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KG
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v.756

Investigation of Circle
A2
Observations
June 5th 1879 – Aug 20th 1879

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Investigation of errors of
Meridian Circle
by
W. A. Rogers

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2

1879 June 5

Division into 2 equal parts
by means of glow plots on border circle

zero of A = 6 26.0

A	6	ε	Ā	Q	b	Mean
0 26.0	0 4.0	0 0-0.3	2.2	2.9	7.4	
	5.4	-0.7	2.0	3.1	7.2	
	5.7	-0.7	1.8	3.0	7.2	
	5.0	-0.3	1.8	2.9	7.4	
	4.3	-0.3	1.8	3.1	7.3	
	24 4	23	46	15 0	15	
	4.88	-0.46	1.92	3.00	7.30 =	3.~~13~~

Adjusted glow plots and zero

A						
11 54.5	4 53.3	0 0 2.8	3.8	5.2	9.1 10.0	
	51.8	2.8	4.5	5.2	8.8 10.1	
	52.2	2.6	4.8	5.2	8.7 10.1	
	51.7	2.5	4.8	4.9	8.8 9.9	
	52.2	2.3	4.0	5.0	10.1	
	11 2	30	19	24.6	2	"
	52.24	2.60	4.38	4.92	10.04	5.49

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zero of 6. = 0′ 7″0

H	6		Q	F		76	Mean
0 26.0	0 18.8	0	0 0.0	7.8	7.8	0.2	
	19.2		0.0	9.0	7.7	−0.2	
	16.3		−0.2	9.0	7.5	−0.3	
	17.8		0.0	9.3	7.7	−0.3	
	18.7		−0.1	9.7	7.3	−0.3	
	408			448	30	9	
	0 18.16		−0.06	8.96	7.60	−0.18	~~8.98~~ 8.78
	0 4.88						3.93
	0 13.28						+ 90

5 6.1	0	0	2.5	11.0	4.9	2.9
3.1			2.2	11.3	4.9	2.7
4.0			2.6	11.6	4.9	2.9
3.5			2.3	11.7	4.9	2.9
4.0			3.0	11.6	4.9	2.8
20.7			12.6	22		4.2
4.14			2.52	11.44	4.90	2.84
52.24						
+11.90						

542
549
− 07

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Adjusted plates for focus.

#		b	E	F	G	H	
11	54.5	5 0.8	0 0 4.7	3.3	4.3	9.6	
		0.2	1.8	3.8	4.8	9.8	
		−0.9	2.0	3.8	4.8	10.1	
		+0.2	1.8	3.8	5.0	10.0	
		0.6	1.7	3.8	4.9	9.8	
		0.9	40	35	38	43	
		0.18	1.80	3.70	4.76	9.86	5.03
11	54.5	5 4.1	1.3	3.7	4.9	8.7 9.7	
		3.0	1.3	3.8	4.4	8.8 9.8	
		3.7	1.6	3.7	4.9	8.4 9.9	
		5.0	1.4	3.9	5.1	8.1 9.8	
		4.8	1.1	4.0	5.1	9.7	
		20.6	17	41	44	41	
		4.12	1.34	3.82	4.88	9.82	4.97
11	54.5	5 13.0	−0.4	2.4	4.8	8.7	
		16.8	−0.7	2.2	4.4	9.0	
		16.2	−0.3	2.0	4.6	9.2	
		16.1	−0.6	1.9	4.4	8.7	
		15.9	−0.3	2.2	4.3	8.9	
		15.60	−0.46	2.14	4.50	8.90	3.88

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A	b	E	F	G	H	
11 54.5	5 1.8	0 0 3.2	10.0	5.0	2.8	
	1.9	3.0	11.6	5.1	3.7	
	1.7	2.8	11.4	5.1	3.3	
	0.3	2.8	11.8	5.0	3.0	
	2.1	3.1	12.1	5.1	3.0	
	7 8	9	19	3	8	
	1.56	3.18	11.38	5.06	3.16	5.6-6
	0.18					503
	+1.38					+66
11 54.5	5 ~~13.2~~	2.0	10.2	4.4	1.8	
	11.1	1.9	10.2	4.1	2.0	
	10.7	1.9	10.2	4.0	2.4	
	9.8	2.2	10.9	4.4	2.0	
	8.0	2.3	11.1	4.7	1.8	
	6.28	10.3				
	10.56	2.06	10.52	4.32	2.00	4.73
	4.12					4.97
	+ ~~2.36~~ 2.44					-0.24

Note: When the second reading of b is less than the first, the distance from ~~A to b~~ plate A to plate b is greater than 10s°

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Z	A	b	E	F1	G	H	Mean
9	13/11 54.5	4 57.2	0 0 0.0	1.8	5.3	8.5 9.3	9
		56.3	−0.2	1.5	5.8	8.5 9.6	
		57.9	−0.1	1.8	5.8	8.6 9.7	
		57.8	−0.3	2.0	5.5	8.1 9.8	
		57.7	−0.1	1.7	5.3	10.1	
		19	7	38	27	35	
		57.38	−0.14	1.76	5.54	9.70	42.1

N							
9	18	5 37.2	0 0 0.4	6.8	4.0	0.2	
		37.0	0.7	7.4	3.9	0.1	
		37.2	0.8	8.2	3.8	−0.2	
		36.7	0.7	7.2	3.8	0.0	
		38.2	0.3	6.5	3.4	0.0	
		363	29	36.1	18.9	01	
		5 37.26	0.58	7.22	3.78	0.02	2.90
		4 57.38					+1.31
		+ 39.88					

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Z

		A	b	E	F	G	H	
9	26	11 54.5	4 57.8	0 0 0.2	1.4	5.3	9.8	
			57.7	0.2	1.9	5.2	10.3	
			56.7	-0.2	2.2	5.0	10.0	
			58.1	0.2	2.1	5.6	9.8	
			57.0	0.5	2.2	5.3	9.9	
			3 7 3	09	9 8	14	4 8	
			57.46	0.18	1.96	5.28	9.96	43

N

9	30	11 54.5	5 38.0	0 0 1.2	6.8	3.8	0.6	
			36.0	1.2	7.2	4.7	0.3	
			35.0	1.3	7.2	3.8	0.7	
			34.3	1.2	8.0	3.9	0.0	
			34.4	1.2	7.3	3.8	0.0	
			27 7	11	15	50	16	
			5 35.54	1.22	7.30	4.00	0.32	3.21
			4 57.46					4.44
			+38.08					

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8

Z

		A	b			E	F	G	H	
9	37	11 54.5	5	0.0	0	0.2	2.0	6.8	9.9	
				-0.7		0.3	1.6	6.2	9.7	
				+57.1		0.3	2.2	6.3	9.9	
				58.0		0.0	2.1	6.4	9.4	
				57.8		0.2	2.6	6.4	9.8	
				2922		10	7	21	37	
				58.44		0.20	2.14	6.42	9.74	4.65

N

9	40	11 54.5	5	37.8	0	0.0	7.3	3.9	0.7	
				37.0		0.1	7.6	3.6	0.2	
				36.3		0.2	8.2	3.8	0.0	
				35.4		0.2	7.7	3.7	0.1	
				37.1		0.3	8.0	4.0	0.0	
				336		8	40	40	10	
			5	36.72		0.16	7.80	3.80	0.20	2.99
			4	58.44						+1.6
				+38.28						

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Z	A	b			ε	η	ζ	ħ	
9	46	11 54.5	4	57.2	0 0	0.2	1.3	5.8	9.8	
				56.0		0.1	1.2	5.7	10.0	
				57.2		0.2	1.5	5.4	9.8	
				57.0		0.5	1.6	5.2	10.0	
				57.0		0.2	1.6	5.7	10.0	
				44		12	22	28	46	
				56.88		0.24	1.44	5.56	9.92	4.29

N	A	b							
9	50	11 54.5	5	35.7	0 0	0.5	8.3	8.3	0.0	
				35.2		0.2	8.5	8.5	-0.3	
				35.2		0.2	8.8	3.3	-0.1	
				35.0		0.6	8.7	3.4	0.1	
				37.0		0.6	8.3	3.7	0.0	
				28.1		21	26	22	03	
			5	35.62		0.42	8.52	3.44	-0.06	3.10
			4	56.88						7.19
				38.74						

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Z

		A	b		E	F	G	H	
9	57	11 54.5	4 57.3	0.0	0.2	2.1	5.2	10.0	
			57.2		0.4	1.8	5.1	10.1	
			57.0		0.3	2.0	5.2	10.0	
			57.2		0.3	2.1	5.1	10.1	
			57.2		0.3	2.1	5.0	9.9	
			9		15	1	6	1	
			57.18		0.30	2.02	5.12	10.02	4.37

N

10	0	11 54.5	5 39.5	0.0	0.2	9.1	3.8	−0.6	
			38.8		0.2	8.1	3.7	−0.1	
			38.2		0.1	8.7	3.7	−0.2	
			37.0		0.2	8.4	3.8	−0.1	
			38.2		0.4	7.8	3.8	−0.0	
			39.7		11	21	38	10	
			5 37.94		0.22	8.42	3.76	−1.20	3.05
			4 57.18						+1.32
			+40.76						

Adjusted A & b

Let $A = b + 180^\circ\ 0'\ 0''$

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Z	A	b	E	F	G	H	
10	7 12	6.2					
		~~5.78~~	0 0 0.2	1.8	4.4	8.9	
		~~5.53~~	0.6	1.7	4.7	9.2	
		~~5.78~~	0.3	1.7	4.1	9.1	
		~~5.56~~	0.2	2.1	4.8	9.2	
		~~5.54~~	0.6	2.2	4.7	8.8	
		~~19~~					
		~~56.38~~	0.38	1.90	4.54	9.04	3.97
	12 62	5.52	2.1	9.2	4.8	1.7	
		5.18	2.2	9.3	4.8	1.6	
		5.12	1.8	9.8	4.8	1.7	
		5.4	1.9	9.8	49	1.9	
		5.1	1.9	9.8	4.4	18	
		17	49				
	5	5.34	1.98	9.58	4.74	1.74	4.57
	4	~~6.38~~					−0.54
		~~1.04~~					
	12 67	5 5.7	0 0 −0.1	+08	4.8	8.7	
		5.0	0.0	+1.1	4.3	8.8	
		4.8	−0.2	+1.2	4.3	8.9	
		6.2	−0.2	+1.2	4.3	9.0	
		5.2	−0.3	+1.2	4.4	9.0	
		269	8	5	21	44	
		5.38	−0.16	+1.10	4.42	8.88	3.54
		38	0 0 1.9	9.8	4.7	1.9	
		5.5	1.9	10.1	4.6	1.8	
		4.1	2.1	10.2	4.8	1.6	
		4.1	2.2	10.7	4.8	1.8	
		7.1	2.2	10.2	50	1.3	
		24.6	3	10	39	34	
	5	4.92	2.06	10.20	4.78	1.68	4.58
	5	5.38					−1.02
		0.46					

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12

Z	A	b	E	F	G	H	
	12 6,2 5	5.0	0 0 −0,2	1.0	4,6	8.7	
		3.8	−0.1	0.8	4.2	8.8	
		5.1	−0.2	1.1	5.0	8.8	
		3.8	−0.3	1.3	4.7	8.5	
		6.1	−0,4	0.9	4,7	8.8	
		23.8	12	5.1	32	8.32	11
		4.76	−0.24	1.02	4,64	8.72	3,59
N	12 6,2 5	5.8	0 0 2.5	9.9	4.7	1.9	
		5.0	2.2	10.4	4.6	1.7	
		3.4	2.2	10.1	4.8	1.8	
		5.8	2.2	10.2	4.4	1.4	
		5.0	1.8	9.8	4.7	1.7	
			9	4	32	31	
	5−	5.00	2.18	10.08	4.64	1.62	463
	5−	4.76					−1.10
		+0,24					
Z	12 6,2 5	3.0	0 0 0.1	1.1	4,8	9.1	
		0.0	0.1	0.8	4.3	9,2	
		2.0	0.1	1.3	4.8	9,1	
		1.3	0.2	1.0	4,8	8,8	
		1.3	0.0	1.4	4,7	9.0	
		7.5	4	6	34	2	
		1.52	0.08	1.12	4.68	9,04	3.73
N	12 6,2 5	2,2	0 0 2.2	9.8	4,7	2,2	
		0.8	2,3	10,3	4,8	1,8	
		1,2	2,3	10,1	4,8	1.8	
		1.2	2,6	10.1	4,8	1,7	
		2.2	25	10.2	4,8	1,2	
		7.5	17	5	39	37	
	5−	1.52	2.34	10,10	4,78	1,74	4,74
	5−	1.52					−1,01
		0,0 0					

Adjusted glass plates

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Z	A		b		E	F	G	H	
	12	6.2	5	34.1	0 0	4.6	4.8	9.8	13.3
				34.4		4.6	5.4	10.7	13.2
				33.4		4.3	5.6	10.1	13.2
				33.8		4.2	5.7	10.1	13.0
				33.8		4.3	5.7	9.9	13.1
				19 5		20	22	0	
				33.90		4.40	5.44	1.000	13.16
N	12	6.2	4	57.3	0 0	6.6	14.8	10.8	7.0
				59.2		6.1	14.8	10.9	6.6
				56.8		6.2	14.9	10.8	6.3
				57.3		6.6	15.4	10.8	6.8
				59.7		6.6	14.9	10.7	6.6
				42 3		21	48	40	33
			4	58.46		6.42	14.96	10.80	6.66
			5	33.90					
				−34.44					

Z. 12 6.2

Set ~~plate~~ A + 6. to correspond with zero of E

	12	6.2	5	37.8	0 0	1.2	5.6	2.8	9.7
				37.0		1.0	5.8	2.8	9.3
				37.3		1.0	5.7	2.8	9.7
				37.2		0.8	5.1	2.8	9.8
				36.5		0.8	5.2	2.8	9.8
				35 8		48	24		41
				37.16		0.96	5.48	2.80	9.82
N			5	26.2	0 0	3.6	11.4	6.2	3.8
				26.0		3.1	11.8	5.9	3.9
				25.2		3.7	11.9	6.2	3.7
				26.2		3.7	11.9	6.1	3.6
				27.2		3.2	12.1	6.0	3.7
				30 8		23	41		37
			5	26.16		3.46	11.82	6.08	3.74
			5	37.16					
				−11.00					

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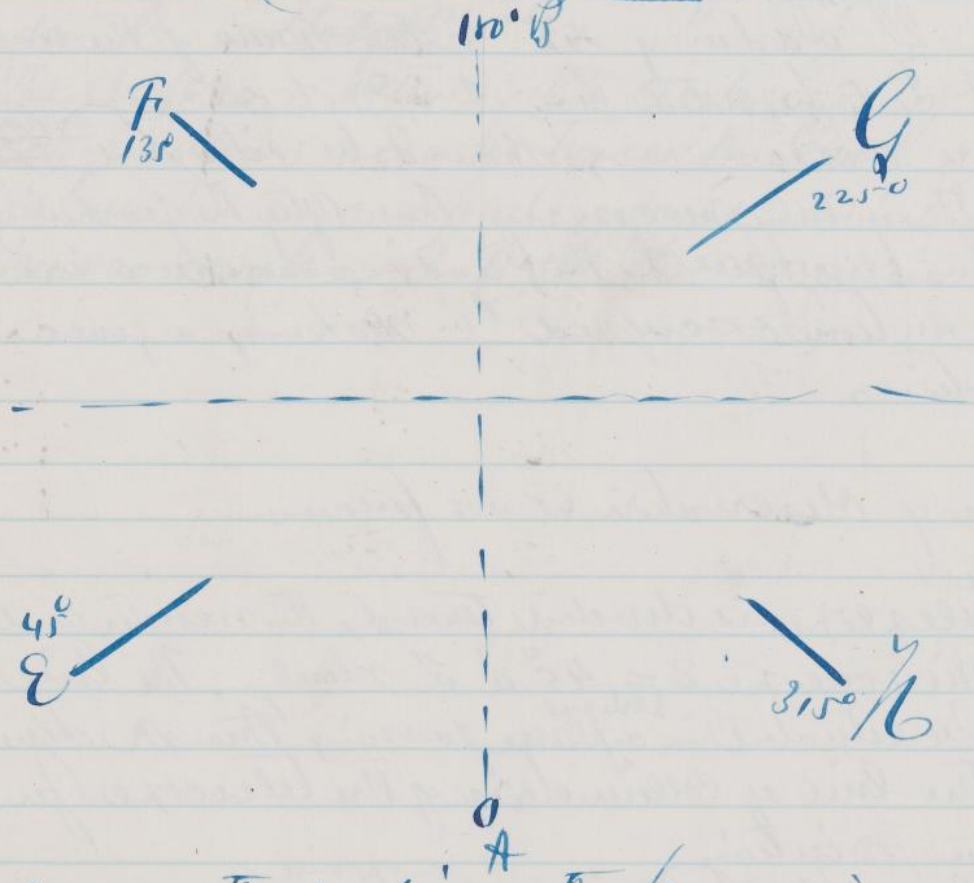
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14									
	A		C		E	F	G	H	
	12 6.2	5	39.2	0 0	0.9	2.3	4.9	9.7	
			39.1		0.9	2.0	5.0	9.3	
			39.0		1.2	2.8	5.0	9.3	
			40.0		1.3	2.5	5.0	9.4	
			38.2		1.2	2.5	4.8	9.5	
			45 5		5	21	24 7	22	
			39.10		1.10	2.42	4.94	9.44	497
N	12 6.2	5	25.2	0 0	3.7	11.8	5.8	3.6	
			26.1		3.8	11.9	6.2	3.3	
			27.3		3.8	11.9	6.0	3.2	
			26.8		3.6	11.6	5.9	3.2	
			28.8		3.7	11.7	5.7	3.3	
			342		32	39	46	16	
			26.84		3.72	11.78	5.92	3.32	618
			39.10						−121.
			−12.26						

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Investigation of the relation between the two readings of the Meridian Circle, the order of reading being from the zenith (division 180°) southwards to the nadir



The mean of the readings the four microscopes define the vertical line passing through the center of the circle. If O falls exactly on an even degree and the equator point - zenith, nadir, this line is situated in a plane which passes through the line of collimation of the telescope (when this line is vertical) and the center of the graduated circle.

In this discussion it will be assumed that the fixed line A O B is in this plane. When the telescope points to the zenith. When the telescope is directed towards any point south of the zenith, the line of collimation has moved away from the fixed line A O B by an angle equal to the difference between the readings by the microscopes for the

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The two positions plus or minus the error of this part of the graduated arc.

If only two microscopes are used, we can give the fixed line of reference A B the same definition as before by adding 45° to the mean of the readings.

It is to be noted that it is not necessary that the four microscopes should be situated exactly 90° apart. It is only necessary that after the reading of A B has been found, this reading should be a constant during the time occupied in making a given series of observations.

The order of observation is as follows:-

(a) The telescope is directed towards the meridian and set for Microscope E = 45° 0' 0" nearly. The line A B will then be situated in a plane passing through division 180°, and the line of collimation of the telescope for this particular position.

(b) The glass plates attached to the opposite Circle are then set as nearly as possible 180° apart. If by examination they are found to be exactly 180° apart, then have only to read and compare the mean of the four microscopes E, F, G, H, for the two halves of the circle in order to ascertain the relation between these halves.

(c) If the glass plates are not set exactly 180° apart, the order of proceeding is as follows:-

(1) Telescope set for E = 45° 0' 0"

(2) Microscope A set for coincidence with the new line of plate (A)

(3) The position of the new line on plate (B) is measured with Microscope B

(4) Microscopes F G H are then read.

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(5) The telescope is reversed from South to North 180° and a coincidence is made with the micrometer thread by mechanical adjustment.

(6) The reading of the new line of the glass plate under b is taken.

(7) The difference between the readings of b for the two positions will be twice the error of division and the equal parts depend on division of wire screw.

(8) Microscopes 2, 3, 4, 5 are again read.

Over

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Recapitulation of readings in the order of the Magnitudes of the difference between the reading of C for Zenith and Nadir.

		C	$\frac{Z+T+S+W}{4}$	E
Z.	4	57.18	4.37	59.54
N	5	37.94	3.05	57.94
		40.76	1.32	
Z	4	57.38	4.21	
N	5	37.26	2.90	
Δ		39.88	1.31	
Z	4	56.88	4.29	
N	5	35.62	3.10	
Δ		38.74	1.19	
Z	4	57.44	4.65	
N	5	36.72	2.99	
Δ		38.28	1.16	
Z	4	57.46	4.35	
N	5	35.57	3.21	
Δ		38.08		
Z	0	4.88	3.93	
N	0	16.16	3.93	
Δ		13.28	0.00	
Z	4	52.24	5.49	
W	5	4.14	5.42	
Δ		11.90		

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2

Z	5	4.12	497
N	5	10.56	4.73
Δ		6.44	0.24

Z	5	1.52	3.78
N	5	1.52	4.74
Δ		.00	1.01

Z	5	5.20	3.53
N	5	4.76	4.63
Δ		.24	1.10

Z	5	4.52	3.56
N	5	5.38	4.58
Δ		.46	1.02

Z	5	5.34	3.97
N	5	6.38	4.51
Δ		1.04	0.54

Z	5	~~20.16~~ 7.16	4.97	0.96	5.48	2.80	9.82
N	5	~~27.44~~ 26.16	6.26	3.46	11.82	6.08	3.74
Δ		11.00 1.28	1.49	−2.50	−6.34	−3.28	+6.08

Z	5	39.10	4.97	1.10	2.42	4.94	9.44
N	5	26.84	6.18	3.72	11.78	5.92	3.32
Δ		12.26 1.31	1.21	−2.62	−9.36	−0.98	+6.12

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1879phae.proj.1760R

June 9 1879

Observations of the four quadrants of the Zenith Circle.

Set the pillars 90° apart nearly. The vernier plate has been removed 180° since the previous series in order to make the increasing readings correspond to an increasing South Zenith distance.

In the following means the telescope is moved from the Zenith North to the Nadir, S. & Zenith again. Readings increasing reading in this direction. The readings of microscope A diminishes whereas when B ~~reading less~~ readings less than for telescope direct - 2, the telescope has made more than 1/4 of a revolution.

Order from Zenith North

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1879phae.proj.1760R

T = 11 h 15 Solartime

	A	b		E	Z F	G	H
4	59.6	5	53.9	5 0	-2.4	0.7	0.2	2.9
			53.3		-2.2	0.3	0.7	3.0
			53.2		-2.5	0.0	0.8	2.8
			52.9		-2.7	0.2	0.7	3.0
			52.8		-2.8	0.2	0.8	2.8
			21 53.42		-2.52	0.28	0.64	2.90

N.6.

4	59.6	5	50.2	5 0	08	2.9	-5.1	-1.7
4			50.2		0.7	3.0	-5.1	-1.3
	270		51.2		0.3	3.2	-5.1	-1.2
			50.2		0.3	3.0	-5.2	-1.6
			50.2		0.6	2.9	-5.2	-1.2
			50.40		0.54	3.00	-5.14	-1.40

N

4	59.6	5	49.5	5	0.13	7.8	0.0	-4.4
			48.2		-1.5	7.8	-0.1	-4.4
	180		48.2		-1.7	7.8	-0.1	-4.3
			48.0		-1.6	8.0	+0.2	-4.9
			47.8		-1.5	7.8	0.0	-4.7
			48.34		-1.52	7.88	0.00	-4.54

S.6.

