 0
23 - 18	49	21	74	-13	99 - 0
24 - 19	50	21	75	-12	100 - 0
X 25 - 19					

Mag 10 1877 2 Plates ruled by the preceding correction.

$$1 \text{ space} = \frac{1}{40} \text{ in.} \quad \frac{1}{6} \text{ in.} \text{ by system}$$

	Σ P. div.	I	Mean	Div. seconds
1	20.0	0 0 0	20.00 +06 +06 +1.5	
2	0	0 0 0	00 +06 +12 +3.0	
3	0	1 1 1	07 -01 +11 +2.8	
4	1	1 0 0	05 +01 +12 +3.0	
5	0	2 0 1	07 -01 +11 +2.8	
6	2	1 2 2	.18 -12 -01 -0.2	
7	1	0 2 2	.12 -06 -07 -1.7	
8	1	1 2 1	.12 -06 -13 -3.2	
9	1	0 0 2	.06 +00 -13 -3.2	
10	0	0 1 1	.04 +02 -11 -2.8	
11	0	1 0 0	02 +04 -07 -1.7	
12	0	1 0 0	02 +04 -03 -0.7	
13	2	1 1 1	12 -06 -09 -2.2	
14	1	1 0 1	08 -02 -11 -2.8	
15	1	0 1 0	05 +01 -10 -2.5	
16	1	1 1 0	08 -02 -12 -3.0	
17	1	0 1 1	07 -01 -13 -3.2	
18	0	0 0 0	00 +06 -07 -1.7	
19	0	0 1 1	05 +01 -06 -1.5	
20	0	1 1 1	05 +01 -05 -1.2	

$$\begin{array}{r} 20.062 \\ .480 \\ \hline 1604960 \\ 80248 \\ \hline 96298 \end{array}$$

$$1 \text{ div} = 9.630$$

$$\frac{24000}{9630} = 24.9$$

	II	Mean	Div. Mean
	20.0 0 0	20.00 +05 +05 +1.2	+1.3
1	1 0	.07 -02 +03 +0.7	+1.8
0	0 2	.07 -02 +01 +0.2	+1.5
0	0 1	.04 +01 +02 +0.5	+1.9
1	1 1	.10 -05 -03 -1.2	+0.8
2	2 1	.17 -12 -15 -3.7	-2.0
0	1 1	.07 -02 -17 -4.2	-3.0
2	1 1	.13 -08 -25 -6.2	-4.6
0	1 0	.03 +02 -23 -5.7	-4.3
0	1 0	.03 +02 -21 -5.2	-4.0
1	0 0	.03 +02 -19 -4.7	-3.2
0	0 0	.06 +05 -14 -3.5	-2.1
1	0 0	.03 +02 -12 -3.0	-2.7
0	1 0	.03 +02 -10 -2.5	-2.6
0	0 1	.03 +02 -8 -2.0	-2.2
0	0 1	.03 +02 -6 -1.5	-2.2
0	0 0	.00 +05 -1 -0.2	-1.7
2	0 1	.10 -05 -6 -1.5	-1.6
0	0 0	.00 +05 -1 -0.2	-0.8
0	0 0	.00 +05 +4 +1.0	-0.1

$$20.05$$

0	0	0	0
5 1	-27	H1	-1
10 2	-57	+2	-3
15 3	-47	+3	-3
20 4	-82	+3	-5
25 5	-145	+3.2	-11
30 6	-209	+3	-18
35 7	-230	+3	-20
40 8	-260	+3	-23
45 9	-272	+2	-25
50 10	-254	+1.2	-24
55 11	-245	+2	-23
60 12	-228	+2	-21
65 13	-206	+2	-19
70 14	-183	+3	-15
75 15	-146	+2.5	-12
80 16	-119	+3	-9
85 17	-91		-6
90 18	-57	+3.0	-3
95 19	-19	+2	-0
100 20	-0.1	+1.0	+0

New discussion.