4	59.6	5	33.2	5	0 -5.3	5.0	2.8	-0.7
			32.1		-5.3	5.0	2.8	-0.6
			32.1		-5.7	5.0	2.9	-1.0
	W		31.3		-5.7	4.7	2.8	-0.9
			31.8		-5.3	4.9	2.9	-0.8
			32.12		-5.46	4.92	2.84	-0.80

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1879phae.proj.1760R

I = 11h 33m

Z

A		b		E	F	G	H
4	59.6	5	48,7	5 0 -2.8	+0.2	0.1	2,8
			48,0	-2.8	+0.2	0.3	2.9
			49.2	-2.9	+0.3	0.4	3.0
			49.9	-2.9	+0,5	0.2	2.9
			49.9	-2.8	+0.2	0.0	2.8
			7	42	14	10	44
			49.14	-2.84	+0.28	0.20	2.88

N.6.

4	59.6	5	49.0	5 0	0.7	2.8	-5,2	-1,0
			49.1		0.8	2.8	-5.1	-1,0
			49.9		0.7	2.8	-5,2	-1.12
			49.9		0.8	2.9	-5.1	-1.1
			49.3		0.7	3.1	-5.0	-1.2
			22		37	44	6	3
			49.44		0.74	2.88	-5.12	-1,06

N

4	59.6	5	45.8	5 0	-1.7	7.3	-0.3	-4.9
			47.0		-1.9	7.2	-0.1	-4.9
			45,2		-1.8	7.7	-0.2	-4.8
			45.2		-1.7	7.5	-0.2	-4.9
			45.0		-1.7	7.7	-0.1	-5.0
			282		33	24	9	45
			45.64		-1,66	7,48	-0.18	-4.90

Y.6

4	59.6	5	24.9	5 0	-6.5	3.4	2.2	-1.3
			26.1		-6.0	3,5	2.3	-1,5
			26,0		-5.7	3.7	2.1	-1,5
			26.3		-6.0	4.1	2.3	-1,3
			25.8		-6.2	4.2	2.1	-1.3
			291		14	39	10	19
			25,82		-6.28	3.78	2.20	-1,38

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1879phae.proj.1760R

I = 11h 41m

~~4~~	~~59.6~~	5	~~45.6~~		Z	E	F	G	H/6
4	59.6	5	45.0	5	0	-2.8	-0.3	0.0	2.5
			45.5			-2.9	-0.8	0.1	2.8
			45.1			-2.6	-0.8	0.3	2.4
			46.3			-2.8	-0.2	0.2	2.3
			45.8			-2.8	-0.2	0.3	2.8
			27			39	23	9	28
			45.54			-2.78	-0.46	0.18	2.56

N.6.

4	59.6	5	42.8	5	0	0.0	2.6	-5.3	-1.7
			41.8			0.2	2.7	-5.3	-1.6
			42.0			0.3	2.8	-5.1	-1.2
			42.7			0.3	2.9	-5.3	-1.1
			42.8			0.1	2.6	-5.3	-1.2
			21			9	36	13	15
			42.42			0.18	2.72	-5.26	-1.36

N

4	59.6	5	48.2	5	0	-1.7	7.3	0.1	-4.4
			50.1			-1.3	7.0	0.2	-4.8
			49.8			-1.7	7.2	0.2	-4.7
			50.2			-1.6	7.4	0.1	-4.6
			49.3			-1.7	7.8	0.1	-4.8
			2476			30	17	7	33
			49.52			-1.60	7.34	0.14	-4.66

L.6

4	59.6	5	27.0	5	0	-6.3	3.8	+2.2	-1.3
			26.3			-6.3	3.9	2.2	-1.2
			26.8			-6.2	3.9	1.9	-1.2
			27.3			-6.5	3.9	2.2	-1.6
			26.4			-6.2	3.7	2.1	-1.3
			338			15	42	106	16
			26.76			-6.30	3.84	2.12	-1.32

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1879phae.proj.1760R

I = 11 59

Z

A		b		E	F	G	H
4 59.6	5	42.2	5 0	-3.2	-1.1	0.1	2.5
		42.3		-3.1	-1.3	0.3	2.7
		43.1		-3.1	-1.2	0.0	2.2
		43.0		-3.1	-1.2	-0.1	2.1
		43.7		-3.1	-1.2	+0.1	2.6
		43		6	10		21
		42.86		-3.12	-1.20	+0.08	2.42

N. b.

4 59.6	5	38.1	5 0	-0.4	+1.8	-5.3	-1.9
		38.2		-0.2	2.0	-5.2	-1.6
		39.0		-0.2	2.4	-5.2	-1.6
		38.5		-0.0	2.6	-5.7	-1.4
		3.84		-0.1	2.2	-5.7	-1.7
		22		9	10	21	32
		38.44		-0.18	2.20	-5.42	-1.64

N.

4 59.6	5	54.3	5 0	-1.7	+7.8	1.0	-4.6
		55.2		-1.6	8.0	0.8	-4.7
		56.1		-1.7	7.8	0.2	-4.3
		56.2		-1.3	7.8	0.7	-4.4
		56.6		-1.2	7.8	0.7	-4.6
		284		25	42	34	26
		55.68		-1.50	7.84	0.68	-4.52

N. b.

4 59.6	5	25.8	5 0	-6.4	4.2	2.2	-1.8
		25.8		-6.5	4.0	2.1	-1.9
		26.0		-6.3	3.9	2.0	-1.6
		25.9		-6.4	3.6	2.1	-1.4
		26.8		-6.6	3.8	2.4	-1.8
		3		18	45	8	35
		26.06		-6.36	3.90	2.16	-1.70

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T = 12 25

A		5	δ		E	F	G	H
4	59.6	5	42.7	5	0 -3.7	-1.1	0.2	1.7
			42.1		-3.6	-0.7	0.0	1.8
			42.0		-3.7	-0.8	-0.2	1.7
			41.7		-3.7	-1.3	-0.1	1.9
			43.7		-3.3	-1.3	+.00	1.9
			122		30	2	03	40
			42.44		-3.60	-1.04	-0.06	1.80
					N. 6.			
4	59.6	5	38.0 #	5	0 -0.7	2.5	-5.7	-1.8
			38.6		-0.2	1.9	-5.5	-1.7
			36.2		-0.6	1.8	-5.7	-1.7
			37.7		-0.2	1.9	-5.8	-1.9
			37.2		-0.7	1.7	-5.8	-1.7
			47		24	38	35	38
			37.94		-0.48	1.76	-5.70	-1.76
					N.			
4	59.6	5	54.8	5	0 -1.7	7.7	0.8	-4.2
			55.0		-1.4	8.3	0.9	-4.1
			55.8		-1.2	8.0	1.0	-4.3
			56.2		-1.3	7.7	1.1	-4.0
			56.6		-1.7	8.2	1.0	-4.0
			284		23	39	48	6
			55.68		-1.46	7.98	0.96	-4.12
					S 6.			
4	59.6	5	20.2	5	0 -7.7	3.1	1.8	-2.0
			21.2		-7.4	3.2	1.8	-2.1
			21.6		-7.4	3.1	1.7	-2.0
			21.2		-7.8	3.1	2.1	-2.0
			21.0		-7.8	3.3	1.8	-1.5
			2		31	8	42	-96
			21.04		-7.62	3.16	1.84	-1.92

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For South Zenith distances
Value of 1 revolution ε / b

ε	b	ε	b
5′ 0′	5′ 21.6	5 1	13′
−6.8	22.2	−7.3	53.7
−6.8	22.3	−7.5	53.1
−7.3	22.8	−7.8	55.8
−6.8	21.8	−7.7	56.1
−6.9		−7.5	55.8
			5

	ε	c
	"	
0	53.08	5 22.14
1	52.44	13 54.90
	59.36 = 83.76	= 5′ 12.76 div

1 div = 0.116″

b	ε	b	ε
7′	5′ 0	15	5′ 1
4.8	4.4	45.2	4.0
4.8	4.3	42.7	4.0
5.1	4.1	41.3	4.1
5.3	4.0	41.0	4.2
5.5	3.8	41.7	4.1

	7	5.10
0	4.12	15 42.38
1	4.08	8 37.28
	59.96	8 44.90 = 52.90

1 div = .114″

b	ε	b	a
7′	5′ 0	15	5′ 1′
21.0	5.2	47.2	5.0
20.3	5.0	47.8	5.0
19.3	5.2	46.3	5.0
19.8	5.3	46.8	5.2
20.2	5.0	47.0	5.0

0	5.14	7 20.12
1	5.04	15 47.02
	59.90	8 26.90 = 506.90

1 div = .118″

0.116	
.114	
.118	
.118	
.116	

5′ ε′ 0	b 7	5 ε′ 1	b 15
7.7	34.9	4.9	42.8
7.9	35.0	4.6	43.2
8.1	35.3	4.3	42.8
8.1	35.3	4.1	42.8
8.7	35.8	4.3	43.1

0	8.10	7 35.26
1	4.44	15 42.94
	56.34	8 7.68 = 487.68

1 div = .115″

Mean div = 0.116″

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New series, set glass plates anew.

A		b		E	Z	H	G	K
4	59.7	5	43.2	0	0	−0.2	2.2	3.0	4.7 5.2
			42.2			−0.5	2.6	2.9	4.9 5.1
			42.9			−0.1	2.3	2.8	4.8 5.2
			42.0			+0.2	26	3.0	5.2
			42.3			00	2.5	2.8	4.9
			26				22	45	6
			42.52			−0.12	2.44	2.90	5.12
						S. C.			
4	59.7	5	42.3	00		0.6	3.8	−3.7	00
			43.6			0.7	3.9	−3.6	0.1
			43.1			0.7	4.0	−3.7	0.0
			43.4			0.7	4.3	−3.4	−0.1
			42.0			0.3	41	−3.4	+02
			144			30	1	28	02
			42.88			0.60	4.02	−3.56	0.04
						Mader			
4	59.7	5	42.3	00		−3.3	56	0.3	−4.2
			43.0			−3.3	5.8	0.7	−4.8
			43.6			−3.7	6.1	0.8	−4.7
			44.2			−3.2	6.2	0.2	−5.0
			43.8			−3.4	6.1	0.2	−50
			169			19	298	22	37
			43.38			−3.38	5.96	0.44	−4.74
						M. C.			
4	59.7	4	31.8	0	0	−7.3	1.3	0.2	−2.8
			33.2			−7.7	2.0	0.8	−2.8
			32.4			−8.1	2.2	1.0	−2.8
			32.1			−7.4	2.2	0.8	−2.8
			32.8			−7.5	1.8	08	−2.9
			128			30	45	36	41
			32.46			7.60	1.90	0.72	−2.82

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I = 10 25 Adjusted plates slightly

A C

Z

A			C			E		F		G		H	
4 59.7	5	37.9		0	0	1.6		4.2		4.7		6.6	
		39.2				1.7		4.3		4.8		6.8	
		39.6				1.6		4.8		5.0		7.2	
		39.1				1.8		4.8		4.8		6.8	
		39.2				1.9		4.8		4.9		6.7	
		0				36		29		42		41	
	5	39.00				1.72		4.58		4.84		6.82	

No change — No

N. C.

		I	II			I	II	I	II	I	II	I	II
4 59.7	5	57.1	62.8	0	0	2.6	3.1	4.4	6.0	-3.2	-1.8	2.3	2.6
		59.0	64.4			2.4	3.5	4.5	5.8	-3.2	-2.1	2.2	2.8
		60.8	64.4			2.3	3.2	4.8	5.7	-3.2	-1.8	2.4	2.3
		59.9	65.1			2.4	3.6	5.1	6.1	-3.3	-1.7	2.5	2.7
		59.3	65.1			2.5	3.3	5.0	5.5	-3.2	-1.7	2.7	2.6
		47.0	218			22	17	38	41	11	41	21	30
		59.40	64.36			2.44	3.34	4.76	5.82	-3.22	-1.82	2.42	2.60

~~change~~ I = yes II = no

N

4 59.7	5	34.3	0	0	-3.9	5.6	-1.0	-5.8
		33.4			-3.8	5.0	-0.8	-5.8
		33.8			-3.8	5.6	-0.7	-5.3
		32.9			-4.0	6.0	-0.5	-5.7
		33.2			-4.0	6.0	-0.8	-5.3
		17 6			4 5	3 2	3 8	29
		33.52			-3.90	5.64	-0.76	5.58

No change

S. C.

4 59.7	4	3.8	0	0
		3.1		
		3.2		
		3.0		
		3.0		
		11		
		3.22		

Disturbed telescope

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1879phae.proj.1760R

30 Jan 10 1879

Z.

A 6

4 597

Oiled the pivots Cleaned the friction rollers with Kerosene. Took off the rubber caps from the case to prevent spring from the telescope, ~~turned both microscopes A & B 180° in order to have increasing readings~~

Adjusted the plates anew, Set the cross-lines of the glass plates near the transverse lines of the micrometers.

Order for the main South

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1879phae.proj.1760R

32h

I: 3 52 Sider. Time

b	A		E	F	G	H	
8 28.7	6 29.6	5 0	1.8	3.5	4.3	6.8	
	29.0		1.7	3.6	4.3	7.2	
Zenith	29.2		2.0	4.2	4.2	7.0	No change
	29.8		1.7	4.2	4.1	6.8	
	28.8		1.8	4.2	4.1	7.2	
	14		90	47	10	0	
	29.28		1.80	3.94	4.20	7.00	
	86.86						
8 28.7	6 32.6	5 0	-4.3	5.8	3.8	1.3	
	33.5		-4.2	5.9	3.8	1.4	
	34.7		-4.6	6.1	3.9	1.5	No change
S. b.	34.0		-4.7	5.8	3.8	1.4	
	34.7		-4.8	5.7	4.0	1.5	
	19 5		26	33	43	21	
	33.90		-4.52	5.66	3.86	1.42	
	4 48.4	5 0	-5.2	3.8	-3.3	-7.5	
	48.0		-5.0	3.8	-3.4	-7.3	
Nadir	48.3		-5.1	4.2	-3.3	-7.8	NB.
	47.8		-5.3	3.8	-3.2	-7.7	
	48.7		-4.8	3.9	-3.3	-8.0	
	12		4	45	15	33	
	48.24		-5.08	3.90	-3.30	-7.66	

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T = 3 56

b	A I	A II			E I	E II	F I	F II	G I	G II	H I	H II
5 28.7	22.8	19.8	5	0	4.0	4.1	6.8	6.9	6.7	5.8	10.2	10.2
	23.2	19.2			4.2	4.5	6.8	6.8	6.2	5.9	10.2	10.1
	23.2	19.3			4.0	4.4	7.1	6.4	6.3	5.8	10.1	10.1
Zenith	23.9	19.8			4.1	4.2	7.1	6.6	6.1	5.7	10.2	9.8
	23.5	19.9			4.4	4.4	7.2	6.7	6.1	5.9	10.2	9.7
	16	31			7	16	0	34	14	41	9	49
	23.32	19.62			4.14	4.32	7.00	6.68	6.28	5.82	10.18	9.98
	2.47				4.23			6.84		6.05		10.08

b	A I	A II			E I	E II	F I	F II	G I	G II	H I	H II
5 28.7	41.8	39.0	5	0	1.0	0.2	10.9	10.6	9.3	9.0	6.8	6.3
	42.1	39.0			0.8	0.8	10.9	10.7	9.3	8.7	6.6	6.2
	42.1	39.5			1.0	0.6	10.9	10.8	9.3	8.8	6.5	6.2
S.b	42.0	39.4			0.7	0.6	10.9	10.9	9.8	9.0	6.4	6.1
	42.3	39.0			0.6	0.2	10.9	10.9	9.3	9.0	6.6	6.2
	3	9			41	24		39	20	45	29	10
	42.06	39.18			0.82	0.48	10.90	10.78	9.40	8.90	6.58	6.20
	40.62				0.65		10.84		9.15		6.39	

5 28.7	5 39.8	5	0	0.9	10.2	2.7	-1.8
	39.9			1.2	10.2	2.9	-1.6
	39.2			1.2	10.2	2.9	-1.3 No change
Nadir	39.1			1.1	10.2	3.1	-1.2
	38.0			1.0	9.8	2.8	-1.2
	10			4	6	14	21
	39.20			1.08	10.12	2.88	-1.42

5 28.7	3.9	5	0	+0.2	2.2	-5.8	-0.4
	1.5			+0.1	1.5	-5.8	-0.3
	3.0			+0.2	2.1	-6.0	-0.2
	2.2			+0.4	1.9	-5.9	-0.4
	1.7			+0.2	1.7	-5.8	-0.1
	123			11	44	43	14
	2.46			0.22	1.88	-5.86	-0.28

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T = 4 18

	h		A			E	F	G	H	
5	28.7	5	24.0	5	0	4.8	6.3	6.8	10.1	
			25.1			4.7	6.8	6.4	10.2	
Zenith			24.2			4.5	6.8	6.6	10.2	No change
			24.2			4.7	6.8	6.3	10.0	
			23.3			4.8	7.1	6.3	10.3	
			208			35	38	24	8	
			24.16			4.70	6.76	6.48	10.16	
5	28.7	5	38.8	5	0	0.3	9.9	9.0	6.0	
			38.2			0.2	10.6	8.7	6.0	
S.E.			37.8			0.2	10.5	9.1	6.1	No change
			38.8			0.1	10.1	9.0	6.0	
			38.7			0.0	10.2	8.8	6.3	
			23			18	13	46	4	
			38.46			0.16	10.26	8.92	6.08	
5	28.7	5	43.2	5	0	0.8	10.3	3.2	−1.2	
			43.2			1.2	10.4	3.3	−1.3	
			42.3			1.2	10.4	3.0	−1.2	No change
Nadir			42.3			1.6	10.0	3.0	−1.2	
			42.1			15	10.0	3.1	−1.0	
			31			13	11	6	9	
			42.62			1.26	10.22	3.12	−1.18	
5	28.7	4	0.8	5	0	0.0	1.7	−6.2	−1.3	
		3	60.8			0.0	1.5	−5.8	−0.8	
N.E.		3	59.0			0.1	1.9	−6.1	−0.8	No change
			60.0			0.0	1.9	−5.9	−0.7	
			60.2			0.0	2.1	−6.0	−0.8	
			08			1	41	0	44	
			60.16			0.02	1.82	−6.00	−1.88	

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T = 4h 35m

~~Rad vect of Mercury~~

b	A		E I	E II	F I	F II	G I	G II	H I	H II
5 28.7	5 27.5	27.7 5 0	4.7	4.5	6.8	6.2	7.3	6.5	10.8	10.6
	27.1	26.7	4.9	4.6	7.2	6.1	7.5	7.0	10.3	10.8
Zenith	27.2	27.2	5.0	4.7	6.8	6.3	7.8	6.9	10.2	10.1
	27.9	27.5	4.8	4.8	6.8	6.3	7.8	7.1	10.6	10.3
	27.5	28.1	4.8	4.4	6.8	6.1	7.0	6.8	10.2	10.2
	22		42		44		16		18	
	27.44		4.84	4.60	6.88	6.20	7.32	7.06	10.36	

5 28.7	5 40.3	5 0	0.2	10.5	10.1	8.8		5.9
	40.7		0.4	10.4	10.0	8.9		6.6
	40.1		0.6	10.9	9.8	9.1		6.0
S.C.	40.0		0.7	9.8	10.0	8.9		6.2
	39.3		0.3	9.8	10.2	9.0		6.2
	22		22	50.4	101	47		9
	5 40.08		0.44	10.08	1062	8.94		6.18

5 28.7	5 48.0	5 0	1.8		9.8	3.2	-1.2
	48.2		1.3		9.5	3.2	-1.0
	48.8		1.3		9.8	3.3	-0.8
Nadir	49.0		1.2		10.0	3.2	-1.2
	48.0		1.6		9.9	3.1	-1.0
	20		22		46	10	2
	48.40		1.44		9.82	3.20	-1.04

Beg. Rad.

5 28.7	56.1	51.0 5 0	-1.5		0.3	-6.5	-1.3
	56.6	51.2	-1.1		0.7	-6.2	-1.6
N.C.	56.8	51.2	-1.1		0.3	-6.2	-1.3
	56.2	51.9	-1.2		0.2	-5.9	-1.3
	56.2	53.3	-1.2		0.2	-6.1	-1.7
	19	86	11		17	9	22
	56.38	51.72	-1.22		0.34	-6.18	-1.44

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36

T = 5⁻ 8

	A			E	F1	G	H6
6.							
5 28.7	5 36.2	5	0	4.7	5.6	7.2	11.1
	35.8			4.8	6.3	7.8	11.2
Zenith	35.3			4.9	6.2	7.8	11.2
	36.1			4.4	6.1	8.0	11.2
	36.0			4.9	6.2	8.2	11.6
	44			37	4	40	13
	35.88			4.74	6.08	7.80	11.26

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I = 9 13

b	A			E	F	G	H
~~5 56.1~~ ~~4 43.0~~	6	8	19.8	5 0	5.5	6.8	10.8	10.7
		1	20.8		5.6	6.9	10.9	11.2
		1	20.9		5.9	6.7	10.2	11.0 No change
		0	20.6		5.9	7.2	10.7	11.0
		9	21.0		5.6	7.2	10.8	10.9
		39	31		35	48	34	48
			20.62		5.70	6.96	10.68	10.96
5 56.1	6		20.0	5 0	2.5	11.8	13.0	9.1
			20.0		2.4	11.6	13.2	9.6
			18.9		2.5	11.9	13.4	9.1
			20.7		2.3	12.0	13.2	9.3
			20.6		2.7	11.8	13.2	9.3
			2		24	91	10	14
			20.04		2.48	11.82	13.20	9.28
5 56.1	5		50.0	5 0	4.4	13.8	10.9	4.1
			51.7		4.5	13.8	11.0	3.9
			51.0		4.9	13.8	10.9	3.8
			50.7		5.0	13.9	11.1	4.1
			50.3		5.1	14.1	11.1	3.9
			37		39	44	0	48
			50.74		4.78	13.88	11.00	3.96

			I	II		I	II	I	II	I	II	I	II
5 56.1	6		20.1	15.0	5 0	10.2	10.1	11.8	12.1	5.7	5.1	10.1	9.2
			19.9	14.9		10.2	10.1	12.1	12.2	5.7	5.5	10.2	9.5
			21.3	13.4		10.0	9.8	12.2	12.3	5.6	4.8	10.1	9.3
			21.3	14.6		10.3	9.7	12.2	12.0	5.3	5.1	10.1	9.6
			20.9	14.8		10.2	9.8	12.6	11.5	5.5	5.0	10.1	8.3
			35	227		9	45	9	1	28	5	6	19
			20.70	14.54		10.18	9.90	12.18	12.02	5.56	5.10	10.12	9.18
						10.04		12.10		5.33		9.65	

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9h 28m

b	A	E	F	G	H
5 56.1	6 22.8	5 0 6.8	7.3	11.3	12.2
	22.5	6.3	7.7	11.8	12.8
	23.2	6.6	7.6	11.2	12.3
	23.2	6.4	8.2	11.1	12.2
	24.3	6.3	7.8	11.1	12.6
	160	24	36	15	21
	23.20	6.48	7.72	11.30	12.42
5 56.1	6 15.8	5 0 2.0	12.9	13.8	9.4
	16.1	2.1	12.6	13.6	9.6
	16.0	2.4	11.8	13.2	10.2
	16.2	2.3	12.1	13.2	9.9
	15.1	2.6	11.9	13.5	9.7
	42	17	103	23	38
	15.84	2.34	12.06	13.46	9.76
5 56.1	5 55.1	5 0 5.6	14.8	11.0	4.1
	53.8	5.4	14.3	10.7	4.1
	54.0	5.1	14.7	10.7	4.2
	54.2	5.4	14.2	10.4	3.8
	53.2	5.9	14.5	10.9	3.7
	203	24	25	37	49
	54.06	5.48	14.50	10.74	3.98

b	A I	A II	E I	E II	F I	F II	G I	G II	H I	H II
5 56.1	6 13.2	8.8	5 0 9.2	9.8	11.9	11.8	5.1	4.9	9.9	8.9
	13.7	8.2	9.6	9.8	12.2	11.4	5.2	5.1	9.9	9.0
	13.7	8.0	10.3	9.2	12.0	11.0	4.9	4.9	9.3	9.0
	13.8	8.0	10.1	9.7	11.7	11.8	4.9	5.1	9.2	9.3
	13.7	8.2	10.1	9.8	11.6	11.8	5.1	5.0	9.6	9.2
	31	12	43	33	44	28	12	0	29	4
	13.62	8.24	9.86	9.66	11.88	11.56	5.04	5.00	9.58	9.08
			9.76		11.72		5.02		9.33	

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h m
9 44

		A		E	F	G	H
5 56.1	6	25.8	5 0	6.2	8.0	11.8	13.0
		25.3		6.0	7.3	11.7	13.2
		26.2		5.9	7.3	11.3	13.1
		25.3		6.0	7.6	11.2	13.0
		26.2		6.2	7.4	11.7	13.0
		3		3	26	27	3
		25.76		6.06	7.52	11.54	13.06

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June 16 1879 Orders for Zenith South
Investigation of eccentricity &c.

Σ	φ	ε	ψ	ε	ψ	ε	ψ
Σ = 45°		~~Σ = 35~~					
0 ′	0 ′	Σ = 30		30		25	
1.0	2.3	0.8	5.8	1.3	6.2	0.2	2.7
0.9	1.7	1.0	5.6	1.7	5.8	0.2	2.8
1.6	1.7	0.8	5.8	1.2	6.2	0.3	2.6
1.0	1.8	0.9	5.6	1.3	6.2	0.7	2.6
1.1	1.7	0.9	5.7	1.6	6.3	0.7	2.8
1.00	1.84	0.88	5.70	1.42	6.14	0.42	2.70
Σ = 35							
		34		29		24	
1.5	3.0	0.7	~~7.8~~	1.2	4.1	0.9	2.8
1.5	2.7	0.8	8.2	1.2	4.4	1.2	2.8
1.3	2.7	1.0	8.2	1.2	4.2	0.8	2.8
1.2	2.7	0.9	8.3	1.0	4.4	1.0	2.8
1.3	2.3	1.2	8.6	1.1	4.8	1.2	2.7
1.36	2.68	0.92	8.22	1.14	4.38	1.02	2.78
Σ = 25							
		33		28		23	
0.6	0.4	0.9	6.2	1.3	3.3	1.3	2.1
1.0	0.6	1.1	6.3	1.2	3.8	1.3	2.1
0.8	0.4	1.1	6.2	1.5	3.6	1.8	2.1
0.9	0.3	1.0	5.9	1.2	3.8	1.5	1.8
0.8	0.2	1.0	6.1	1.1	3.8	1.3	1.7
0.82	0.38	1.02	6.14	1.26	3.66	1.44	1.96
Σ = 15							
		32		27			
1.0	4.2	1.2	5.2	1.6	3.8		
1.0	4.3	0.9	5.3	1.7	3.8		
1.0	4.2	1.1	5.0	1.8	3.8		
1.0	4.6	1.2	5.2	1.8	4.0		
1.0	4.3	1.2	5.2	1.8	4.0		
1.00	4.32	1.12	5.18	1.74	3.88		
Σ = 5							
		31		26			
1.0	2.8	1.2	5.8	1.2	3.9		
0.8	3.8	1.2	6.1	1.3	3.9		
0.8	3.8	1.2	5.7	1.4	4.1		
0.7	4.0	1.2	5.8	1.1	4.2		
0.7	4.0	1.2	6.0	1.3	3.9		
0.80	3.88	1.20	5.88	1.26	4.00		

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E	G	E	G	E	G	E	G
1.3	0.9	0.9	−5.7	1.7	−6.8	0.8	−3.0
1.6	0.8	0.8	−6.0	1.2	−7.2	0.9	−3.8
1.5	0.7	0.4	−6.0	1.3	−6.9	0.7	−3.1
1.7	0.6	0.6	−5.9	1.3	−7.0	0.6	−3.2
1.8	0.8	0.3	−5.9	1.1	−7.1	0.6	−3.8
1.58	0.76	0.60	−5.90	1.32	−7.00	0.72	−3.38
1.7	0.2	0.2	−7.3	2.0	−5.3	0.2	−3.8
1.8	0.6	0.0	−7.3	2.2	−5.2	0.0	−3.9
1.8	0.3	0.1	−7.2	2.0	−5.3	0.0	−3.9
1.8	0.2	0.1	−7.2	1.8	−5.2	0.1	−3.9
1.8	0.3	0.1	−7.3	1.8	−5.3	0.0	−3.8
1.78	0.32	0.10	−7.26	1.96	−5.26	0.06	−3.86
1.8	−1.7	0.2	−7.3	2.1	−4.3	0.8	−1.3
1.8	−1.8	0.0	−7.3	2.1	−4.3	0.9	−1.2
1.7	−1.8	0.1	−7.4	2.2	−4.3	0.9	−1.1
1.8	−2.0	0.1	−7.2	2.0	−4.6	0.6	−1.2
1.6	−2.0	0.2	−7.0	2.0	−4.7	0.6	−1.3
1.74	−1.86	0.12	−7.24	2.08	−4.44	0.76	−1.22
1.9	−2.8	1.8	−5.2	2.2	−4.0	1.2	+0.9
1.8	−2.8	1.7	−5.2	2.0	−4.0	0.9	0.9
1.6	−2.8	1.8	−5.3	2.0	−4.0	0.7	0.9
1.6	−3.1	1.7	−5.3	2.3	−4.0	0.9	1.0
1.6	−2.8	1.4	−5.2	1.7	−4.0	0.9	1.0
1.70	−2.86	1.68	−5.24	2.04	−4.00	0.92	0.94
1.2	−3.0	1.3	−6.3	1.8	−4.3		
1.6	−3.0	1.2	−6.3	1.6	−4.3		
1.4	−3.1	1.3	−6.3	1.7	−4.0		
1.2	−2.9	1.6	−6.1	1.8	−3.8		
1.4	−2.9	1.8	−6.6	1.7	−3.7		
1.36	−2.98	1.44	−6.32	1.72	−4.02		

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Jowian results

z	3-A	z	B'-A'=3-A	n'
45	+84"	22	-4,56 -,82	+.01"
35	+1,32	215	-4,34 -1,46	-.07
25	(+2,82)	205	-6,70 -3,60	-.34
15	+3.32	195	-8,36 -4,56	-.62
6	+3.08	185	-8,36 -4,34	-.63
355	+4.82	175	-6,92 -6,50	-.84
345	+7,30	165	-7,36 -7,36	-.03
335	+5,12	155	-8,32 -7,36	-1.12
325	+4,06	145	-7,22 -6,52	-1,43
315	+4,68	135	-6,52 -7,76	-1,64
305	+4,72	125	-6,04 -8,32	-1.80
295	+3,24	115	-5,74 -7,22	-1.98
285	+2,40	105	-4,10 -6,52	-2,06
275	+2,14	95	-3 -6,04	-1,95
265	+2,74	85	-5,74	-1,50
255	+2,85	75	-4,10	-,91
245	+1,96	65	-3,52	-1,08
235	+0,62	55	-1,98	-,73
225	+56,66	4	94,52	
			56,66	
			37,86	
			6,31	
			a = -1,05	

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1879 June 16

Eccentricity ☿C from microscopes E. & G.

$\Sigma = 45^\circ$

−5′		0′		+5′	
E	G	E	G	E	G
0.2	−0.9	+0.1	−0.3	0.6	−0.6
0.2	−0.4	+0.2	−0.8	0.5	−1.0
−0.2	−0.2	0.2	−0.7	0.6	−0.8
0.0	−0.3	0.2	−0.9	0.6	−1.0
0.1	−0.8	+0.2	−0.8	0.4	−0.7
03	26	9	35	27	41
0.06	−0.52	0.18	−0.70	0.54	−0.82
G−E +.58		$\Sigma = 35^\circ$		+1.42	+.96

$\Sigma = 15^\circ$

−5′		0′		+5′	
E	G	E	G	E	G
1.9	3.8	2.8	49	3.2	4.9
1.9	3.7	2.6	5.1	3.2	4.8
1.9	3.8	2.7	4.8	3.2	4.5
1.9	3.8	2.7	5.0	3.3	4.8
1.9	4.0	2.7	4.9	3.2	4.9
	41		47	11	39
1.90	3.82	2.70	4.94	3.22	4.78
+1.92		+2.24		+1.56	+1.91

−5′		0′		+5′	
0.0	−0.2	1.5	1.8	1.9	2.1
0.1	−0.2	1.8	1.9	1.8	1.9
0.3	−0.2	1.7	2.0	1.9	1.5
0.2	−0.2	1.7	2.0	1.8	1.6
0.2	+02	1.8	2.1	1.9	1.2
8	06	35	98	43	83
0.16	−0.12	1.70	1.96	1.86	1.66
−.28		+.26		−.20	+.28
		$\Sigma = 25^\circ$			−11

$\Sigma = 05^\circ$

1.1	3.0	1.0	3.0	1.1	3.2
1.1	3.2	0.9	3.1	1.1	3.3
0.8	2.9	1.2	3.3	1.1	3.2
1.0	3.1	1.1	3.3	1.0	3.2
0.9	2.9	1.2	3.7	1.1	3.2
49	1	4	14	4	11
098	3.02	1.08	3.28	1.08	3.22
+2.04		+2.20		+2.14	+.13

−5°		0′		+5′	
0.9	+0.6	1.3	0.3	2.2	0.0
1.1	−0.8	1.2	0.2	1.8	−0.1
1.2	−0.3	1.2	0.2	1.9	0.0
1.1	−0.8	1.2	0.1	2.1	0.0
1.0	−0.7	1.3	0.1	1.9	0.0
3	32	12	9	99	−01
1.06	−0.64	1.24	0.18	1.98	−0.02
+1.70		+1.06		+2.00	+1.59

$\Sigma = 35^\circ$

0.9	4.8	1.2	6.2	0.8	5.3
0.7	4.8	1.6	6.2	1.0	5.8
0.8	4.8	1.7	6.0	11	5.1
0.5	4.8	1.5	6.1	1.1	5.1
0.6	4.8	1.3	6.3	0.8	4.9
35	41	23	8	48	26
0.70	4.82	1.46	6.16	0.96	5.24
+4.12		+4.70		+4.28	+4.37

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$\Sigma = 345^-$

ε	G	ε	G	ε	G
1.2	6.7	1.8	7.8	2.9	8.2
1.6	6.3	1.8	7.8	2.8	8.2
1.3	6.2	1.8	7.9	2.3	7.8 60
1.3	6.6	2.0	7.9	2.3	8.7
1.2	6.8	2.0	7.8	2.7	8.1
16	21	44	42	30	10
1.32	6.42	1.88	7.84	2.60	8.20
+5.70		=+5.96		+5.60	=+5.55

$\Sigma = 315^-$

ε	G	ε	G	ε	G
0.8	4.3	1.0	5.2	1.3	5.2
0.6	4.6	1.0	5.0	1.2	5.2
0.8	4.8	0.8	4.9	1.2	5.1 50
0.5	4.8	0.8	4.9	1.1	4.9
0.6	4.3	0.9	4.9	1.2	5.0
33	28	45	49	10	254
0.66	4.56	0.90	4.98	1.20	5.08
+3.90		+4.08		+3.88	=+3.95

$\Sigma = 335^-$

1.7	6.2	2.1	7.0	1.9	6.2
1.8	6.2	2.1	7.0	1.8	6.0
1.7	6.7	2.1	7.3	1.8	6.6
1.8	6.8	1.9	7.1	1.8	6.6 70
18	6.3	2.2	7.2	2.0	66
38	22	4	6	93	20
1.76	6.44	2.08	7.12	1.86	6.40
+4.68		+5.04		+4.54	=+4.75

$\Sigma = 305$

1.0	5.8	1.6	5.9	1.4	6.2
1.0	5.8	1.3	5.9	1.4	6.1
0.7	5.7	1.3	6.2	1.3	6.0 100
1.0	5.6	1.3	6.3	1.4	6.0
0.8	5.8	1.2	6.2	1.4	6.0
45	37	17	5	19	3
0.90	5.74	1.34	6.10	1.38	6.06
+4.84		+4.76		+4.68	=+4.76

$\Sigma = 320^-$

0.2	4.2	0.4	4.2	1.0	4.2
0.2	3.9	0.6	4.1	0.7	4.3
0.2	4.0	0.8	4.3	1.0	4.2 h
0.1	4.0	0.6	4.4	0.9	4.1
0.3	4.1	0.8	4.4	0.9	4.7
10	2	32	14	45	10
0.20	4.04	0.64	4.28	0.90	4.20
+3.84		+3.64		+3.30	=+3.59

$\Sigma = 295^-$

1.6	4.2	1.9	4.5	2.0	4.6
1.8	4.5	2.0	4.2	2.1	4.3
1.7	3.9	2.1	4.6	1.8	4.8 110
1.6	4.1	1.7	4.4	1.8	4.8
1.5	4.3	2.0	4.8	1.9	4.7
32	10	98	25	96	32
1.64	4.20	1.96	4.50	1.92	4.64
+2.56		+2.54		+2.72	=+2.61

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Σ=28⁻

−5 ε	−5 G	0 ε	0 G	+5 ε	+5 G
0.8	3.0	1.3	3.3	1.2	3.3
0.7	3.0	1.2	3.2	1.8	3.7
0.8	2.9	1.2	3.2	1.6	3.7
0.8	2.8	1.0	3.5	1.8	3.8
0.7	2.8	0.9	3.4	1.6	3.8
5.6	14.5	6	16	30	33
0.76	2.90	1.12	3.32	1.60	3.66
±2.14		±2.20		±2.06	=±2.13

120

Σ=27⁻

ε	G	ε	G	ε	G
0.8	2.2	1.0	3.2	0.8	3.3
0.7	2.3	1.0	3.2	0.9	3.1
0.6	2.3	0.8	3.3	1.0	3.6
0.4	2.2	0.9	3.2	0.9	3.3
0.3	2.3	0.9	3.2	0.9	3.3
2.8	1.3	4.6	11	4.5	16
0.56	2.26	0.92	3.22	0.90	3.32
±1.70		±2.30		±2.42	=±2.14

Σ=26⁺

ε	G	ε	G	ε	G
0.8	2.9	1.1	3.8	0.9	3.4
0.8	3.2	1.0	3.8	1.2	3.8
1.0	3.3	1.2	3.8	1.1	3.7
0.9	3.6	1.6	3.9	1.2	3.8
1.1	3.3	1.5	3.6	1.1	3.9
4.6	1.3	1.4	3.9	5	3.6
0.92	3.26	1.28	3.78	1.10	3.72
±2.34		±2.50		±2.62	=±2.49

144

25⁻

ε	G	ε	G	ε	G
3.2	3.9	7.2	8.7	2.8	4.1
2.9	3.7	7.1	8.6	2.4	4.1
3.2	4.1	7.0	8.2	2.9	3.9
3.2	3.8	6.8	8.0	2.7	4.1
2.9	3.9	6.9	8.3	2.8	8.4
15.4	4.4	0	18	3.6	1
3.08	3.88	7.00	8.36	2.72	4.02
±0.80		±1.36		±1.30	=±1.15

150

24⁻

ε	G	ε	G	ε	G
0.9	1.6	1.3	2.3	1.3	3.0
0.9	1.8	1.3	2.6	1.8	3.0
0.9	1.9	1.1	2.7	1.9	3.0
0.9	1.8	1.1	2.3	1.3	2.8
0.9	1.8	1.2	2.2	1.6	2.9
3.9	1.0	1.0	2.1	2.9	4.7
0.90	1.78	1.20	2.42	1.68	2.94
±0.88		±1.22		±1.36	=±1.15

160

2

23⁻

ε	G	ε	G	ε	G
2.0	2.0	2.8	2.0	3.2	2.9
2.1	2.0	2.8	2.3	3.2	3.0
1.9	2.1	2.8	2.3	3.1	3.1
1.8	1.5	2.8	2.1	3.2	2.9
1.9	1.8	2.5	2.2	3.2	2.8
4.7	4.4	3.7	9	9	4.7
1.94	1.88	2.74	2.18	3.18	2.94
−.86		−.96		−.24	=−.29

170

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22J

ε	G	ε	G	ε	G	
3,0	2.7 0.2	1.0	2.9	1.8	3.2 3.5	1.8 2.2
2,8	2.9 0.0	0.7	2.9	0.9	3.4 3.8	1.8 1.9
2,6	3.0 0.0	0.6	2.8	1.1	3.1 3.6	1.9 1.8
2.7	2.9 -0.1	0.5	2.8	1.2	3.2 3.8	1.8 1.9
2,6	3.0 0.0	0.5	2.9	1.0	3.2 3.8	1.8 2.0
3.4	1.45 0.K		33 43	1 0	11 35	41 48
2,68	2.90 0.02	0.66	2.86	1.20	3.22 3.70	1.82 1.96

2.90 0.66 -1.66 -1.74 =-1.88
-2.24

19J

ε	G	ε	G	ε	G
1.0	-3.8	-1.6	-3.2	1.3	-3.2
1.2	-3.6	-1.5	-3.2	1.5	-2.9
1.2	-3.8	-1.9	-3.2	1.2	-2.9
1.2	-3.9	-1.8	-3.2	1.8	-3.1
1.1	-3.8	-1.6	-3.4	1.5	-3.0
7	39	34	12	23	1
1.14	-3.78	-1.68	-3.24	1.46	-3.02

-4.92 -4.92 -4.48 =-4.77

21J

1.3	-1.5	2.3	0.2	2.6 2.5	0.9	0.9	0.2	-4.4	0.7 1.8	5.4 -3.2	1.2 -4.2
1.2	-1.7	2.8	0.0	2.6 2.9	0.9	0.9	0.7	-4.6	0.7 1.6	-4.2 -3.2	0.9 -4.2
0.9	-1.9	2.3	0.1	2.8 2.8	0.7	0.8	0.3	-4.6	0.5 1.4	-4.6 -3.2	1.0 -4.3
1.0	-1.9	2.7	0.0	2.9 2.8	0.8	0.8	0.5	-4.2	0.6 1.5	-4.7 -3.2	1.0 -4.1
1.3	-1.8	2.9	-0.1	2.9 3.0	0.8	0.8	0.2	-4.3	0.5 1.3	-4.5 -3.1	1.2 -4.1
7	38	28	02	38 40	41	42	19	21	30 26	24 9	3 9
1.14	-1.76	2.56	0.04	2.76 2.80	0.82	0.84	0.38	-4.42	0.60 1.52	-4.48 -3.18	1.06 -4.18

-2.90 -2.52 -1.84 -1.96 =-2.33 -4.80 -5.08 -4.70 -5.24=-4.95

17J

20J

3.2	2.2	4.9	4.0	5.0	4.9		1.6 3.0	5.6 4.9	2.5 3.0	5.0 4.0	3.2 3.0 4.8 4.8
3.2	2.2	5.2	3.9	5.0	3.9	200 20	1.5 2.7	5.8 4.8	2.7 3.0	4.2 4.2	3.0 3.1 5.0 4.8
3.6	2.6	4.6	4.0	4.9	3.9		1.4 2.8	5.3 5.0	2.6 3.2	4.2 4.4	3.0 3.1 4.9 4.8
3.2	2.2	4.8	3.9	5.0	3.9		1.4 2.8	5.3 4.8	2.6 2.9	4.9 4.3	3.0 3.2 4.8 4.8
3.2	2.1	5.1	3.8	5.1	3.9		1.4 2.8	5.2 4.6	2.7 2.9	4.9 4.5	4.3 4.5 4.8
14	7	46	46	0	46		23 41	27 41	31 0	46 14	8 41
3.28	2.14	4.92	3.92	5.00	3.92		2.82	-4.82	3.06	-4.28	3.16 -4.80

-1.14 -1.00 -1.08 =-1.07 1.46 -5.54 2.62 -4.92 3.08 -4.82

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16J

ε	g	ε	g	ε	g
1.2	4.8	6.8	-4.2	0.9	3.9
1.0	4.9	6.9	4.3	0.9	4.1
0.8	4.9	6.9	4.4	0.6	4.2
1.1	4.8	6.8	4.2	0.6	4.2
0.9	4.7	6.8	4.2	0.7	4.1
0	41	42	13	37	35
1.00	-6.84			0.74	-7.86
	4.82		-4.26		-5.02
	-9.08				-9.12

ε	g	ε	g	ε	g
8.0	-5.6	0.9	4.4	8.7	-4.8
7.9	5.1	0.7	4.2	8.3	4.9
7.9	5.0	0.8	4.3	8.7	4.9
7.7	5.0	0.8	4.3	8.9	4.9
7.8	5.0	0.7	4.4	8.9	-4.8
43	1	38	16	35	43
		0.76		8.70	
	-5.02		4.32		-4.86
	-9.18				= -9.13

240
60

13J

ε	g	ε	g	ε	g
3.9	-5.6	3.5	-5.7	4.2	-5.6
3.7	-5.8	3.5	5.8	4.1	5.0
4.0	6.2	4.0	5.7	4.3	5.1
3.7	6.2	3.6	5.9	4.0	5.1
3.8	-6.1	3.6	6.0	4.0	5.1
41	44	32	41	6	3
3.82	-5.98	3.64	-5.82	4.12	-5.06
	-9.80		-9.46		-9.18 = -9.48

270
90

15J

0′ −5′ +5′

II		I			
1.3	-7.0	0.3	1.3	9.8	-8.0
1.2	-7.2	0.4	1.2	9.7	8.1
1.3	-7.2	0.5	1.3	9.3	8.0
1.1	-7.2	0.4	1.3	9.6	8.0
1.1	7.3	0.0	1.3	9.3	8.0
10	9	16	14	27	1
1.20	-7.18	0.32		-9.54	
	-8.38		1.28	-8.02	
			-9.86	-9.30	

0.5	-7.0				
0.5	-7.2				
0.6	-7.7				
0.5	-7.7				
0.8	-7.3				
29	19				
0.58	-7.38				
	-7.96		= -8.7		