$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$
20.1	0	20.05	+01 +01 +0.2
10	2	10	-04 -03 -0.5
15	2	15	-09 -12 -3.0
20	3	25	-19 -31 -7.7
25	2	20	-14 -45 -11.2
30	1	15	-09 -54 -13.4
35	2	15	-09 -63 -15.7
40	3	20	-14 -77 -19.2
45	2	15	-09 -86 -21.4
50	1	10	-04 -90 -22.4
55	0	00	+04 -86 -21.4
60	0	00	+04 -82 -20.4
65	0	00	+04 -78 -19.4
70	0	00	+04 -74 -18.4
75	-1	00	-05 +11 -63 -15.7
80	-1	00	-05 +11 -52 -12.9
85	0	00	-05 +11 -41 -10.2
90	0	00	+06 -35 -8.7
95	-2	-20	+26 -09 -2.2
100	0	00	+06 -03 -0.7

15.0
 3.5
 11.5
 20.06
 4.8
 16.048
 8.024
 96.288
 9.629

24.9

$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$	$\frac{1}{h}$
35.6	.5	35.55	-02 -02 -0.3	-0.1	0.0		
.7	.7	.70	-15 -17 -2.4	-1.5	-1.0		
.6	.8	.76	-15 -32 -4.5	-3.8	-3.0		
.7	.8	.75	-20 -52 -7.3	-7.5	-6.0		
.9	.8	.85	-32 -84 -11.8	-11.5	-11		
.9	.5	.70	-17 -101 -14.2	-13.8	-14.8		
.9	.8	.85	-32 -133 -18.7	-17.2	-20		
.7	.9	.80	-27 -160 -22.6	-20.9	-20.3		
.8	.8	.80	-27 -187 -26.4	-23.9	-25		
.7	.5	.60	-07 -184 -27.4	-24.9	-24		
.6	.4	.50	+03 -191 -26.9	-24.2	-23		
.5	.4	.45	+08 -183 -25.8	-23.1	-21		
.5	.4	.45	+08 -178 -24.6	-22.0	-19		
.4	.3	.35	+18 -187 -22.1	-20.2	-15		
.3	.2	.25	+28 1.29 -18.1	-16.9	-12		
.1	.4	.25	+28 -1.01 -14.2	-13.8	-9		
.2	.3	.25	+28 -7.3 -10.3	-10.2	-6		
.5	.3	.40	+13 -60 -8.5	-8.6	-3		
.0	-1	-0.5	+58 -02 -0.3	-1.2	-0		
7	4	.55	-02 -1.00 +0.0	+0.3	0		

35.53
 4.8
 28.424
 14.212
 170.54
 14.1

Adopted

New values

1873phae.proj...429R

0
0
0
0
0
0
1
8
0
03
5
4
3
1
9
5
2
2
6
8
0
0

Observation of (112)

<u>1845</u> Mch. 4	<u>Comp. Sid. Y.</u> 7 ^h 43.9 ^m	<u>Comp. X</u> (112) = N_2 III 665	<u>Δx</u> +28.15, +1' 54".81	<u>$\Delta \delta$</u> -25.07, +8 2.20	<u>No. of</u> <u>Comp.</u> 4
8	7 47.3	= $Lm.$ +21° 51' 9"			14
8	8 12.6	= N_2 III 813	+43.68 +6	21.55	10
25	8 49.7	= $Lm.$ +22° 65' 0"	-12.28 +6	35.04	33

Not corrected for parallax & refraction

<u>Mag.</u>	<u>Mch. 4</u>	
	12	
	8	12 $\frac{1}{2}$
	25	13 $\frac{1}{2}$

Observation of (112)

<u>1845</u> Mch. 24	<u>Cand. Id. Y.</u>	<u>Cmp. *</u>	<u>$\Delta \alpha$</u>	<u>$\Delta \delta$</u>	<u>No. of Comp.</u>
	7 43.9	(112) = W ₂ III 665	+28.15, +1' 54".81		4
8	7 47.3	= Lm. +21° 579	-25.07, +8	2.20	14
8	8 12.6	= W ₂ III 813	+43.68 +6	21.55	10
25	8 49.7	= Lm. +22° 650	-12.28 +6	35.04	33

Not corrected for parallax & refraction

<u>Mag.</u>	<u>Mch. 24</u>	<u>12</u>
	8	12 $\frac{1}{2}$
	25	13 $\frac{1}{2}$

1873phae.proj...425R