250
70

12J

1.9	-8.6	2.0	7.0	7.4	2.0	1.7	8.3	-8.2	
1.9	8.1	2.0	1.8	7.0	7.8	1.8	1.9	8.3	-8.2
2.0	8.0	1.9	1.8	6.8	7.5	1.9	1.8	8.2	-8.3
1.7	7.8	1.9	1.6	7.0	7.5	2.0	1.8	8.4	-8.6
1.9	-7.9	2.1	1.7	7.0	7.3	1.7	1.7	-8.2	-8.3
44	4	9	9	29	34	8	25	9	4
1.88	-8.08	1.98		6.96		1.88		-8.28	
		1.11	1.58		-7.50		1.78		-8.32
	-9.96		-8.54	-9.08		-10.16		-10.10	
								= -9.65	

14J

1.3	-7.3	1.2	4.6	6.5	-3.3
1.3	7.0	1.2	4.6	6.4	3.7
1.2	7.0	1.3	4.6	6.3	3.8
1.3	7.1	1.1	4.3	6.1	3.6
1.2	-7.0	1.1	4.7	-6.0	3.6
13	4	9	28	0	30
1.26	-7.08	1.18		-6.20	
	-8.34		4.56	-360	
			-8.16		

1.4	-6.9				
1.2	7.2				
1.2	7.2				
1.2	7.1				
1.2	-7.1				
13	5				
1.26	-7.10				
	-8.36		= -8.29		

260
80

11J

1.7	-6.1	2.2	-5.1	3.2	-4.4
1.5	6.9	2.1	4.9	3.0	4.2
1.5	6.3	2.3	5.0	2.9	4.2
1.7	6.4	2.2	5.0	2.9	4.1
1.3	-6.5	2.6	-5.2	3.0	-4.5
27	14	14	2	6	14
1.54	-6.28	2.28	-5.04	3.00	-4.28
	-7.82		-7.32		-7.28 = -7.47

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110

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105

ε	G	ε	G	ε	G
0.9	−4.2	1.5	−4.1	2.2	−3.7
1.3	−4.2	1.5	−4.0	2.2	−3.4
1.6	−4.3	1.9	−3.9	2.4	−3.3 300
1.2	−4.7	1.8	−3.9	2.2	−3.2 120
1.4	−4.7	2.1	−3.9	2.1	−3.7
24	27	38	48	11	23
1.48	−4.42	1.76	−3.96	2.22	−3.46
	−8.90		−5.72		−5.68 = −5.77

75

ε	G	ε	G	ε	G
5.0	0.9	6.3	2.2	1.9	−1.9
5.0	0.4	6.0	2.1	2.1	−1.9
5.0	0.3	6.0	2.0	2.1	−1.5 330
5.0	0.3	6.0	1.9	2.1	−2.0 150
5.2	0.3	6.0	1.8	2.1	−1.7
2	22	3	0	3	40
5.04	0.44	6.06	2.00	2.06	−1.80
	−4.60		−4.06		−3.86 = −4.18

95

ε	G	ε	G	ε	G
2.6	−3.7	2.0	−3.8	2.9	−2.8
2.3	3.8	2.2	3.8	3.0	−2.8 310
2.4	3.7	2.3	3.6	3.0	−2.9 130
2.1	3.8	2.3	3.7	3.0	−3.0
2.3	−3.8	2.2	−3.7	3.1	−3.1
17	38	10	36	0	46
2.34	−3.76	2.20	−3.72	3.00	−2.92
	−6.10		−5.92		−5.92 = −5.98

65

ε	G	ε	G	ε	G
2.6	−0.8	3.4	−0.2	3.7	+0.2
2.9	−0.9	3.3	−0.2	4.3	+0.2
2.8	−1.1	3.2	−0.6	4.2	+0.2
2.8	−1.2	3.2	−0.7	4.1	+0.1
2.4	−1.0	3.1	−0.6	4.2	+0.0
35	0	12	23	15	7
2.70	−1.00	3.24	−0.46	4.10	0.14
	−3.70		−3.70		−4.24 = −3.85

85

ε	G	ε	G	ε	G
3.2	−4.1	2.2	−3.5	3.0	−3.4
2.4	−4.0	2.4	−3.6	3.1	−3.0
2.2	−4.1	2.3	−3.8	3.1	−2.9 320
2.3	−3.9	2.2	−3.8	3.0	−3.0 140
2.5	−4.0	2.3	−3.7	3.1	−3.0
16	1	14	34	3	3
2.32	−4.02	2.28	−3.68	3.06	3.06
	−6.34		−5.96		−6.12 = −6.14

55

ε	G	ε	G	ε	G
4.9	1.8	5.7	3.2	3.9	2.1
4.7	2.2	5.5	3.2	4.0	2.1
4.6	2.1	5.5	3.4	4.0	2.1 350 170
4.7	2.2	5.3	3.8	4.0	2.0
4.8	2.1	5.5	3.7	4.1	2.0
37	4	25	23	10	3
4.74	2.08	5.50	3.46	4.00	2.06
	−2.66		−2.04		−1.94 = −2.1

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ε	g	ε I	ε II	g I	g II	ε	g
0.9	0.6	1.0	2.0	1.6	1.5	1.8	1.6
1.1	0.3	1.3	1.7	1.1	1.4	1.8	1.7
1.0	0.3	1.3	1.8	1.3	1.1	1.8	1.4
0.8	0.2	1.0	1.7	1.4	1.3	1.8	1.2
0.8	0.5	1.0	1.7	1.6	1.2	1.4	1.3
46	19	6	39	20	15	36	22
092	0.38	1.12	1.78	1.40	1.30	1.72	1.44

360
180

For reduction see page 69

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52 June 18 1879

Division of Circle into 2 equal parts.

Let Σ in Coincidence with 45° division.

ε	G
0.0	− 0.1
0.0	− 0.1
0.0	− 0.2
0.1	− 0.3
0.0	− 0.2

ε	G
0.02	− 0.18
0.04	− 1.74

−.20″
−1.78
1.98
−.99

−.99
−.78 +.39

Let Σ in Coincidence with 225°

ε	G
0.1	− 1.6
0.0	− 1.8
0.1	− 1.7
0.1	− 1.8
−0.1	− 1.8

60.02 60.04
59.88 58.26
59.95 59.15
+.07 +.89 +.41
.48
+.41

ϑ = 225°		ϑ = 45°	
ε	G	ε	G
0.0	− 1.7	0.0	− 0.5
0.0	− 1.5	0.0	− 0.6
0.0	− 1.80	0.0	− 0.2
0.0	− 1.85	0.0	− 0.2
0.0	− 1.70	0.0	− 0.8
0.0	− 1.75	0.0	− 0.7
0.0	− 1.65	0.0	− 0.3
0.0	− 1.95	0.0	− 0.6
0.0	− 1.80	0.0	− 0.2
0.0	− 1.850	0.0	− 0.0
	− 1.775		− 0.410

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1879phae.proj.1760R

	0°	180°
0°	0.00	0.00
90°	59.23	58.23
	59.10	59.11
	+.20	+0.88 +.68

$\Sigma = 45^\circ$ 11
$\Sigma = 45^\circ$ −410
$\Sigma = 225^\circ$ −1,775 − .682 − .34
−2185
−1,092

Division into 4 equal parts.

Set Σ at 45°0

$\Sigma = 45^\circ$ $\Sigma = 225^\circ$

Σ	h	Σ	h	g	
0.0	2.4	0.0	10.8	−0.2	
0.0	2.5	0.0	11.0	−0.8	
0.0	3.0	0.0	11.0	0.0	−.80
0.0	2.9	0.0	11.3	−0.1	−1,30
0.0	3.1	0.0	10.8	−0.1	1.65 +.48
0.0	3.3	0.0	11.0	−0.3	−.88 −.34
0.0	3.3	0.0	10.8	−0.1	
0.0	3.0	0.0	10.7	−0.8	
0.0	3.0	0.0	11.0	−0.7	
0.0	3.3	0.0	11.2	−0.4	
	2.99		10.96	−.35	

$\Sigma = 225^\circ$

Σ	h
0.0	10.8
0.0	11.0
0.0	11.0
0.0	11.3
0.0	10.8
0.0	11.0
0.0	10.8
0.0	10.7
0.0	11.0
0.0	11.2
	10.96

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1879phae.proj.1760R

Sol → $\varepsilon = 228^\circ$

Σ	F	G
0.0	10.7	−1.3
0.0	9.7	−1.0
0.0	10.3	−1.0
0.0	9.7	−1.3
0.0	9.8	−1.3
0.0	10.1	−1.0
0.0	9.8	−1.7
0.0	9.8	−1.3
0.0	9.8	−1.8
0.0	9.9	−1.3
	9.96	−1.30

Sol $\varepsilon = 83^\circ$

Σ	F	
0.0	2.7	2.99 +3.65
0.0	2.8	10.96 −4.32
0.0	2.7	9.96 −3.32
0.0	2.6	2.65 +3.99
0.0	2.8	6.64
0.0	2.3	
0.0	2.6	
0.0	2.8	
0.0	2.2	
0.0	8.0	
	2.65	

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1879phae.proj.1760R

Let ξ & η = 0

ξ	η	ζ
0.0	2.4	−0.7
0.0	3.0	−0.1
	3.0	−0.1
	2.9	−0.3
	3.1	+0.1
	3.1	+0.2
	2.9	+0.1
	2.3	−0.3
	2.4	−0.2
	2.9	+0.0
	2.14	−0.09

+1.96
+0.84
+1.09
+1.71
+2.13

−0.9 5991
−1.30 57.70 −0.91
1.39 1761 −0.55
.69 5880
+.60

Relation between the two scales

ξ	η
−.20	−1.78
−.41	−1.58
−.31	−1.30
−0.9	−1.30
−.26	−1.57
5879	58.46
58.46	
1820	−.64
57.10	

Let P = the position of the telescope & the micrometer;
Let ξ = 0 when P = 0

From P = 0 to P = 180
space from division to division is ten short

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Measures of halves and quarters of circle

$\Sigma = 45°$

Σ	F	G
0.0	+1.5	−0.5
0.0	+2.2	−0.6
0.0	+1.9	−0.2
0.0	+1.8	−0.3
0.0	+2.2	−0.0
0.0	+2.1	−0.2
0.0	+2.0	−0.6
0.0	+1.5	−0.9
0.0	+1.9	−0.0
0.0	+1.7	−0.1
	+1.880	−0.340

$\Sigma = 45°$

Σ	F
0.0	8.8
0.0	8.6
0.0	9.0
0.0	8.9
0.0	8.8
0.0	9.0
0.0	9.2
0.0	8.8
0.0	8.9
0.0	8.9
	8.890

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$\varepsilon = 45° - 180$

ε	F	G
0.0	~~8.4~~ 7.7	−1.2
0.0	7.8	−1.4
0.0	8.2	−1.0
0.0	8.0	−1.6
0.0	7.9	−1.3
0.0	7.7	−1.8
0.0	7.7	−1.9
0.0	7.7	−1.7
0.0	8.2	−1.1
0.0	8.4	−1.9
	7.930	−1.490

$\varepsilon = 45 - 270$

ε	R
0.0	1.2
0.0	0.8
0.0	1.1
0.0	1.7
0.0	0.8
0.0	1.0
0.0	0.9
0.0	0.8
0.0	1.0
0.0	0.8
	1.010

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1879phae.proj.1760R

ε	F	G
00	0.6	0,0
0.0	1.0	+0.3
0.0	1.6	−0.1
00	1.9	−0.1
0,0	1.2	+0.1
0.0	1.2	−0.2
0,0	1.0	−0.6
0,0	1.1	−0.9
0,0	1.0	−0.1
00	1,0	−0.1
	1.160	−0.170

Σ 45 −0,34 ε = 225 −149

−0.17

−51

−925 +.62 = Corr. to 180°

−1.49

174

−.87

1.88 +3.05

889 −3.96

7.93 −3.00

1.01 +3.52

4,93

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June 1878

Investigation of each quadrant — the east-west ~~Mean~~ values of the arc between

$\Sigma = 45^0$

Σ	F	G	F	G	N	G	N	E	N	E	G
0.0	4.4	−0.6	0.0	−4.8	+0.2	0.0	+5.4	+1.1	0.0	−4.1	+0.3
0.0	4.5	−0.2	0.0	−5.0	−0.2	0.0	+5.2	+0.9	0.0	−3.9	0.2
0.0	4.5	−0.1	0.0	−4.7	+0.1	0.0	5.1	0.7	0.0	−3.9	0.9
0.0	4.4	−0.3	0.0	−4.3	+0.2	0.0	5.1	0.6	0.0	−4.0	0.9
0.0	4.8	−0.5	0.0	−4.1	+0.2	0.0	+5.0	+0.7	0.0	−4.0	+0.7
	26	17		29	5		8	49		49	30
	4.52	−0.34		−4.58	+0.10		5.16	0.80		−3.98	0.60

~~$\Sigma = 22^0$~~ 135^0

0.0	11.3	4.9	0.0	−6.1	−7.8	0.0	−0.6	−5.6	0.0	−4.2	8.1
0.0	12.0	4.9	0.0	−5.9	−7.3	0.0	−1.2	−6.0	0.0	−4.9	7.9
0.0	12.1	4.4	0.0	−6.0	−7.4	0.0	−0.3	−6.2	0.0	−4.4	7.9
0.0	12.0	4.9	0.0	−6.1	−7.7	0.0	−0.7	−6.1	0.0	−4.2	8.2
0.0	12.4	5.1	0.0	−6.1	−7.2	0.0	−0.3	−5.8	0.0	−4.6	8.2
	98	42		2	24		31	47		23	3
	11.96	4.84		−6.04	−7.48		−0.62	−5.94		−4.46	8.06

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$\Sigma = 225$

E	F	G	F	G	H	G	H	E	H	E	F
0.0	+9.8	-2.2	0.0	-12.0	-13.9	0.0	-1.8	+1.8	0.0	+3.3	14.0
0.0	10.3	-2.0	0.0	-12.6	-14.1	0.0	-1.1	+2.0	0.0	3.6	14.9
0.0	11.1	-1.3	0.0	-12.7	-14.3	0.0	-1.2	2.3	0.0	3.8	14.9
0.0	11.1	-1.1	0.0	-13.0	-14.6	0.0	-1.3	2.4	0.0	3.7	14.8
0.0	10.8	-1.6	0.0	-12.6	-14.2	0.0	-1.4	2.2	0.0	4.0	15.1
	53 1	32		12 9	11		18	7		34	37
	10.62	-1.64		-12.58	-14.22		-1.36	2.14		3.68	14.74

0.0	3.9	-9.4	0.0	-13.3	-5.3	0.0	7.9	10.8	0.0	3.7	7.1
0.0	4.2	-9.1	0.0	-14.0	-5.8	0.0	6.1	10.6	0.0	4.1	8.2
0.0	4.2	-8.9	0.0	-13.2	-5.1	0.0	6.7	10.3	0.0	4.0	8.2
0.0	3.7	-9.2	0.0	-14.0	-6.3	0.0	6.8	10.3	0.0	3.9	7.3
0.0	3.6	-8.9	0.0	-13.7	-5.0	0.0	7.5	10.7	0.0	3.6	7.1
	46	5		32	25		0	27		19 3	37 9
	3.92	-9.10		-13.64	-5.50		7.00	10.54		3.86	7.58

Check

$E \text{ to } G = E \text{ to } A + F \text{ to } G \quad = +3.20 - 4.63 = -1.38$

$= +2.87 - 3.37 = -.50$

$-.94$ — 91

E to G direct

$F \text{ to } H = F \text{ to } E + E \text{ to } H \quad = -4.63 - 2.61 = -7.24$

$-3.07 - 3.91 = -7.28$

-7.26 — 7.11

F to H direct

90
180
270
360

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Reduction of Observations for Jan 19

Mean

Half = Prm E to G −0.34 −1.64 −1.98 −.99 59.66 58.36 59.01 − 65 − 1.17 − .91

" Prm F to N +010 −1.422 −1.412 −.706 60.10 45.76 105.86 52.54 − 7.16 − 7.07 − 7.11

E = +15°

Prm G to E +080 +2.14 2.94 1.47 60.60 2.14 1.97 + 1.47

Prm N to F +0.60 +14.74 5.34 7.67 0.60 +14.74 7.67 + 7.07

E to G +4.87 −9.10 −1.26 −2.13 + 6.97 + 6.24 + 7.60

F to N −7.48 −5.50 −12.98 −6.49 − 0.99 + .34

E = 22½°

G to E −5.94 +10.54 +4.60 +2.30 − 8.24

N to F +0.06 +7.38 +5.44 +7.72 + 0.34 + .99 + 0.67

Constant arc = E to G	= F to G	= G to N	= N to E.
90 1 4.52 + 3.25	55.42 − 4.63	5.16 − 2.61	56.02 + 3.74
180 2 11.96 − 4.21	53.96 − 3.17	59.38 + 3.17	55.54 + 4.22
270 3 10.62 − 2.87	47.42 + 3.37	58.64 + 3.91	3.68 − 3.92
360 4 3.92 + 3.83	46.36 + 4.43	7.00 − 4.45	3.86 − 4.10
7.75	50.79	62.55	59.76

P = the pointing of the telescope when the zenith. M = distance from P to E when P = 0

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June 23 1879

Investigation zeeman quadrant of the Circle

$\Sigma = 41^{\circ} 9$

Σ	P	ℓ	ℵ	Σ	P	ℓ	ℵ	ℓ	ℵ	ε	H	ℵ	ε	I	ℓ
		1.3	4.0												
0.0	3.9	~~0.7~~	~~3.2~~	~~0.0~~	~~-1.7~~	~~-0.9~~	~~-2.8~~	0.0	2.3	-1.8	+1.0	0.0	-3.0	0.0	-1.9
0.0	3.0	1.4	4.1	0.0	-1.7	-1.6	-2.3	0.0	2.5	-1.0	1.3	0.0	-3.8	-0.3	-2.2
0.0	3.3	1.3	3.4	0.0	-1.5	-0.7	-2.5	0.0	2.8	-0.7	2.2	0.0	-4.1	-1.0	-2.4
0.0	3.3	1.8	4.1	0.0	-1.7	-1.2	-2.2	0.0	3.2	-0.3	2.1	0.0	-3.8	-0.8	+2.8
0.0	3.4	1.9	4.0	0.0	-1.6	-1.0	-2.2	0.0	2.8	-0.6	1.3	0.0	-3.2	-0.6	-2.2
		27	196												
0.00	3.26	1.54	3.92	0.00	-1.64	-1.08	-2.40	0.00	2.72	-0.88	1.58	0.00	-3.58	-0.54	-2.30

$\Sigma = 22^{\circ} 90$

0.0	+9.8	7.1	5.2	0.0	-2.4	-4.8	-9.8	0.0	-2.0	-6.2	+4.0	0.0	-4.3	+6.7	+2.8
0.0	10.1	6.8	5.9	0.0	-2.8	-5.1	-9.9	0.0	-2.3	-6.4	+3.9	0.0	-3.9	+7.0	+3.1
0.0	9.9	6.7	4.8	0.0	-3.4	-5.8	-10.7	0.0	-3.4	-8.1	+3.3	0.0	-3.8	7.0	3.1
0.0	9.7	6.1	5.1	0.0	-3.5	-5.7	-10.3	0.0	-2.8	-7.2	+3.6	0.0	-4.3	6.9	2.8
0.0	10.1	6.8	5.0	0.0	-3.2	-5.3	-9.8	0.0	-3.2	-7.8	+3.1	0.0	-5.0	5.9	2.7
										36	29		213	335	45
0.00	9.92	6.70	5.00	0.00	-3.06	-5.34	-10.10	0.00	-2.74	-7.22	+3.38	0.00	-4.26	6.70	2.90

0.0	+8.4	+0.3	-2.8	0.0	-7.2 -12.0 -8.5
0.0	8.8	1.0	-2.8	0.0	-8.0 -12.2 -8.4
0.0	8.8	1.0	-2.8	0.0	-8.1 -12.3 -8.3
0.0	9.4	1.0	-3.2		
0.0	9.0	1.1	-2.3		

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Σ = 180

E	F	G	H	F	G	H	E	G	H	E	F	H	E	F	G
0.0	+8.4	+0.3	-2.8	0.0	-7.2	-12.0	-8.5	0.0	-4.0	0.0	+9.1	0.0	+4.8	+13.9	+4.2
0.0	8.8	1.0	-2.8	0.0	-8.0	-12.2	-8.4	0.0	-3.9	+0.1	+9.2	0.0	+4.9	+13.7	+4.4
0.0	8.8	1.0	-2.8	0.0	-8.1	-12.3	-8.3	0.0	-4.0	+0.2	+9.3	0.0	+4.8	+14.2	+4.7
0.0	9.4	1.0	-3.2	0.0	-8.9	-12.5	-8.6	0.0	-3.8	+0.6	+9.8	0.0	+4.4	+14.0	+4.1
0.0	9.0	1.1	-2.3	0.0	-8.8	-12.3	-8.0	0.0	-4.0	+0.1	+9.0	0.0	+4.4	+13.6	+4.0
			49		10	13	18		19.7	7.0	14		33	19.4	14
0.00	8.88	0.88	-2.98	0.00	-8.20	-12.26	-8.36	0.00	-2.94	0.20	9.28	0.00	4.66	13.86	4.28

Σ = 270

0.0	+1.3	-6.9	-1.1	0.0	-9.9	-4.0	-2.2	0.0	+5.3	+7.9	+10.9	0.0	+3.7	+5.8	-4.3
0.0	+1.6	-6.3	-1.0	0.0	-10.6	-4.7	-2.2	0.0	+5.2	+8.4	+10.9	0.0	+3.7	+6.1	-5.0
0.0	+1.8	-6.8	-1.1	0.0	-10.1	-4.2	-2.0	0.0	+5.0	+8.2	+10.7	0.0	+3.6	+6.1	-4.8
0.0	+1.7	-6.5	-1.0	0.0	-10.3	-4.4	-1.9	0.0	+4.6	+8.7	+11.0	0.0	+3.3	+6.0	-4.9
0.0	+1.5	-7.1	-1.3	0.0	-10.3	-4.6	-2.0	0.0	+4.4	+8.5	+11.0	0.0	+3.8	+6.8	-4.3
		29	36	5	12	19	3		4.5	17	4.5		31	8	33
0.00	1.58	-6.72	-1.10	0.00	-10.24	-4.38	-2.06	0.00	4.90	8.34	10.90	0.00	3.62	6.16	-4.66

ξ	η
60.0	60.00	-1.54
60.54	60.88	-.88
60.77	60.44	
.77	.44	

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Recapitulation

Jan 29 1879

P	Σ–T	R–S	S–N	N–E
0	~~+3.26~~			
90	+3.26	-1.64	+2.72	~~+3.58~~
180	9.92	-3.06	-2.74	-4.26
270	8.88	~~-8.20~~	-3.94	+4.66
360	1.58	~~10.24~~	~~+4.90~~	+3.62
	5.91	-5.79		

3.24 +2.65	58.36 -4.15	62.72 ~~+7.38~~ 2.49	56.42 +3.69
9.92 -4.01	56.94 -2.73	57.26 ~~+3.82~~ 2.97	55.~~X~~ +4.37
8.88 -2.97	51.80 +2.41	56.06 +~~5.02~~ +4.17	~~4.66~~ -4.55
1.58 +4.33	49.76 +4.45	~~64.90~~ -7.25 4.67	63.62 -3.51
5.91	54.21	60.23	60.11

Σ	R	S	N
0	0	0	0
+2.65	~~+1.28~~ -4.15	-2.49	+3.69
-1.36	~~+4.75~~ -1.88	+.48	+~~3.06~~
-4.33	~~-0.32~~ -4.47	+4.68	+3.51
+0.00	0 -.02	+.00	+.00

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Excentricity, ellipticity &c.

P	n	n sin2	n cos2	n sin2 n cos2		n	sin2	cos2	n sin2	n cos2	
0	~~-.96~~	+.000	+1.000	+.00	-.96	180	-1.88	.000	-1.000	-.00	+1.88
10	-.11	+.174	+.985	-.19	-.11	190	-2.33	+.174	-.985	+.40	+2.30
20	-1.59	+.342	+.940	-.54	-1.49	200	-1.07	-.342	-.940	+.36	+1.00
30	+1.91	+.500	+.866	+.95	+1.65	210	-4.77	-.500	-.866	+2.38	+4.13
40	+2.13	+.643	+.766	+1.36	+1.63	220	-4.95	-.643	-.766	+3.18	+3.79
50	+4.37	+.643 +.766	+.643	+3.35	+2.81	230	-7.57	-.766	-.643	+5.80	+4.87
60	+5.55	+.500 +.866	+.500	+4.81	+2.77	240	-9.13	-.866	-.500	+7.91	+4.56
70	+4.75	+.342 +.940	+.342	+4.47	+1.62	250	-8.47	-.940	-.342	+7.96	+3.03
80	+3.59	+.174 +.985	+.174	+3.53	+0.62	260	-8.29	-.985	-.174	+8.16	+1.44
90	+3.95	+1.000	+.000	+3.95	+.00	270	-9.48	-1.000	+.000	+9.48	+.00
100	+4.76	+.174 +.985	-.174	+4.69	-.83	280	-9.65	-.985	+.174	+9.50	-1.68
110	+2.61	+.342 +.940	-.342	+2.46	-.89	290	-7.47	-.940	+.342	+7.01	-2.55
120	+2.13	+.500 +.866	-.500	+1.85	-1.06	300	-5.77	-.866	+.500	+5.00	-2.88
130	+2.14	+.643 +.766	-.643	+1.64	-1.38	310	-6.98	-.766	+.643	+4.58	-3.84
140	+2.49	+.643 +.766	-.766	+1.61	-1.91	320	-6.14	-.643	+.766	+3.94	-4.70
150	+1.15	+.500	-.866	+0.57	-.99	330	-4.18	-.500	+.866	+2.09	-3.62
160	+1.15	+.342	-.940	+0.39	-1.08	340	-3.88	-.342	+.940	+1.33	-3.64
170	-0.29	+.174	-.985	-0.05	+.29	350	-2.21	-.174	+.985	+0.38	-2.18
~~180~~	+42.66			+35.63	+11.39		-10.362			+7.983	+2.700
	-2.95			-.78	-10.70		+39.71				-2.509
	+39.71			+34.85	+0.69	36	-.639				+1.71
				+79.13	+1.91		-1.78				
				+114.68	+2.60						

362 sin P = +2.60 log 0.41497

362 cos P = +114.68 2.05949

Tang P 8.35548

P +1° 18'

log 36 2.05960

log 2 1.55630

0.50330

+3.19

$i = +3''.19[\sin 2 + 3'.4]$

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z	22	n'	Sin22	Cos22	n'Sin22	n'Cos22
0°	0	−1.42″	0.000	+1.000	−.00	−1.42
10	20	−1.22	+.342	+.940	−.42	−1.15
20	40	−1.33	+.643	+.766	−.86	−1.02
30	60	−1.43	+.866	+.500	−1.24	−.72
40	80	−1.41	+.985	+.174	−1.39	−.24
50	100	−1.60	+.985	−.174	−1.58	+.28
60	120	−1.78	+.866	−.500	−1.55	+.90
70	140	−2.06	+.643	−.766	−1.32	+1.58
80	160	−2.35	+.342	−.940	−.80	+2.21
90	180	−2.76	+.000	−1.000	−.00	+2.76
100	200	−2.43	−.342	−.940	+.83	+2.29
110		−2.43	−.643	−.766	+1.56	+1.86
120		−1.82	−.866	−.500	+1.58	+.91
130		−1.82	−.985	−.174	+1.89	+.33
140		−1.82	−.985	+.174	+1.79	−.32
150		−1.52	−.866	+.500	+1.32	−.76
160		−1.36	−.643	+.766	+.87	−1.04
170		−1.25	−.342	+.940	+.43	−1.18
					+10.27	+13.12
					−9.16	−7.85
n''		−1.77″			+1.11	+5.27

18/"Sin F" = +5.27 log 0.72181
18/"Cos F" = 1.11 " 0.04532
tang F" " 0.67649
F" 78° 6'

log 18/" .73125
log 18 1.25527
log f" 9.47598
f" +.30"

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P = c		n	n sin 3z	n cos 3z	n sin 3z	n cos 3z	n	n sin 3z	n cos 3z	n sin 3z	n cos 3z
0	0	−.96	.000	+1.000	−.00	−.96	−1.88	+.000	−1.000	−.00	+1.88
29	30	−.11	+.500	+.866	−.06	−.10	−2.33	−.500	−.866	+1.17	+2.02
59	60	−1.59	+.866	+.500	−1.38	−.80	−1.07	−.866	−.500	+.93	+.54
80	90	+1.91	+1.000	+.000	+1.91	+.00	−4.77	−1.000	−.000	+4.77	+.00
70	120	+2.13	+.866	−.500	+1.84	−1.06	−4.50	−.866	+.500	+4.29	−2.48
50	150	+4.37	+.500	−.866	+2.19	−3.78	−7.57	−.500	+.866	+3.79	−6.56
60	180	+.55	+.000	−1.000	+.00	−.55	−9.13	+.000	+1.000	+.00	−9.13
47	210	+4.35	−.500	−.866	−2.38	−4.11	−8.87	+.500	+.866	−4.44	−7.68
80	240	+3.59	−.866	−.500	−3.11	−1.80	−8.29	+.866	+.500	−7.18	−4.15
80	270	+3.90	−1.000	+.000	−3.95	+.00	−9.48	+1.000	+.000	−9.48	−.00
100	300	+4.76	−.866	+.500	−4.12	+2.38	−9.65	+.866	−.500	−8.36	+4.83
100	330	+2.61	−.500	+.866	−1.31	+2.26	−7.47	+.500	−.866	−3.74	+6.47
240	0	+2.13	−.000	+1.000	−.00	+2.13	−5.77	+.000	−1.000	−.00	+5.77
139		+2.49	+.500	+.866	+1.07	+1.85	−5.98	−.500	−.866	+2.99	+5.18
		+2.49	+.866	+.500	+2.16	+1.25	−6.14	−.866	−.500	+5.32	+3.07
		+1.15	+1.000	+.000	+1.15	+.00	−4.18	−1.000	−.000	+4.18	+.000
		+1.15	+.866	−.500	+1.00	−.58	−3.88	−.866	+.500	+3.36	−1.94
		−0.29	+.500	−.866	−.14	+.25	−2.21	−.500	+.866	+1.11	−1.91
					+11.32	+10.12				+31.91	+29.76
					−16.45	−13.74				−33.20	−33.85
					−5.13	−3.62				−1.29	−4.09
					−1.29	−4.09					
					−6.42	−7.71					

$\log 36 f''' \sin F''' = -7.71$ log. 0.88705n

$\log 36 f''' \cos F''' = -6.42$ " 0.80753n

$\log \tan F''$ 0.07952

F'' 230° 13'

$\log \frac{1}{2} f'''$ 1.00142

$\log 36$ 1.55630

$\log f'''$ 9.44512

f'' +.28''

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$n - 1{,}78 = 6.38 \sin(2n + 1^\circ 18') + .60 \sin(2n + 78^\circ 6') + .06 \sin(3n + 230^\circ 13')$

$2n$	$n-178$	$2n+1^\circ 18'$	$\sin$	$\times 6.38$	A_1	$2n+78^\circ 6'$	$\sin$	$\times 60$	A_2	$3n+230^\circ 13'$	$\sin$	$\times .06$	A_3
0	+0.82	1° 18'	+.023	+.02	+7.0	78° 6'	+.979	+58	+12	230° 13'	−.768	−.43	+55
10	+1.67	11 18	.196	+1.25	+1.42	98 6	+.990	+60	−.18	260 13	−.885	−.55	+37
20	+0.19	21 18	.363	+2.31	−2.12	118 6	+.982	+59	−2.91	290 13	−.938	−.52	−2.19
30	+3.69	31 18	.520	+3.32	+0.37	138 6	+.868	+40	−.03	320 13	−.640	−.35	+.32
40	+3.91	41 18	.660	+4.21	−0.30	158 6	+.678	+22	−.52	350 13	−.170	−.09	−.43
50	+6.15	51 18	.812	+5.18	+.97	178 6	+.078	+.02	+.95	20 13	+.345	+.19	+.76
60	+7.33	61 18	.877	+5.60	+.73	198 6	−.318	−.18	+.91	50 13	+.768	+.43	+.48
70	+6.53	71 18	.974	+6.21	+.32	218 6	−.617	−.37	+.69	80 13	+.885	+.55	+.14
80	+5.37	81 18	.988	+6.30	−.93	238 6	−.849	−.51	−.42	110 13	+.938	+.52	−.94
90	+5.73	91 18	1.000	+6.38	−.65	258 6	−.938	−.59	−.06	140 13	+.640	+.35	−.41
100	+6.54	101 18	.980	+6.25	+.29	278 6	−.990	−.60	+.89	170 13	+.170	+.09	+.80
110	+4.39	111 18	.932	+5.95	−1.66	298 6	−.882	−.53	−2.09	200 13	−.345	−.19	−1.90
120	+3.91	121 18	.854	+5.45	−1.54	318 6	−.668	−.40	−1.14	230 13	−.768	−.43	−.71
130	+3.92	131 18	.757	+4.79	−0.87	338 6	−.373	−.22	−0.09	260 13	−.885	−.55	−.12
140	+4.27	141 18	.625	+3.99	+.28	358 6	−.033	−.02	+.30	290 13	−.938	−.52	+.82
150	+2.83	151 18	.480	+3.07	−.14	378 6	+.311	+.19	−.33			−.35	+.92
160	+2.93	161 18	.321	+2.05	+.88	398 6	+.617	+.37	+.51			−.09	+.60
170	+1.49	171 18	+.151	+0.96	+.53	418 6	+.849	+.51	+.02			+.19	−.17
180	−0.10	181 18	−.023	−.12	+.02	438 6	+.978	+.58	−.56			+.43	−.99
190	−0.55	191 18	−.196	−1.25	+.70	458 6	+.990	+.59	+.11			+.55	−.44
200	+0.71	201 18	−.363	−2.31	+3.02	478 6	+.883	+.59	+2.43			+.52	+1.91
210	−2.99	211 18	−.520	−3.32	+.33	498 6	+.668	+.40	−.07			+.35	−.42
220	−3.17	221 18	−.660	−4.21	+1.04	518 6	+.373	+.22	+.82			+.09	+.73
230	−5.79	231 18	−.812	−5.18	−.61	538 6	+.033	+.02	−.63			−.19	−.44
240	−7.35	241 18	−.877	−5.60	−1.76	558 6	−.310	−.19	−1.56			−.43	−1.13
250	−7.09	251 18	−.974	−6.21	−.88	578 6	−.617	−.37	−.51			−.55	+.04
260	−6.51	261 18	−.988	−6.30	−.21	598 6	−.849	−.51	+.30			−.52	+.82
270	−7.70	271 18	−1.000	−6.38	−1.32	618 6	−.978	−.59	−.93			−.35	−.38
280	−7.87	281 18	−.980	−6.25	−1.62	638 6	−.990	−.60	−1.02			−.09	−.98
290	−5.69	291 18	−.932	−5.95	+.26	658 6	−.882	−.53	+.79			+.19	+.60
300	−3.99	301 18	−.854	−5.45	+1.46	678 6	−.668	−.40	+1.86			+.43	+1.43
310	−4.20	311 18	−.757	−4.79	+.59	698 6	−.373	−.22	+.81			+.55	+.26
320	−4.36	321 18	−.625	−3.99	−.37	718 6	−.033	−.02	−.37			+.52	−.89
330	−2.30	331 18	−.480	−3.07	+.77	738 6	+.311	+.19	+.58			+.35	+.28
340	−2.10	341 18	−.321	−2.05	−.05	758 6	+.617	+.37	−.42			+.09	−.57
350	−0.43	351 18	−.151	−.96	+.53	778 6	+.849	+.51	+.02			−.19	+.21
					+14.21				+12.11				+11.09
					−14.92				−14.02				−11.11
					−0.71				−1.91				−.02

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Scopes E & G.

Division into 2 equal parts for each 10° of revolution, with micrometer from page 44, &c.

		$\delta^0 - \delta^1$			$\delta^1 + \delta^2$			$\delta^0 + \delta^2$		
0°	180°	0.06	-2.90	-0.29	0.18	2.86	-0.44	0.54	3.70	-0.68
		59.48	0.66	-1.12	59.30	1.20	-0.83	59.18	1.96	-0.87
		59.77	1.78	-0.70 +0.41	59.74	2.03	-0.64 +.20	59.86	2.83	-0.78 ±.10
10	190	0.16	1.14	-0.14	1.70	2.56	+0.13	1.86	2.78	-.10
		59.88	58.24	-1.45	1.96	0.04	-1.26	1.66	0.83	-.98
		0.02	59.69	-0.80 +.66	1.83	1.30	-0.56 +0.69	1.76	1.80	-.54 +.44
20	200	1.06	3.28	-.85	1.24	1.92	-.53	1.98	3.00	-1.00
		59.36	2.14	-0.57	0.18	3.92	-.50	59.98	3.92	-.54
		0.21	2.71	-0.71 +.14	0.71	4.42	-.52 -.01	0.98	4.46	-.77 -.23
30	210	1.90	1.14	+.96	2.70	58.32	+1.12	3.22	1.16	+.78
		3.82	56.22	-2.46	4.94	56.76	-.78	4.78	56.98	-2.24
		2.86	58.68	-0.75 +1.71	3.82	57.54	+0.17 +.95	4.50	59.22	-0.73 +1.51
40	220	0.98	0.38	+1.02	1.08	1.06	+1.10	1.08	1.06	+1.07
		3.02	55.58	-2.40	3.28	56.17	-2.44	3.22	55.82	-2.62
		2.00	57.98	-0.69 +1.71	2.18	58.62	-0.67 +1.77	2.15	58.44	-0.78 +1.85
50	230	0.70	2.14	+1.06	1.46	2.81	+2.35	0.96	3.12	+2.14
		4.82	54.82	-3.66	6.16	55.40	-3.71	5.24	55.19	-3.96
		2.76	58.48	-1.30 +2.36	3.81	59.10	-0.68 +3.03	3.10	59.16	-.91 +3.05
60	240	1.32	4.82	+2.55	1.88	4.10	+2.98	2.60	4.32	+2.80
		6.42	55.74	-4.54	7.84	54.98	-4.56	8.20	55.14	-4.59
		3.87	0.28	-1.00 +3.55	4.86	59.54	-0.79 +3.77	5.40	59.73	-0.90 +2.70

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		$0^\circ - 5'$			$0^\circ + 0'$			$0^\circ + 5'$		
70°	250°	1.76	1.20	+2.34	2.08	0.80	+2.52	1.86	0.58	+2.27
		6.44	52.82	−4.19	7.12	51.22	−4.79	6.40	52.68	−3.95
		4.10	57.01	−0.92	+3.26	4.60	56.01	−1.13	+3.65	4.13	56.63	−0.84	+3.11
80	260	0.20	1.26	+1.92	0.64	4.56	+1.82	0.90	1.26	+1.65
		4.04	52.92	−4.17	4.28	56.40	−4.08	4.20	52.90	−4.18
		2.12	57.09	−1.12	+3.04	2.46	0.18	−1.13	+2.95	2.55	57.08	−1.26	+2.91
90	270	0.66	3.82	+1.95	0.90	3.64	+2.04	1.20	4.12	+1.94
		4.56	54.02	−4.90	4.98	54.18	−4.73	5.08	54.94	−4.59
		2.61	58.92	−1.48	+3.43	2.94	58.91	−1.34	+3.38	3.14	59.53	−1.27	+3.21
100	280	0.90	1.88	+2.42	1.34	1.78	+2.38	1.38	1.83	+2.34
		5.74	51.92	−4.98	6.10	52.77	−4.30	6.06	51.70	−5.07
		3.32	56.90	−1.28	+3.70	3.72	57.28	−1.06	+3.44	3.72	56.76	−1.36	+3.70
110	290	1.64	1.54	+1.28	1.96	2.28	+1.27	1.92	3.02	+1.36
		4.20	53.72	−3.91	4.50	54.96	−3.66	4.64	55.72	−3.64
		2.92	57.63	−1.31	+2.59	3.23	58.62	−1.20	+2.47	3.28	59.36	−1.14	+2.50
120	300	0.76	1.48	+1.07	1.12	1.76	+1.10	1.60	2.22	+1.03
		2.90	55.58	−2.95	3.32	56.04	−2.86	3.66	56.54	−2.84
		1.83	58.53	−0.94	+2.01	2.22	58.90	−0.88	+1.98	2.63	59.38	−0.90	+1.93
130	310	0.56	2.34	+0.85	0.99	2.20	+1.11	0.90	3.02	+1.21
		2.26	56.24	−3.05	3.22	56.28	−2.96	3.32	57.08	−2.96
		1.41	59.29	−1.10	+1.95	2.10	59.24	−0.92	+2.03	2.11	0.04	−0.88	+2.09

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140°	320°	0.92	2.32	+1.77	1.28	2.28	+1.25	1.10	3.06	+1.31	
		3.26	55.98	−3.17	3.78	56.32	−2.98	3.72	56.94	−3.06	
		2.09	59.15	−1.00	+2.17	2.53	59.30	−0.86	+2.11	2.41	0.00	−0.88	+2.17
150	330	3.08	5.04	+0.40	7.00	6.06	+.68	2.72	2.06	+0.65	
		3.88	0.14	−2.30	8.36	2.00	−2.03	4.02	58.20	−1.93	
		3.48	2.74	−0.95	+1.35	7.68	4.03	−0.68	+1.36	3.37	0.13	−0.64	+1.29
160	340	0.90	2.70	+.44	1.20	3.24	+.61	1.58	4.10	+.68	
		1.78	59.00	−1.85	2.42	59.54	−1.85	2.94	0.14	−1.98	
		1.34	0.85	−0.70	+1.14	1.81	1.39	−0.62	+1.23	2.26	2.12	−0.65	+1.38
170	350	1.94	4.74	−.03	2.74	5.50	−.28	3.18	4.40	−.12	
		1.88	2.08	−1.33	2.18	3.46	−1.02	2.94	2.06	−.97	
		1.91	3.11	−0.68	+0.65	2.46	4.48	−0.65	+.93	3.06	3.03	−0.54	+0.66
180	360										

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Recapitulation from page 74 &c.

From 0° to 180° & 180° to 0°

n	n'	−5′	+0′	+5′	Mean.	Sin 2n	cos 2n	n' sin 2n	n' cos 2n	37″ sin 2n	37″ cos 2n
0	180	−.70″	−.64″	−.78″	−.71″	+.00	+1.00	−.00	−.71	+0	+19
10	190	−.50	−.56	−.54	−.63	+.34	+.94	−.24	−.59	+11	+16
20	200	−.71	−.52	−.77	−.67	+.64	+.77	−.43	−.52	+22	+01
30	210	−.75	[+.17]	−.73	−.74	+.87	+.50	−.64	−.37	+30	−14
40	220	−.69	−.67	−.78	−.71	+.98	+.17	−.70	−.12	+33	−14
50	230	−1.30	−.68	−.91	−.96	+.98	−.17	−.94	+.16	+33	−39
60	240	−1.00	−.79	−.90	−.90	+.87	−.50	−.79	+.45	+30	−30
70	250	−.92	−1.13	−.84	−1.00	+.64	−.77	−.64	+.77	+22	−33
80	260	−1.12	~~−1.04~~ −1.13	−1.26	−1.17	+.34	−.94	−.40	+1.10	+11	−38
90	270	−1.48	−1.04	−1.27	−1.36	+.00	−1.00	−.00	+1.36	+0	−46
100	280	−1.28	−1.06	−1.36	−1.23	−.34	−.94	+.41	+1.16	−11	−23
110	290	−1.31	~~−1.15~~ −1.22	−1.14	−1.22	−.64	−.77	+.78	+.94	−22	−10
120	300	−.94	~~−.92~~ −.88	−.90	−.91	−.87	−.50	+.79	+.46	−30	+29
130	310	−1.10	~~−.86~~ −.92	−.88	−1.00	−.98	−.17	+.98	+.17	−33	+23
140	320	−1.00	~~−.64~~ −.86	−.88	−.91	−.98	+.17	+.89	−.15	−30	+32
150	330	−.90	−.68	−.64	−.76	−.87	+.50	+.66	−.38	−30	+44
160	340	−.70	−.62	−.65	−.66	−.64	+.77	+.42	−.51	−22	+46
170	350	−.68	−.63	−.52	−.62	−.34	+.94	+.21	−.21	−11	+39
±0					−.90			+5.14	+6.57		
								−4.75	−3.57		
								+0.39	+3.00		

Since the columns 4 indicates a larger systematic error than n' the supposition that the errors are a function of 2n is not a correct one.

The errors therefore are probably functions of sin 2n and cos 2n, or systematic errors of division or more probably of eccentricity and the systematic errors of division

If″ sin R″ = +3.00	0.47712
If″ cos R″ = +0.39	9.59106
	0.88606
R″	82° 36′
log If″	.48076
log If	1.25527
log f″	9.22549
f″	0.17″
2f″	0.34″

Over

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Subtraction des corrections pour 0° pour 10°, 10° pour 20° etc

de 10 en 10				$\pi = 90''$	Ecart
0°	0	0	0	+.19	+.07
10	+.08	+.07	+.07	+.27	+.03
20	−.04	−.04	+.03	+.23	+.03
30	−.07	−.08	−.05	+.16	−.04
40	+.03	+.02	−.03	+.19	−.09
50	−.25	−.25	−.28	−.06	−.14
60	+.06	+.05	−.33	+.00	−.27
70	−.10	−.10	−.33	−.10	−.38
80	−.17	−.18	−.51	−.27	−.52
90	−.19	−.19	−.70	−.46	−.72
100	+.13	+.12	−.58	−.33	−.60
110	+.01	+.01	−.57	−.32	−.50
120	+.31	+.30	−.27	−.01	−.37
130	−.09	−.10	−.37	−.10	−.47
140	+.09	+.09	−.28	−.01	−.19
150	+.15	+.14	−.14	+.14	−.03
160	+.10	+.09	−.05	+.24	−.05
170	+.4	+.03	−.2	+.28	
180	+.0	.0	−.2		
	+1.00				
	−.91				
	+.09				

Ecart-type de chaque mesure = −0.90" pour micromètre E de P=0 à P=180°

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1 div = 0.116"

Discussion of results from data on page 2 2 and following.

		E	R	Q	N	C	
Z	52m. 53.42	57.48	0.28	60.64	62.90	−7.35 = −0.85"	60.85
NE	50.40	60.54 [63.06]	3.00	59.86	58.60	−4.33 −0.50	60.50
N	48.34	58.48 [59.94]	7.88	60.00	55.46	−2.27 −0.26	60.24
SE.	32.12	54.54 [56.06]	4.92	62.84	57.20	+13.91 +1.62	58.88
Z	46.07	57.16 [62.62]	0.28	60.28	62.88		61.62

	E	R	Q	N	C
	63.01	62.72	54.22	55.70	−2.21
	57.94	64.88	65.14	56.86	+2.51
	56.44	57.04	62.84	63.74	+4.18
	62.62	55.36	57.44	63.88	−4.24

II

			E	R	Q	N	C	E	R	Q	N
Z	5	49.14 −4.63 −0.77	57.16	60.28	60.20	62.88	60.77 [59.23]	63.58	62.60	54.68	56.06
NE		48.44 −4.93 −0.50	60.74	62.88	52.88	58.94	60.40 [59.20]	57.60	64.60	54.94	56.16
N		48.64 −3.13 −0.36	58.74	67.48	59.82	55.10	60.36 [59.64]	55.38	56.30	62.38	63.52
SE		25.82 +16.69 +1.93	53.72	63.78	62.20	58.62	58.67 [64.93]	63.50	55.76	57.88	63.94
Z		42.51	59.22	59.54	60.18	62.56		E	R	Q	N

−2.81
+3.20
+4.98
−5.43

III

Z	5	48.54 −4.48 −0.52	57.22	59.54	60.18	62.56	60.52	62.96
NE		42.42 −1.36 −0.16	60.18	62.72	59.74	58.64	60.16	58.22
N		49.52 +4.46 +0.56	58.40	67.34	60.14	55.34	60.88	55.30
SE.		26.76 +14.34 +1.67	53.70	63.84	62.12	58.68	58.35	63.18
Z		41.06	56.88	58.80	60.08	62.42		

−2.44
+1.94
+5.18
−4.83

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IV

		C		ε	P	ℓ_2	π_c	b	ε	ℓ_2	π_b
z_1	5	42.86	−2.10	−.23	58.88	58.80	60.08	2.42	60.23	63.00	
MC		38.44	+2.32	+.27	57.88	62.20	54.58	58.36	59.73	58.62	
V		55.68	−1.45	−.172	58.50	67.54	0.68	55.48	61.72	58.76	
SC		24.06	+14.70	+1.70	53.66	63.80	2.16	58.30	58.30	62.74	
z_1		40.76			56.40	58.96	59.94	61.80			

V

5	42.44	−3.16	−.37	56.40	58.96	59.94	61.80	60.37	63.12	
	37.94	+1.34	+.16	59.52	61.76	54.30	58.24	58.84	58.02	
	55.68	−1.60	−.190	58.54	67.58	60.96	55.08	61.90	53.84	
	21.02	+18.24	+2.11	52.38	63.18	61.14	58.08	57.88	64.02	
	39.28			56.40	58.96	59.94	61.80			

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From observed South zenith distances
Observations on page 28

		Ao		Z	P	G	M	b	E	F	g	N
II	Z	5	42.52 -17.44 -2.01	59.88	2.64	2.90	5.12	57.98	60.72			
	S.C.	5	42.88 -17.80 -2.06	60.60	4.02	5.64	0.04	57.94	56.02			
	N	5	43.38 -18.20 -2.12	56.62	5.96	0.44	5.26	57.88	55.78			
	NC	4	32.46 +5.26 +7.10	52.40	1.90	0.72	57.18	66.10	67.48			
		8	245.08									
	Z			59.88								

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II		5	21.47 +4.47 -1.21 -10.53	64.23	6.84	6.05	10.10	58.98	55.46	59.28 64.00	53.73 3.70	52.19 56.29
	N	5	40.62 -14.68 -3.44 -27.68	60.65	10.84	9.15	6.39	56.56	61.10	51.46 57.28	57.26 58.73	61.14 52.19
	Sb	5	39.20 -13.26 -3.28 -28.26	61.08	10.12	2.88	58.58	56.92	58.76	51.76	51.26	61.14
	N	4	2.46 +23.45 +7.94 +68.48	60.22	1.88	54.14	59.72	67.94	64.82	64.96	71.91	70.38
	Nb	5	10.14									
				64.23	6.84	6.05	10.10					
	Z											

+3.33 -5.21 -4.31 +2.50
-4.54 -2.72 +2.83 +4.37
-2.04 +4.96 +5.46 -4.42
+3.12 +2.98 -3.97 -2.44

III	Z	5	24.16 -12.31 -1.43	4.70	6.76	6.48	10.16	57.45 55.52	55.46	63.50	62.44	55.92
	S.C.	5	38.46 -27.11 -3.44	0.16	10.26	8.98	8.08	56.86	61.10	59.96	54.20	52.74
	N	5	42.62 -31.27 -3.63	1.26	10.22	3.12	58.82	56.37	58.76	51.60	50.88	54.30
	Nb	4	0.16 +11.19 +8.25	0.02	1.82	54.00	58.12	68.25	64.82	64.94	72.48	72.04
	Z	5	11.35	4.84	6.76	6.48	10.16					
				4.76								

+3.06 -4.88 -3.92 +2.60
-4.24 -3.10 +2.66 +4.12
-2.38 +4.77 +5.49 -2.93
+3.43 +3.31 -4.23 -3.79

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		C			E	P	G	M	E. R. G M
Σ	5	27.44	−14.37	−1.67	58.33	4.84	6.88	7.32	10.36	55.60 63.14 61.62 55.82
Lb.	5	40.08	−27.01	−3.13	58.87	0.44	10.32	8.94	6.18	61.00 59.78 54.26 52.78
N	5	48.40	−35.33	−4.09	59.91	1.40	9.80	3.20	58.96	57.34 50.84 50.62 59.60
Nb.	3	~~51.72~~ 51.33	+76.69	+7.79	61.79	58.78	0.34	53.82	58.56	65.96 66.06 65.74 73.98 72.70
Σ	5	13.07				4.74	6.08	7.80	11.26	

+2.73 −1.41 −3.25 +2.51
−4.13 −2.91 +2.61 +4.09
−1.43 +5.37 +5.29 −3.69
(+2.83 2.73) +3.08 −5.19 −3.91

A

Σ	6	20.62	−9.14	−1.06	58.94	3.70	6.96	10.68	10.96	56.78 64.86 62.52 58.32
SC	6	20.04	−8.56	−.99	59.01	2.48	11.82	13.20	9.28	62.30 62.06 57.80 54.68
N	5	50.74	+20.74	+2.40	62.40	4.78	13.88	11.02	3.96	65.12 58.14 54.10 65.22
NC	6	14.54	−3.06	−.35	59.65	9.80	12.02	5.68	9.18	{56.58 55.80} 58.70 66.20 63.24
Σ	6	11.48				6.48	7.72	11.30	12.42	

+2.16 −5.92 −3.58 +0.62
−3.29 −3.05 +1.21 +4.33
−2.72 +4.26 +8.30 −2.42
+(3.08 3.85) +8.99 −6.85 −3.59

Σ	6	23.20	−12.86	−1.49	58.51	6.48	7.72	11.30	12.42	55.86 64.34 62.16 57.34
SC	6	15.84	−5.50	−.64	59.36	2.34	12.06	13.46	9.76	63.14 62.44 57.28 54.22
N	5	54.62	+16.28	+1.89	61.89	5.48	14.58	10.74	3.98	64.18 57.06 54.26 65.10
NC	6	8.24	+2.10	+.24	60.24	9.66	11.56	5.00	9.08	{58.40 56.82} 55.56 66.54 63.58
Σ	6	10.34				6.06	7.52	11.54	13.06	

+2.65 −5.83 −3.05 +1.17
−3.78 −3.08 +2.08 +5.14
−2.29 +4.83 +7.63 −3.31
(+3.84 3.42) +4.28 +6.30 +3.74

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Recapitulation

E

Σ+G

	I	III	IV	V	Mean	Σ	
0							
90	+3.33	+2.73	+3.06	+2.16	+2.65	+2.79	+2.79	−.84
180	−4.54	−4.13	−4.24	−3.29	−3.78	−4.04	−1.25	−2.70
270	−2.04	−1.43	−2.39	−2.72	−2.29	−2.17	−3.42	+1.58
360	+3.12	+2.78	+3.43	+3.46	+3.63	+3.28	−0.14	

F

F+H

90	−5.21	−4.88	−4.11	−5.92	−5.83	−5.35	−5.35
180	−2.72	−3.10	−2.91	−3.05	−3.08	−2.97	−8.32
270	+4.96	+4.47	+5.37	+4.26	+4.43	+4.78	−3.54
360	+2.98	+3.31	+3.05	+3.95	+4.28	+3.51	−.03

G

90	−4.31	−3.92	−3.29	−3.58	−3.05	−3.63	−3.63
180	+2.83	+2.66	+2.61	+1.21	+2.08	+2.28	−1.35
270	+5.46	+5.49	+5.29	+8.30	+7.63	+6.43	+5.08
360	−3.97	−4.23	−5.79	−6.15	−6.30	−5.25	−.17

H

90	+2.50	+2.60	+2.51	+0.62	+1.17	+1.88	+1.88
180	+4.37	+4.12	+4.09	+4.33	+5.14	+4.41	+6.29
270	−4.42	−2.93	−3.69	−2.82	−3.31	−3.43	−2.86
360	−2.44	−3.79	−3.91	−3.59	−3.74	+3.49	

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Division into two equal parts from each 10° of revolution from micrometers F and H. from observations on page 118 from Prof. Pickerings Record Book.

0°	180°	2.82	11.14	+1.03		2.88	12.55	+1.12		3.16	12.42	+.99	
		4.88	58.76	−6.19		5.12	59.51	−6.52		5.14	59.76	−6.33	
		3.85	4.95	−2.58	+3.61	4.00	6.03	−2.70	+3.82	4.15	6.09	−2.67	+3.66
10	190	3.24	10.06	+1.00		4.92	11.68	+1.07		5.16	12.28	+.89	
		5.24	56.68	−6.69		7.06	58.44	−6.62		6.94	59.44	−6.42	
		4.24	3.37	−2.84	+3.80	5.99	5.06	−2.78	+3.85	6.05	5.86	2.76	+3.65
20	200	6.98	13.30	−.42		6.90	15.56	−.07		7.26	15.56	−.20	
		6.14	2.98	−5.16		6.76	3.99	−5.78		6.86	4.86	−5.35	
		6.56	8.14	−2.79	+3.21	6.83	9.78	−2.92	+2.85	7.06	10.21	−2.78	+2.58
30	210	7.80	7.28	−.61		8.98	7.74	−.49		9.82	8.02	−.90	
		6.58	56.86	−5.20		8.20	57.76	−4.99		8.02	57.82	−5.10	
		7.17	2.08	−2.90	+3.51	8.49	2.75	−2.74	+2.25	8.92	2.92	−3.00	+2.10
40	220	7.82	7.74	−.47		8.30	8.36	−.56		8.18	8.24	−.65	
		6.88	57.62	−5.06		7.18	57.78	−5.29		6.88	58.12	−5.06	
		7.35	2.68	−2.76	+2.29	7.74	3.07	−2.92	+2.36	7.53	3.18	2.85	+2.20
50	230	6.30	6.32	−.56		7.96	6.96	−.58		6.66	6.30	−.45	
		5.18	56.14	−5.09		6.80	56.94	−5.01		5.76	56.30	−5.00	
		5.74	1.23	−2.82	+2.26	7.38	1.95	−2.80	+2.22	6.21	1.30	−2.72	+2.27
60	240	11.26	5.14	−1.51		11.98	5.30	−1.35		12.72	5.30	−1.51	
		8.24	56.40	−4.37		9.28	56.84	−4.63		9.70	56.38	−4.31	
		9.75	0.77	−2.94	+1.43	10.63	0.67	−2.99	+1.64	11.21	0.69	−2.91	+1.40

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70°	250°	11.28	5.70	−1.26	11.76	4.42	−1.35	11.80	5.26	−1.41
		8.76	57.46	−4.12	9.06	55.98	−4.22	8.98	56.96	−4.15
		10.02	1.58	−2.69 +1.43	10.41	0.20	−2.78 +1.43	10.39	1.11	−2.78 +1.37
80	260	9.86	4.98	−2.29	10.04	5.04	−2.40	10.12	5.63	−2.14
		5.28	58.28	−3.35	5.24	58.46	−3.29	5.84	57.91	−3.86
		7.57	1.63	−2.82 +.53	7.64	1.75	−2.84 +.44	7.98	1.77	−3.00 +.86
90	270	10.80	5.30	−2.98	11.58	5.98	−3.09	12.10	5.80	−2.97
		4.84	1.78	−1.76	5.40	1.44	−2.27	6.16	2.04	−1.88
		7.82	3.54	−2.37 −0.61	8.49	3.71	−2.68 −.41	9.13	3.92	−2.42 −.55
100	280	10.92	3.08	−2.84	10.76	3.34	−2.70	11.44	3.15	−3.17
		5.24	59.22	−1.93	5.36	0.20	−1.57	5.10	59.41	−1.87
		8.08	1.15	−2.38 −.46	8.06	1.77	−2.13 −.57	8.27	1.28	−2.52 −.65
110	290	7.54	2.78	−1.83	8.16	3.74	−2.02	8.80	4.20	−2.32
		3.88	58.04	−2.37	4.12	59.00	−2.37	4.16	59.22	−2.49
		5.71	0.41	−2.10 +.27	6.14	1.37	−2.20 −.18	6.48	1.71	−2.40 +.08
120	300	10.34	2.06	−4.18	10.64	3.43	−3.95	11.02	3.23	−3.93
		1.98	1.70	−.18	2.74	2.65	−.39	3.16	3.07	−.08
		6.16	1.88	−2.18 −2.00	6.69	3.04	−2.17 −1.78	7.09	3.15	−2.00 −1.93
130	310	8.50	2.11	−3.97	8.96	2.36	−4.22	9.94	3.24	−4.29
		0.56	1.18	−.48	0.52	1.16	−.60	1.36	2.16	−.54
		4.53	1.66	−2.22 −1.75	4.74	1.76	−2.41 −1.81	5.65	2.70	−2.42 −1.87

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140°	320°	12.88	3.62	−5.20		14.04	3.52	−5.53		14.28	4.24	−5.58	
		2.48	5.30	+.84		2.98	5.50	+.99		3.12	5.86	+.81	
		7.68	4.46	−2.18	−3.02	8.51	4.51	−2.27	−3.26	8.70	5.05	−2.38	−3.20
150	330	13.24	4.08	−6.51		18.04	4.66	−6.40		12.76	0.74	−6.08	
		0.22	7.04	+1.48		5.24	8.10	+1.72		0.60	4.20	+1.73	
		6.73	5.56	−2.52	−3.99	11.64	6.38	−2.34	−4.06	6.68	2.47	−2.18	−3.90
160	340	10.06	2.21	−5.98		11.18	3.04	−5.61		11.46	3.44	−6.00	
		58.16	5.57	+1.68		59.96	5.10	+1.03		59.46	5.68	+1.12	
		4.08	3.89	−2.15	−3.83	5.57	4.07	−2.29	−3.32	5.46	4.56	−2.44	−3.56
170	350	11.00	5.29	−5.51		11.74	6.98	−5.60		12.38	6.08	−5.69	
		59.98	6.20	+.15		0.54	8.38	+.70		1.00	6.50	+.21	
		5.49	5.74	−2.53	−2.98	6.14	7.68	−2.45	−3.15	6.69	6.29	−2.74	−2.95
180	360												

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1879phae.proj.1760R

Recapitulation

From P=0 to P=180° P=180° to P=0°

n		−5′	+0′	+5′			n−2.58	Σ
0	180	−2.58″	−2.76	−2.67″	−2.65	+.07	″ −.79	″
10	190	−2.84	−2.78	−2.76	−2.79	−.21	−.14	−.14
20	200	−2.79	−2.82	−2.78	−2.83	−.25	−.04	−.18
30	210	−2.90	−2.74	−3.00	−2.88	−.30	−.05	−.23
40	220	−2.76	−2.82	−2.85	−2.84	−.26	+.04	−.19
50	230	−2.82	−2.80	−2.72	−2.78	−.20	+.06	−.13
60	240	−2.94	−2.99	−2.91	−2.94	−.36	−.16	−.29
70	250	−2.69	−2.78	−2.78	−2.75	−.17	+.19	−.10
80	260	−2.82	−2.84	−3.00	−2.89	−.31	−.14	−.24
90	270	−2.87	−2.68	−2.42	−2.49	+.09	+.40	+.16
100	280	−2.38	−2.13	−2.52	−2.34	+.24	+.15	+.31
110	290	−2.10	−2.20	−2.40	−2.23	+.35	+.11	+.42
120	300	−2.18	−2.17	−2.00	−2.12	+.46	+.11	+.53
130	310	−2.22	−2.41	−2.42	−2.35	+.23	−.23	+.30
140	320	−2.18	−2.27	−2.38	−2.28	+.30	+.07	+.37
150	330	−2.52	−2.34	−2.48	−2.38	+.20	−.10	+.27
160	340	−2.15	−2.29	−2.44	−2.29	+.29	+.09	+.36
170	350	−2.03	−2.40	−2.74	−2.57	+.01	−.28	+.08
					−104.0			
					−2.58″			

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Division into ten equal parts for successive 10 degrees of revolution. From pages 77 and 84

☿	Correction of G Excess		Microscopes	Correction of N Excess	
☿	$\frac{1}{2}a''$	a''		$\frac{1}{2}a''$	a
0°	−0.26	+.52		−3.70	−7.40
10	−.60	1.20		−3.78	−7.56
20	−+1.13	+.26		−2.88	−5.76
30	−+1.39	+2.78		−2.22	−4.44
40	−+1.77	+3.54		−2.28	−4.56
50	−+2.81	5.62		−2.25	−4.50
60	−+3.34	6.68		−1.49	−2.98
70	−+3.341	6.68		−1.41	−2.82
80	−+2.97	5.94		−.61	−1.22
90	−+3.34	6.68		+0.52	+1.04
100	−+3.61	7.22		+0.56	+1.12
110	−+2.52	5.04		−0.06	−0.12
120	−+1.97	3.94		+1.91	+3.82
130	−+2.02	4.04		+1.81	+3.62
140	−+2.16	4.32		+3.16	+6.32
150	−+1.33	2.66		+3.98	+7.96
160	−+1.23	2.46		+3.57	+7.14
170	−+0.75	1.50		+3.03	+6.06

The values of a given above are found in the following way

Let R = ~~The reading of the~~ the excess of the distance between microscopes E and E over 180°
x = the excess of the distance between division 0 and division 180° over 180°
a = the excess of the distance between division 0 and division 180° over 180°

$R = E_{0°} - E_{180°} = 180° + x + a$

$R' = E_{180°} - E_{0°} = 180° + x - a$

$R - R' = 2a$

$\frac{1}{2}(R - R') = a$

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1879phae.proj.1760R

Recapitulation

Corrections to be applied to each micrometer.

	E I	E II	E III	E Mean	P II	P III	P Mean	Q II	Q III	Q Mean	H II	H III	H Mean
90°	+3.05	+3.25	+2.65	+2.89	-4.63	-4.15	-4.39	-2.61	-2.49	-2.55	+3.74	+3.69	+3.71
180	-3.96	-4.21	-4.01	-4.06	-3.17	-2.73	-2.95	+3.17	+2.97	+3.07	+4.22	+4.37	+4.30
270	-3.00	-2.87	-2.97	-2.95	+3.37	+2.41	+2.89	+3.91	+4.17	+4.04	-3.92	-4.55	-4.23
360	+3.92	+3.83	+4.33	+4.03	+4.43	+4.45	+4.41	-4.45	-4.67	-4.56	-4.10	-3.51	-3.80

	E	Σ	P	Σ	Q	Σ	H	Σ
0	"	0	"	0	"	0	"	0
90	+2.89	+2.89	-4.39	-4.39	-2.55	-2.55	+3.71	+3.71
180	-4.06	-1.17	-2.95	-7.34	+3.07	+0.52	+4.30	+8.01
270	-2.95	-4.12	+2.89	-4.45	+4.04	+4.56	-4.23	+3.78
360	+4.03	-.09	+4.41	-.04	-4.56	+.00	-3.80	-.02

	E + Q	R + H.	~~E + Q + P + H~~ / 4
	"		
0	.01	-.00	.00
90	+.34	-.61	-.14
180	-.65	+.67	+.01
270	+.44	-.67	-.12
360	[-.09]	[-.06]	

+2.89	-4.39		-4.06	+3.07	-2.95	+2.89
+3.71	-2.55		-2.95	+4.30	4.23	4.04
6.60	-6.94		-7.01	+7.37	-7.18	6.93
-.34				+.36	.25	
-.08				+.09	-.06	

+4.03	-4.56	-.08
4.41	3.80	+.09
8.44	8.36	-.06
+.08		+.08

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Aug 8 1879

Set A and B about 30° apart

A set 15° from E towards F

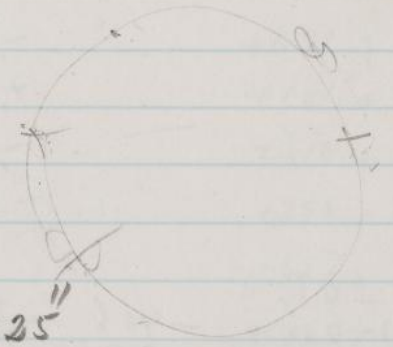
B set 75° " " " "

A set as a constant for P=0 15° 30° ∠e

B read for each 0° 15° ∠e

E. F. G. No. read for each setting of A and B

∠A = 15°
∠B = 45°



1 div A = .125"
1 div B = .120"

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August 29

P	A	B	E	F	G	H
0	6' 50.0	6 28.0	5° 0 1.7	12.6	11.0	15.3
	50.0	26.8	1.4	12.8	11.3	15.2
	50.0	28.5	1.6	13.2	10.9	15.2
	50.0	27.9	1.8	13.4	10.8	15.6
	50.0	26.5	1.8	13.3	10.4	15.8
		377	33	3	44	21
	50.00	27.54	1.66	13.06	10.88	15.42
	6.25	3.30	E-A	E-B		
	-4.59	-1.64	1.8			
30						
	5 50.0	6 40.5	3.1	18.6	15.9	16.9
		41.3	2.9	18.0	15.7	17.4
		41.4	2.9	17.8	15.6	17.0
		40.5	3.2	17.9	15.7	16.9
		40.3	3.1	17.9	15.6	17.2
		40	2	2	35	4
	5000	40.80	3.04	18.04	15.70	17.08
	6.25	4.90				
	-3.21	-1.86				
60						
	5 50.0	6 ~~63.0~~	1.2	20.0	16.8	17.1
		59.0	1.2	19.7	16.8	17.2
		61.2	1.0	19.4	17.0	17.2
		58.8	0.9	19.3	17.2	17.2
		63.0	1.0	19.7	17.0	17.7
		30 50	3	31	48	14
		61.00	1.06	19.62	16.96	17.28

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	A	B	E	F	G	H
5	50.0	6 53.0	59.8	19.0	143	13.9
	50.0	55.6	0.0	18.9	14.2	13.7
	50.0	52.9	59.7	19.0	14.2	13.6
	50.0	52.8	0.1	19.2	14.3	14.1
	50.0	50.4	0.0	19.1	14.4	13.9
		149	29 9.6	2	14	42
	50.00	52.98	59.92	19.04	14.28	13.84

5	50.0	6 ~~57.6~~ 61.3	1.8	20.4	12.9	12.4
20		~~54.6~~ 62.5	1.8	20.2	13.2	12.5
		58.2	1.7	20.3	13.6	12.6
		59.0	1.9	20.5	13.0	12.0
		59.0	1.8	20.7	12.9	12.0
		30 0 0	40	21	6	15
	50.00	60.00	1.80	20.42	13.12	12.30

180		6 58.8	1.7	20.5	12.2	9.0
		58.3	1.9	20.7	12.3	9.1
		60.2	1.9	20.7	12.1	9.3
		60.8	1.8	20.8	12.0	9.3
		59.0	1.8	20.9	12.4	9.6
		471	41	36	10	13
	50.00	59.42	1.82	20.72	12.20	9.26

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	A		B	E	F	G	H
5	50.0	7	18.9	3.2	20.2	10.3	8.1
180			19.8	2.8	20.2	10.2	8.3
			19.2	2.9	20.3	10.1	9.0
			18.4	3.0	20.1	10.2	8.6
			17.6	3.1	20.0	10.0	8.8
			439	0	8	8	28
	50.00		18.78	3.00	20.16	10.16	8.56
	50.0	6	47.9	1.2	16.2	5.2	6.2
			45.9	0.9	16.1	5.3	6.8
170 210			46.0	0.8	16.0	5.2	6.8
			44.8	0.9	16.2	5.2	7.0
			44.3	1.3	16.0	5.1	7.1
			289	51	5	10	39
			45.78	1.02	16.10	5.20	6.78
	50.0	7	5.3	2.9	17.3	3.2	9.7
			5.6	3.0	16.7	3.6	10.3
			4.2	3.2	17.0	3.8	9.8
130 240			4.6	3.5	16.8	3.3	9.8
			4.2	3.7	17.0	3.6	9.8
			39	13	34.8	25	44
			4.78	3.26	16.96	3.50	9.88

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1879phae.proj.1760R

A		B	E	F	G	H
5	50.0	6 50.9	3.2	14.2	3.3	11.1
		48.7	3.2	14.1	3.3	11.2
		49.1	3.3	14.3	3.6	11.3
		47.9	3.4	14.1	3.8	11.2
		48.2	3.6	14.2	3.7	11.3
		8	17	9	27	11
	50.00	48.96	3.34	14.18	3.54	11.22
5	50.0	6 52.2	3.5	13.3	5.1	14.0
		50.7	3.3	13.1	5.3	13.7
		48.0	3.8	13.0	5.4	14.0
		50.6	3.7	13.2	5.6	14.6
		51.3	3.5	13.2	5.4	14.3
		28	28	8	18	6
		50.56	3.56	13.16	5.36	14.12
	50.0	6 50.3	3.5	11.1	8.0	15.9
		44.3	3.9	11.0	8.0	16.2
		42.7	3.3	11.0	8.0	16.1
		41.3	3.8	11.0	8.2	16.1
		44.0	3.7	11.4	8.6	16.2
		126	32	5	8	805
		42.52	3.64	11.10	8.16	16.10
			1.66	1306	10.88	1542
					28	068

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1879phae.proj.1760R

	A	B	E	F	G	H
5	500	6 34.0				
		33.1				
		37.2				
		33.2				
		36.2				
		23.7				
		34.74				

The Lines of A + B a little out of focus at the end of this series

Value of 1 revolution of B.

rev.

~~0 = 0.0~~

0 = 16.4

1 = 16.3

2 = 16.5

3 = 17.6

4 = 15.5

5 = 18.0

~~From B 43 rev. = 300"~~

~~From A 40.0 = 300~~

43 rev. = 300"

~~2580 dist = 300"~~

1 div = .116"

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New Series Aug 8 1879

A		B	E	F	G	H
3 20.0	5	0.5	2.9	13.2	12.4	16.9
		59.5	2.7	13.1	12.2	17.3
		59.0	2.6	13.0	12.2	16.9
		59.6	3.0	13.2	11.7	17.0
		0.4	3.2	13.0	11.2	17.0
		2990	44	5	47	1
	4	59.80	2.88	13.10	11.94	17.02
3 20.0	5	14.1	3.2	18.1	16.0	16.7
		12.1	3.3	17.9	16.2	19.0
		13.9	3.3	18.0	16.4	18.7
		13.9	3.1	18.0	16.6	18.7
		14.0	3.0	18.1	16.7	18.7
		18 0	9	1	19	38
		13.60	3.18	18.02	16.38	18.76
3 20.0	5	37.9	2.0	20.4	18.8	19.0
		36.3	1.4	20.2	18.2	19.1
		37.4	1.6	20.0	18.5	18.7
		37.2	1.8	20.0	18.8	18.8
		36.1	1.7	19.9	19.0	18.9
		349	35	5	33	45
		36.98	1.70	20.10	18.66	18.90

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A	B	E	F	G	H
3 200	33.5	2.0	2.0.0	17.8	15.8
	32.3	1.7	20.1	18.2	15.2
	32.1	1.7	20.3	16.8	15.2
	32.8	1.4	20.2	16.9	15.2
	33.0	1.6	20.1	16.8	15.2
	137	34	7	5	16
	32.74	1.68	20.14	17.10	15.32
3 200	32.0	2.6	20.8	14.8	13.5
	31.3	2.7	21.0	14.7	13.2
	31.1	2.7	21.1	14.5	13.4
	31.1	2.7	21.2	14.4	13.5
	30.1	2.5	21.3	14.8	13.7
	56	32	4	32	23
	31.12	2.64	21.08	14.64	13.46
3 200	31.8	1.5	21.4	13.9	9.8
	31.8	1.7	21.2	13.8	10.0
	32.0	1.8	21.3	13.8	9.7
	32.0	2.0	21.2	14.0	9.7
	31.8	2.3	21.2	14.0	9.9
	94	43	13	45	41
	31.88	1.86	21.26	13.90	9.82

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A	B	E	F	G	H
3 20.0	S 42.8	1.9	19.2	10.0	7.2
	41.5	1.9	19.3	10.8	7.2
	41.0	1.9	19.7	10.5	7.2
	40.8	1.8	19.4	10.8	7.3
	40.0	1.8	19.6	10.6	7.6
	61	43	22	27	15
	41.22	1.86	19.44	10.54	7.30

3 20.0	S 18.7	1.6	17.8	1.7 5.9	1.6 8.1
	17.0	1.9	18.0	1.4 6.2	1.6 8.0
	16.0	1.8	18.2	1.2 6.1	1.1 8.1
	16.0	1.6	18.1	1.1 6.0	1.0 8.1
	16.1	1.5	18.8	1.2 5.9	1.1 8.0
	33 8	34	40 9	16 1	19 3
	16.76	1.68	18 18	1.37 6.02	8.06

3 20.0	S 35.8	3.0	16.8	3.9	8.1
	36.2	3.2	16.9	3.7	8.3
	35.7	3.2	17.2	3.9	8.3
	34.5	3.8	16.9	4.1	8.3
	35.1	3.7	16.7	3.9	8.3
	27 3	19	45	45	13
	35.46	3.38	16.90	3.90	8.26

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1879phae.proj.1760R

A	B	E	F	G	H
3 200	~~23.8~~ 17.0	3.1	13.8	3.4	11.0
	~~21.0~~ 17.7	3.2	13.7	3.2	10.7
	18.6	3.2	13.8	3.2	10.8
	18.4	3.1	14.2	3.6	10.8
	18.7	3.0	13.7	3.8	11.1
	398	6	42	22	44
	17.96	3.12	13.84	3.44	10.88
3 200	21.1	3.6	13.2	6.9	14.1
	20.9	3.9	13.4	7.0	14.1
	22.0	3.7	13.6	6.9	14.1
	21.0	3.9	13.2	7.0	13.9
	20.8	3.4	13.3	6.9	13.9
	58	35	17	47	1
	21.16	3.70	13.34	6.94	14.02
3 200	8.0	2.5	10.9	7.7	15.4
	5.9	2.3	10.4	7.9	15.1
	8.4	2.8	10.3	7.8	15.2
	8.4	2.4	10.2	7.7	15.1
	8.2	2.8	10.6	7.2	15.1
	389	28	29	33	9
	7.78	2.56	10.58	7.66	15.18

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A	B	E	F
3 200	5 2.1		
	59.3		
	2.2		
	0.5		
	0.6		
	47		
	0.94		

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1879. July 9

T = 5 55 Sid. Time

A		B			E	F	G	H
6	5.0	6	26.2	0 0	1.2	15.2	12.3	15.2
			25.7		1.2	14.8	11.9	15.6
			25.1		1.5	14.5	11.9	15.6
			24.0		1.2	14.9	11.8	15.6
			23.8		1.7	14.7	11.4	15.3
			248		18	41	43	23
			24.96		1.36	14.82	11.86	15.46
6	5.0		42.6		2.6	19.2	16.8	16.9
			40.1		2.7	19.2	16.7	17.0
			40.6		2.8	19.2	16.3	17.1
			41.1		2.7	19.2	16.4	16.9
			42.3		2.8	19.8	16.6	16.9
			67		36	16	28	48
			41.34		2.72	19.32	16.56	16.96
6	5.0		57.0		0.0	19.3	17.8	16.2
			57.1		0.0	19.2	17.0	16.0
			56.7		-0.1	19.4	16.9	16.0
			56.0		-0.1	19.7	17.1	16.0
			56.8		-0.2	19.8	16.9	16.1
			36		04	24	7	3
			56.72		-0.08	19.48	17.14	16.06
					59.92			

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1879phae.proj.1760R

A		B	E	F	G	H
6	5.0	6 52.8	+59.3	20.6	15.3	13.8
		53.2	59.3	20.5	15.2	14.2
		52.2	59.3	21.3	15.2	13.8
		53.4	59.6	20.8	15.1	13.8
		51.3	59.8	20.9	15.1	13.6
		12.9	23	41	9	42
		52.58	59.46	20.82	15.18	13.84
6	5.0	55.0	1.6	21.2	13.9	12.8
		53.8	1.2	21.4	14.4	12.6
		56.3	1.0	21.3	14.4	12.2
		55.4	1.3	21.1	14.3	12.2
		55.5	1.2	21.0	14.2	12.0
		260	13	10	12	18
		55.20	1.26	21.20	14.24	12.36
6	5.0	49.2	0.0	21.2	12.3	7.5
		54.1	0.2	21.9	12.3	7.8
		53.2	0.6	21.4	12.4	7.8
		50.8	0.1	21.3	12.3	7.7
		51.2	0.3	21.1	12.6	7.7
		85	12	19	19	35
		51.70	0.24	21.38	12.38	7.70

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A		B	E	F	G	H
6	5.0	6 69.3	1.9	20.5	10.0	6.9
		67.2	1.7	20.3	10.3	7.0
		69.8	1.6	20.7	10.1	7.0
		70.2	1.6	21.0	9.9	7.2
		70.0	1.6	21.0	10.2	7.2
		465	34	35	5	3
		69.30	1.68	20.70	10.10	7.06
6	5.0	6 38.0	0.3	17.7	5.1	6.3
		37.2	0.6	17.9	5.6	6.2
		38.4	0.2	17.2	5.2	6.3
		39.7	0.1	17.0	5.0	6.2
		38.5	0.0	17.6	5.2	6.2
		418	12	24	11	12
		38.36	0.24	17.48	5.22	6.24
6	5.0	6 57.3	2.3	17.0	3.9	7.4
		56.9	1.8	16.9	3.7	7.2
		59.0	2.1	16.7	3.6	7.4
		61.2	2.0	16.6	3.8	7.4
		60.2	2.1	16.8	3.2	7.8
		446	3	40	32	22
		58.92	2.06	16.80	3.64	7.44

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A		B	E	F	G	K
6	5.0	6 35.6	1.1	13.8	2.2	9.0
		37.3	1.5	13.4	2.0	9.0
		37.7	1.2	13.0	2.8	8.9
		36.9	1.3	13.0	2.2	9.1
		34.8	1.1	13.9	2.4	9.0
		323	12	21	16	0
		36.46	1.24	13.42	2.32	9.00
6	5.0	6 36.8	1.2	13.0	16.3	11.2
		37.0	1.2	13.2	16.2	11.3
		34.0	1.2	12.9	16.2	11.1
		36.8	1.2	13.0	16.2	11.5
		40.6	1.3	13.3	16.0	11.7
		352	11	14	9	18
		37.04	1.22	13.28	16.18	11.36
6	5.0	6 26.8	1.7	9.8	8.2	13.6
		25.6	1.9	10.2	8.1	13.7
		24.8	1.9	10.2	8.3	13.6
		24.0	1.7	10.6	8.2	13.4
		23.2	1.9	10.8	8.1	13.2
		244	41	16	14	25
		2488	1.82	10.32	8.28	13.50

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A		B	
6	5.0	6	24.9
			26.1
			25.7
			26.1
			27.1
			29.9
			25.98

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1879 July 10

Value of 1 division of B with new ½ inch objective
Measures of width of division of Circle

E			B		
43.0	56.1	0	5.0	2	18.8
43.5	56.5		5.1		20.8
43.5	56.5		9.9		22.9
43.4	57.3		8.2		24.4
43.3	57.6		7.9		23.1
17	40		36 1		100
43.34	56.80		7.22		22.00

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July 10

	A		B		E	F	G	H
4	15.0	0	56.5	3	36.1	59.1	13.1	11.1	13.9
			54.5		39.2	59.3	13.0	11.1	14.0
			53.8		37.7	59.2	12.9	11.1	14.5
			54.2		36.1	59.7	13.1	11.0	14.1
			53.1		34.8	59.8	12.9	11.0	14.3
			22.1		33.9	21	15.0	3	8
			54.42		36.78	59.42	13.00	11.06	14.16
4	15.0	1	30.0	3	56.8	0.8	17.6	15.4	15.9
			27.7		57.2	0.8	18.1	15.6	16.3
			26.2		56.8	1.0	17.8	15.1	16.2
			25.1		57.2	0.6	18.1	15.4	16.4
			25.6		56.2	0.9	18.2	15.9	16.2
			34 6		33 6	41	48	24	10
			26.92		56.72	0.82	17.96	15.48	16.20
4	15.0	1	30.0		29.3				
			26.4		40.0				
			26.2		40.0				
			24.8		38.2				
			24.8		37.8				
			13 22		1953				
			26.44						

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Micrometer objective and illuminator

1 Div = ±.045"

A		B rev	div	E	F	G	
4	15.0	2 20.8	4 0.5	0.2	14.0	11.9	15.1
		16.1	2.8	0.2	13.9	12.5	15.3
		362	33		79	44	4
		2 18.10	4 1.65	0.20	13.95	12.20	15.20
		1 43.55					
4	15.0	2 53.2	4 25.7	1.2	18.2	16.1	16.6
		53.8	25.1	1.0	18.0	16.6	16.8
		10	8	2	2	7	14
		2 53.50	4 24.00	1.10	18.10	16.35	16.70
		2 30.50					
4	15.0	2 42.0	6 5.2	58.3	19.0	17.2	16.9
		43.2	7.2	58.5	19.4	17.1	17.0
		52	124	8	4	3	139
		2 42.60	6 6.20	58.40	19.20	17.15	16.95
		3 13.60					
4	15.0	2 33.0	5 24.2	57.9	19.5	15.6	13.8
		31.0	22.2	58.0	19.4	15.3	13.7
		40	64	159	9	9	15
		2 32.00	5 23.20	57.95	19.45	15.45	13.75
		2 51.20					
4	15.0	2 37.2	5 57.3	59.8	20.8	14.1	12.9
		34.0	60.8	59.9	20.9	13.9	12.7
		112	1181	17	17	0	16
		2 35.60	5 59.05	59.85	20.85	14.00	12.80
		3 23.45					

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	A		B		E	F	G	H
4	15.0	2	11.2	5. 39.0	58.2	200 20.0	12.2	7.8
			9.8	32.0	58.3	198 19.8	12.4	7.8
			210	20	5	398	6	
		2	10.50	5 31.0	58.25	19.90	12.30	7.80
			3 20.5					
4	15.0	2	58.2	6 15.6	03	19.8	11.0	7.8
			56.1	16.1	0.1	200	10.9	8.0
			143	117	4	398	19	158
		2	57.15	6 15.85	0.20	19.90	10.95	7.90
			3 18.70					
4	15.0	1	56.2	5 10.3	59.6	17.1	7.5	7.8
			54.0	8.0	59.3	17.1	7.3	8.2
			102	183	9		8	0
		1	55.10	5 9.15	59.45	17.10	7.40	8.00
			3 14.05					
4	15.0	2	47.2	6 0.8	1.0	16.9	4.6	8.7
			45.5	0.2	0.8	16.8	4.3	9.0
			127	10	18	17	9	177
		2	46.35	0.50	0.90	16.85	4.45	8.85
			3 13.15					
4	15.0	1	52.0	5 2.2	59.9	13.2	3.0	9.7
			49.0	3.7	0.0	12.9	3.2	10.1
			101.0	5.9	1199	1	2	198
		1	50.50	5 2.95	59.95	13.05	3.10	9.90
			3 12.45					

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	A	B		E	F	G	H
4	15.0	1 35.0	5 5.1	0.8	13.1	6.1	13.2
		31.5	7.8	04	12.9	6.0	13.7
		65	12.9	12	0	1	9
		1 33.25	5 6.45	0.60	13.00	6.05	13.45
		3 33,20					
4	15.0	1 25.3	4 47.8	1.0	11.1	9.0	15.6
		26.3	49.9	1.0	11.1	9.0	15.3
		11.6	17.7				9
		1 25.80	4 48.85	1.00	11.10	9.00	15.45
		3 28,05					
4	15.0	1 3.2	4 13.8				
		4.3	15.6				
		7.5	9.4				
		1 3.75	0 9.47				
		2 56,72					

B a good deal out of focus.

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April 10

New Series II with inch objectives

	A	B Begins	B Ends	E	F1	G	H6
4'	5.2	0 17.2	0 17.0	5.6	18.8	18.2	21.4
		17.7	15.0	5.6	19.0	18.0	21.3
		6.9	120		178	2	7
		17.45	16.00	5.60	18.90	18.10	21.35
4	5.3	5 31.8		7.0	23.1	22.9	22.8
		32.5		6.9	23.1	23.0	22.8
		43		13.9		59	
		32.15		6.95	23.10	22.95	22.80
4	5.3	0 54.0		4.2	24.8	24.3	23.7
		54.8		4.2	24.6	25.1	23.9
		8		1	14	94	16
		54.40		4.20	24.70	24.70	23.80
4	5.3	0 43.8		3.8	25.1	22.8	20.3
		48.6		3.7	25.2	23.0	20.8
		114		15	3	58	11
		45.70		3.75	25.15	22.90	20.52
4	5.3	0 56.1		6.9	27.6	22.1	19.8
		57.1		6.2	27.4	22.4	19.4
		132		121	10	5	12
		56.60		6.05	27.50	22.25	19.60
4	5.3	0 48.8		4.1	25.6	19.4	14.0
		47.5		3.9	25.9	19.3	13.9
		163		0	15	7	79
		48.15		4.00	25.75	19.35	13.95

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	A	B	E	F	G	H
4	5.3	0 58.0	5.1	25.2	16.9	13.3
		59.3	5.2	25.2	16.8	13.6
		173	3		17	9
		58.65	5.15	25.20	16.85	13.45
4	5.3	0 34.2	3.9	22.2	13.1	11.7
		34.6	4.3	22.2	13.3	11.5
		8	82		4	12
		34.40	4.10	22.20	13.20	11.60
4	5.3	0 53.5	6.0	22.0	10.9	14.0
		53.0	6.1	22.3	10.3	13.8
		5	1	3	12	78
		53.25	6.05	22.15	10.60	13.90
4	5.3	0 33.9	5.6	19.2	9.5	14.8
		33.8	5.8	19.0	9.9	15.2
		17	14	2	14	100
		33.85	5.70	19.10	9.70	15.00
4	5.3	0 33.9	5.3	18.2	11.9	17.8
		33.1	5.3	18.0	12.1	18.2
		10		2	0	
		33.50	5.30	18.10	12.00	18.00
4	5.3	0 30.8	5.8	16.1	14.5	20.3
		30.0	5.8	16.0	14.9	20.7
		8		1	14	10
		30.40	5.80	16.05	14.70	20.50

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I″	Σ	II″	Σ	III″	Σ	IV″	Σ
+2,92	+2,92	+2,89	+2,89	+2,40	+2,40	+2,77	+2,77
+1,39	+4,31	+1,29	+4,18	+,50	+2,90	+1,07	+3,84
−0,96	+3,35	−1,42	+2,76	−1,29	+1,61	−1,51	+2,33
−0,02	+3,33	−0,93	+1,83	−0,81	+,80	−0,27	+2,06
−0,84	+2,49	−0,75	+1,08	−1,11	−,31	−1,77	+0,29
−0,78	+1,71	−0,83	+0,25	−0,70	−1,01	−0,79	−0,50
−3,02	−1,31	−3,07	−2,82	−2,75	−3,76	−2,00	−2,50
+0,81	−0,50	+0,50	−1,32	+0,84	−2,92	+,80	−1,70
−1,39	−1,89	−1,25	−3,17	−1,54	−4,46	−1,38	−3,08
+0,44	−1,45	+0,78	−2,39	+1,06	−3,40	+,87	−2,21
+0,26	−1,19	+0,41	−1,98	+1,02	−2,38	+,91	−1,30
+1,19	+,00	+1,97	−,01	+2,41	+,03	+1,26	−,04

w	P	I″	II″	III″	IV	Mean	Σ″
45	0	+2,92	+2,89	+2,40	+2,77	+2,75	+2,75
15	30	+1,39	+1,29	+,50	+1,07	+1,06	+3,81
285	60	−0,96	−1,42	−1,29	−1,51	−1,30	+2,51
255	90	−0,02	−0,93	−,81	−0,27	−0,51	+2,00
	120	−0,84	−0,75	−1,11	−1,77	−1,12	+0,88
	150	−0,78	−0,83	−,70	−,79	−0,78	+0,10
	180	−3,02	−3,07	−2,75	−2,00	−2,71	−2,61
	210	+0,81	+,50	+,84	+,80	+,84	−1,77
	240	−1,39	−1,25	−1,54	−1,38	−1,39	−3,16
	270	+0,44	+,78	+1,06	+,87	+0,79	−2,37
	300	+0,26	+,41	+1,02	+,91	+,90	−1,72
	330	+1,19	+1,97	+2,41	+1,26	+1,71	−,01

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Recapitulation of A and B

From p 91

	I		Σ
	2w	dif	
1	6 27.54	25.22	+25.22
2	40.80	+11.96	+37.18
3	61.00	−8.24	+28.94
4	52.98	−0.21	+28.73
5	60.00	−7.24	+21.49
6	59.42	−6.66	+14.83
7	78.78	−26.01	−11.18
8	45.78	+6.98	−4.20
9	64.78	−12.02	−16.22
10	48.96	+3.81	−12.41
11	50.56	+2.20	−10.21
12	42.52	+10.24	+0.03
	52.76		

From p 96

	II		Σ
	2w	dif	
1	5	−0.20	+24.90
2	13.60	+11.11	+36.01
3	36.98	−12.28	+23.73
4	32.74	−8.03	+15.70
5	31.12	−6.42	+9.28
6	31.88	−7.17	+2.11
7	57.22	−26.52	−24.41
8	16.76	+7.95	−16.46
9	35.46	+10.76	−27.22
10	17.96	+6.75	−20.47
11	21.16	+3.54	−16.93
12	7.78	+16.92	−.01
	24.70		

From p 102

	III		Σ
6	24.96	+20.66	+20.66
	41.34	+4.28	+24.94
	56.72	−11.10	+13.84
	52.58	−6.96	+6.88
	55.20	−9.58	−2.70
	51.70	−6.08	−8.78
	69.30	−23.68	−32.46
	38.36	+7.26	−25.20
	58.92	−13.30	−38.50
	36.46	+9.16	−29.34
	34.04	+8.58	−20.76
	24.58	+20.74	−.02
	45.62		

From p 112

	V		Σ
		17.40	+23.92
		32.15	+9.22	+33.14
		52.40	−13.03	+20.11
		43.70	−2.33	+17.78
		56.60	−15.23	+2.55
		48.15	−6.78	−4.23
		58.65	−17.28	−21.51
		34.40	+6.97	−14.54
		53.25	−11.88	−26.42
		33.85	+7.53	−18.89
		33.50	+7.87	−11.02
		30.40	+10.87	−.05
		41.375		

From p 109

	IV			Σ
1	3 9.87	+35.64	+1.78	+1.78
2	38.75	+10.76	+0.48	+2.26
3	4 24.40	−34.89	−1.57	+0.69
4	34.60	−18.09	−0.81	−0.12
5	4 17.32	−27.81	−1.25	−1.37
6	3 50.75	+11.24	+0.05	−1.42
7	4 36.50	−46.99	−2.11	−3.53
8	8 32.13	+17.38	+0.78	−2.75
9	4 22.92	−33.41	−1.50	−4.25
10	3 26.72	+22.79	+1.03	−3.22
11	3 19.85	+29.66	+1.34	−1.88
12	3 9.32	+42.19	+1.90	+ρ²

	I	II	III	V	Mean	Σ
	+25.22	+24.90	+20.66	+23.92	+23.68	+23.68
	+11.96	+11.11	+4.28	+9.22	+9.14	+32.82
	−8.24	−12.28	−11.10	−13.03	−11.16	+21.66
	−0.21	−8.03	−6.96	−2.33	−4.38	+17.28
	−7.24	−6.42	−9.58	−15.23	−9.62	+7.66
	−6.66	−7.17	−6.08	−6.78	−6.67	+0.99
	−26.01	−26.52	−23.68	−17.28	−23.37	−22.38
	+6.98	+7.95	+7.26	+6.57	+7.29	−15.09
	−12.02	−10.76	−13.30	−11.88	−11.99	−27.08
	+3.81	+6.75	+9.16	+7.53	+6.81	−20.27
	+2.20	+3.54	+6.58	+7.87	+5.55	−14.72
	+10.24	+16.92	+20.74	+10.97	+14.72	+0.00

½ 49.51

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Micrometer.

p	I ε	Δε	ΔB	ε	II ε	ε	B	
	"	"			"			
0	1.66				2.88			
30	3.04	1.38	2.92	+1.54	3.18	0.30	2.88	+2.59
60	1.06	58.02	1.39	+3.37	1.70	58.52	1.29	+2.77
90	59.92	58.86	59.04	+0.18	1.68	59.98	58.58	-1.40
120	1.80	1.88	59.58	-1.90	2.64	0.96	59.07	-1.89
150	1.82	0.02	59.16	-0.86	1.86	59.22	59.25	+.03
180	3.00	1.18	59.22	-1.96	1.86	0.00	59.17	-0.89
210	1.02	58.02	56.58	-1.04	1.68	59.82	56.93	-2.89
240	3.26	2.24	60.81	-1.43	3.38	61.70	60.90	-0.80
270	3.34	0.08	58.61	-1.39	3.12	59.74	58.75	-0.99
300	3.56	0.22	60.64	+0.22	3.70	60.58	60.78	+0.20
330	3.64	0.08	60.26	+0.18	2.56	58.86	60.41	+1.55
0	1.66	58.02	61.19	+3.17	2.88	60.32	61.97	+1.65

III				IV			
1.36				5.60			
2.72	1.36	2.40	+1.04	6.95	+1.35	2.77	+1.42
59.92	57.20	0.50	+3.30	4.20	57.25	1.07	+3.82
59.46	59.54	58.71	-0.83	3.75	59.55	58.49	-1.06
1.26	61.80	59.89	-1.61	6.05	2.30	59.73	-2.57
0.24	58.98	58.89	-.09	4.00	57.95	58.23	+0.28
1.68	1.44	59.30	-2.14	5.15	61.15	59.21	-1.94
0.24	58.06	56.75	-1.31	4.10	58.95	58.00	-.95
2.06	61.82	60.84	-0.98	6.05	01.95	0.80	-1.15
1.24	59.18	58.46	-0.72	5.70	59.65	58.62	-1.03
1.22	59.98	61.06	+1.08	5.30	59.60	60.87	+1.27
1.82	0.60	61.02	+.42	5.80	0.50	60.91	+0.41
1.36	59.54	62.41	+2.87	5.60	59.80	61.26	+1.46

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	I	II	III	IV	Mean		
1	+1.54	+2.09	+1.00	+1.42	+1.65	Σ +1.65	+1.63
2	+3.37	+2.77	+3.30	+3.82	+3.31	+4.96	+4.92
3	+0.18	−1.40	−.83	−1.06	−0.78	+4.18 X	+4.12
4	−1.90	−1.89	−1.61	−2.53	−1.99	+2.19	+2.11
5	−0.16	+.03	−.09	+.28	−.16	+2.03	+1.93
6	−1.96	−.83	−2.14	−1.94	−1.72	+.31 X	+0.19
7	−1.04	−2.89	−1.31	−.95	−1.55	−1.24	−1.38
8	−1.43	−.80	−.98	−1.15	−1.09	−2.33	−2.49
	−1.39	−.99	−.72	−1.03	−1.03	−3.36 X	−3.54
	+0.22	+.20	+.08	+.27	+0.69	−2.67	−2.87
	+0.18	+1.55	+.42	+.41	+.064	−2.03	−2.26
	+3.17	+1.65	+2.87	+1.46	+2.29	+.26 X	.00

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Micrometer

I	II	III	V
13.06	13.10	14.82	18.90
16.04	18.02	19.32	23.10
19.62	20.10	19.48	24.70
19.04	20.14	20.82	27.15
20.42	21.08	21.20	27.52
20.72	21.26	21.38	25.95
20.16	19.64	20.70	25.20
16.10	18.18	17.48	22.20
16.96	16.90	16.80	22.15
14.18	13.84	13.42	19.10
13.16	13.34	13.28	18.10
11.10	10.58	10.32	16.05
13.06	13.10	14.82	18.90

II

			Σ
4.92	2.89	−2.03	−2.03
2.08	1.29	−0.79	−2.82
0.04	58.58	−1.42	−4.24
0.94	59.07	−1.87	−6.11
0.18	59.25	−.93	−7.04
58.18	59.17	+.99	−6.05
58.74	56.93	−1.81	−7.86
58.02	60.20	+2.18	−5.68
56.94	58.75	+1.81	−3.87
59.50	60.78	+1.28	−2.59
59.24	60.41	+3.17	+0.58
62.52	61.97	−0.55	+.03

III

			Σ
4.50	2.40	−2.10	−2.10
0.16	58.70	+.54	−1.56
1.34	58.71	−2.63	−4.19
0.38	59.19	−1.19	−5.38
0.18	58.89	−1.29	−6.67
59.32	59.30	−.02	−6.69
56.78	57.25	+.47	−6.22
59.32	60.84	+1.52	−4.70
56.62	58.96	+1.84	−2.86
59.86	61.06	+1.20	−1.66
59.04	61.02	+3.98	+2.32
4.50	62.41	−2.09	+.23

I + B

			Σ
4.98	2.92	−2.06	−2.06
1.88	1.39	−0.18	−2.25
59.42	59.04	−0.38	−2.63
1.38	59.78	−1.40	−4.03
0.30	59.16	−1.14	−5.17
59.44	59.22	−0.22	−5.39
55.94	56.98	+1.04	−4.35
0.86	60.81	−0.05	−4.40
59.22	58.61	+1.39	−3.01
58.98	60.44	+1.46	−1.55
59.94	60.26	+2.32	+.77
1.96	61.19	−1.19	+.00

V

			Σ
4.20	2.77	−1.43	−1.43
1.60	1.07	−.53	−1.96
0.45	58.49	−1.96	−3.92
2.35	59.73	−2.62	−6.54
58.25	58.23	−.02	−6.56
59.45	59.21	−.24	−6.80
59.00	58.00	+1.00	−5.80
59.95	0.80	+0.85	−4.95
56.95	58.62	+1.67	−3.28
59.00	60.87	+1.87	−1.41
59.95	60.91	+2.96	+1.55
62.85	61.26	−1.59	−.04

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Recapitulation

	I	II	III	V	Mean	Σ	
-210	~~-206~~						
-186	~~-206~~	-203	-2,16	-143	-191	-191	-189
-439	-0.19	-.79	+0.84	-.53	-0,29	-2,20	-2,16
-558	-,38	-1,42	-263	-1,96	-1.60	-3,80	-3,74 x
-688	-1,40	-1,87	-1,19	-262	-1,77	-5,57	-5,49
-689	-1.14	-.93	-1,29	-,02	-,85	-6,42	-6,32
-642	-.22	+.99	-,02	-,24	+.13	-6,29	-6,17 x
-690	+1.04	-1,81	+,47	+1,00	-,07	-6,36	-6,22
-306	-0,5	+218	+1,52	+85	+1,12	-5,24	-5,08
-186	+1,39	+1,81	+1,64	+1,67	+1,68	-3,56	-3,38 x
+212	+1,46	+1,28	+1,20	+1,87	+1,45	-2,11	-1,91
+103	+2,32	+3,17	+3,58	+2,96	+3,11	+1,00	-1,22
	-,77	-,55	-2,09	-1,59	-1,25	-,25	-,00 x

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Microscope G

I

1088		β		Σ	
15.70	4,82	2.92	+1.90	+1.90	-1.90
1696	1.26	1,39	+.13	+2.03	-1,77
1428	57,32	58.04	+1,72	+3.75	-.05
1312	5884	5958	+1,14	+4.89	+1.09
1220	59.06	59.16	+.08	+4.97	+1.17
1016	5996	59.22	+1,26	+6.23	+2,43
520	55.04	5658	+1,94	+8.17	+4,37
3,50	58,30	6081	+2,51		+6,88
3,54	0,04	5861	-1,43		+5,45
536	1,82	6044	-1,38		+4,07
816	2,60	60.26	-2,54		+1,53
1088	2,72	6119	-1,53		+.00

II

1194				Σ
1638	4,44	2,89	-1,55	-1,55
1866	2,28	1,29	-.99	-2,54
1710	5844	5858	+14	-2,40
1464	57,54	59,07	+1,53	-,87
1390	59,26	59,25	-.01	-,88
1054	5664	59,17	+2,53	+1,65
602	5548	56,93	+1,45	+3,10
3,50	57,88	6080	+3,02	+6,12
3,44	59,54	5875	-0,79	+5,33
6,54	3,50	6078	-2,72	+2,61
7,66	0,72	6041	-0,31	+2,30
11,94	4,28	6197	-2,31	-.01

III

1186				Σ	
1656	4,70	2,40	-2,30	-2,30	
1714	0,58	.50	+.08	-2,38	
1518	5804	58,71	+.67	-1,71	
1424	59,06	59,19	+.13	-1,58	
1238	5814	5889	+75	-,83	
1010	5972	59,30	+1,58	+,75	
522	5512	57,25	+2,13	+2,88	
364	5842	60,84	+2,42	+5,30	
282	5868	58,46	-.22	+5,08	
618	3,86	61,00	-2,80	+2,28	
828	2,10	6102	-1,08	+1,20	
1186	3,58	6241	-1,17	+,03	

IV

1810				Σ
2295	4,85	2,77	-2,08	-2,08
2420	1,75	1,07	-.68	-2,76
2290	58,20	5849	+.29	-2,47
2225	59,35	5973	+38	-2,09
1935	59,10	58,23	+1,13	-,96
1685	57,50	59,21	+1,71	+,75
1320	56,35	5800	+1,65	+2,40
1060	59,40	080	+3,40	+5,80
970	5910	58,62	-,48	+5,32
1200	2,30	6087	-1,43	+3,89
1470	2,70	6041	-1,79	+2,10
1810	3,40	6126	-2,14	-,04

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Recapitulation

I	II	III	V	Mean	Σ	
−1.90	−1.55	−2.31	−2.08	−1.96	−1.96	−1.95
+.13	−.99	−.08	−.65	−.40	−2.36	−2.34
+1.72	+.14	+0.67	+.29	+.70	−1.66	−1.63
+1.14	+1.53	+.13	+.38	+.80	−.86	−.82
+.08	−.01	+.75	+1.13	+.49	−.37	−.32
+1.26	+2.53	+1.58	+1.17	+1.63	+1.26	+1.20
+1.94	+1.45	+2.13	+1.65	+1.79	+3.05	+2.57
+2.57	+3.02	+2.42	+3.40	+2.84	+5.89	+5.80
−1.43	−.79	−.22	−.48	−.73	+5.16	5.06
−1.38	−2.72	−2.80	−1.43	−2.08	+3.08	+2.97
−2.54	−.31	−1.08	−1.79	−1.43	+1.65	+1.53
−1.53	−2.31	−1.17	−2.14	−1.79	−1.14	.00

	0	Σ	~~Σ+g~~ g	Σ+g	Σ+g/2
		"	"		
	80	+1.63	−1.95	−.32	−.16
	60	+4.52	−2.34	+2.58	+1.29
X	~~90~~	+4.12	−1.63	+2.49	+1.24
	120	+2.11	−.82	+1.29	+.65
	150	+1.53	−.32	+1.61	+.80
X	180	+0.19	+1.20	+1.39	+.70
	210	−1.38	+2.97	+1.59	+.78
	240	−2.49	+5.80	+3.31	+1.65
X	270	−3.54	+5.06	+1.52	+.76
	300	−2.87	+2.97	+0.10	+.05
	330	−2.26	+1.53	−.73	−.36
	00	0.00	+.00	.00	.00

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Errors from combination of Eclg

From page 91 ℞.

I

½(ε+ε₁)					
6.27		B			
9.37	3.10	2.92	−.18	−.18	−.32
9.01	59.64	1.39	+1.75	+1.57	+2.58
7.10	58.09	59.04	+1.05	+2.62	+2.45
7.46	0.36	59.98	−0.38	+2.24	+1.25
7.01	59.55	59.16	−.39	+1.85	+1.61
6.58	59.57	59.22	−.35	+1.50	+1.35
3.11	56.53	56.98	+.45	+1.55	+1.55
3.38	0.27	60.81	+.54	+2.49	+3.01
3.44	0.06	58.61	−1.45	+1.04	+1.72
4.46	1.02	60.44	−0.58	+46	+0.10
5.90	1.44	60.26	−1.18	−.72	−.73
6.27	0.37	61.19	+.82	+.10	+.00

II

7.41		B		
9.78	2.37	2.89	+.52	+.52
10.18	0.40	1.29	+.88	+1.41
9.35	59.21	58.58	−.63	+.78
8.64	59.25	59.07	−.18	+.60
7.86	59.24	59.25	+.01	+.61
6.20	58.32	59.17	+.85	+1.46
3.85	57.65	56.93	−.72	+.74
3.44	59.79	60.90	+1.11	+1.85
3.28	59.64	58.75	−.89	+.96
5.32	2.04	60.78	−1.26	−.30
5.11	59.79	60.41	+.62	+.32
7.41	2.30	61.97	−.33	−.01

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Jan Mean of F's | Jan Mean Separate

	I	II	III	V	Mean	
				-18 +52 -63 -33	-.16	-16
				+1.57 +1.41 +1.98 +1.24	+1.30	+1.29
				+2.62 +.78 +.80 +.86	+1.29	+1.24
				+2.24 +.60 -.36 -.24	+.56	+.65
				+1.45 +.61 -.02 +.47	+.73	+.80
				+1.52 +1.46 -.30 +.35	+.75	+.70
				+1.95 +.74 +.11 +.70	+.88	+.78
				+2.49 +1.85 +.83 +1.63	+1.75	+1.65
				+1.04 +.96 +.36 +1.07	+.86	+.76
				+.46 -.30 -.53 +.88	+.16	+.05
				-.72 +.32 -.86 +.30	-.24	-.36
				+.10 -.01 +.00 -.04	+.01	.00

III

6.61				
9.64	3.03	+2.40	-.63	-.63
8.53	5.89	0.50	+1.61	+.98
9.32	5.89	5.871	-.08	+.90
7.77	0.45	5.919	-1.26	-.36
6.31	5.854	5.889	+.34	-.02
5.89	5.958	5.930	-.28	-.30
2.93	5.684	5.725	+.41	+.81
2.85	6.012	6.084	+.72	+.83
1.78	5.893	5.846	-.47	+.36
3.70	1.92	6.103	-.89	-.53
5.05	1.35	6.102	-.33	-.86
6.61	+1.56	6.241	+.85	+.00

V

1.185				
14.95	3.10	2.77	-.33	-.33
14.45	5.950	1.107	+1.57	+.84 +1.24
13.32	5.887	5.849	-.38	+.46 +.86
14.15	0.83	5.973	-1.10	-.64 -.24
11.67	5.782	5.823	+0.71	+.05 +.47
11.00	5.733	5.921	-.12	-.05 +.35
8.65	5.765	5.800	+.35	+.30 +.70
8.32	5.967	0.80	+1.13	+1.43 +1.83
7.70	5.738	5.862	-.36	+.07 +1.07
8.60	0.55	6.087	-.08	+.59 +.99
10.25	1.60	6.091	-.69	-.10 +.30
11.85	1.60	6.126	-.34	+.24 -.04

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124 Microscope 16

I

15.42			
17,08	1,66	292	+1,26
17,28	020	139	+1.19
1384	5656	5904	+2,48
1230	5846	59,58	+1,52
926	5696	59,16	+2,20
856	59,30	59,22	−,08
678	58,22	5698	−1,24
988	3,10	6081	−2,29
1122	1,34	5861	−2,73
1412	2,90	6044	−2,46
1610	1,58	6026	−1,72
1342	59,32	1,19	+1,87

−10.52
.52

II

1712			
1876	1,44	289	+1,25
1890	0,14	129	+1,15
1532	5642	5858	+2,16
1346	58,14	59,07	+0,93
982	5836	59,25	+2,89
730	5748	59,17	+1,69
806	0,76	5693	−3,83
826	0,20	6090	+0,70
1088	2,62	5875	−3,87
1402	3,14	6078	−2,36
1518	1,16	6041	−,95
1712	1,54	6197	+,03

10.80
10.81

I	II	III	V	Σ	
+1,26	+1,25	+,90	+1,3	+1,18	+1,18
+1,19	+1,15	+1,40	+,07	+,95	+2,15
+2,48	+2,16	+,93	+1,77	+1,84	+3,99 X
+1,52	+,93	+,67	+,61	+,94	+4,93
+2,20	+2,69	+3,55	+3,88	+3,13	+8,06
−,08	+1,69	−,06	−,29	+,31	+8,37 X
−1,24	−3,83	−1,93	−,15	−1,79	+6,58
−2,29	+0,70	−,36	−1,50	−0,86	+5,72
−2,73	−3,87	−3,10	−2,48	−3,04	+2,68 X
−2,46	−2,36	−1,30	−2,13	−2,06	+0,62
−1,72	−,75	−1,12	−1,59	−1,29	−,67
+1,87	+,53	+,45	+,41	+0,69	+,02 X

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III

15.46			
16.96	1.50	2.40	+.90
16.06	59.10	.52	+1.40
13.84	57.78	58.71	+.93
12.36	58.52	59.19	+0.67
7.70	55.34	58.89	+3.55
7.06	59.36	59.30	−.06
6.24	59.18	57.25	−1.93
7.44	1.20	60.84	−0.36
9.00	1.56	58.46	−3.10
11.36	2.36	61.06	−1.30
13.50	2.14	61.02	−1.12
15.46	1.96	62.41	+0.45
			+7.90
			7.87

V

21.35			
22.80	1.45	2.77	+1.32
23.80	1.00	1.07	+.07
20.52	56.72	58.49	+1.77
19.60	59.08	59.73	+.65
13.95	54.35	58.23	+3.88
13.45	59.50	59.21	−.29
11.60	58.15	58.00	−.15
13.50	2.30	0.80	−1.50
15.00	1.10	58.62	−2.48
18.00	3.00	60.87	−2.13
20.50	2.50	60.91	−1.59
21.35	0.85	61.26	+0.41
			+8.10
			8.14

Ordinates of Σ and Ψ

R	Ψ	$\frac{1}{2}(\Sigma+\Psi)$	$\frac{1}{2}(R+\Psi)$	$\frac{1}{2}(\Sigma+\Psi)$	$\frac{1}{4}(\Sigma+R+\Sigma_1+\Psi)$
−1.89	+1.18	−.71	−.35	−.16	−.25
−2.16	+2.15	−.01	−.01	+1.30	+.65
−3.74	+3.59	+.26	+.19	+1.29	+.71
−5.49	+4.53	−.56	−.28	+.16	+.14
−6.32	+6.06	+1.74	+.87	+.73	+.80
−6.17	+6.37	+2.20	+1.10	+.75	+.92
−6.22	+6.58	+0.36	+.18	+.88	+.53
−5.05	+5.72	+0.64	+.32	+1.75	+1.03
−3.38	+2.68	−0.70	−.35	+.86	+.26
−1.91	+.62	−1.29	−.64	+.16	−.24
−1.22	−.64	−1.89	−.94	−.24	−.59
.00	+.02	+.02	+.01	+.01	+.01

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 Combinations of R No

I	B		
7.41			
9.78	2.37	2.52	+.55
10.18	0.40	1.35	+.95
9.39	5.21	5.04	−.17
8.64	5.25	5.98	+.73
7.88	5.24	5.16	−.08
6.20	5.32	5.22	+.90
3.85	5.65	5.98	−.67
3.64	5.79	6.81	+1.02
3.26	5.64	5.61	−1.02
5.32	2.04	6.04	−1.60
5.11	5.79	6.26	+.47
7.41	2.30	6.1.9	−1.11
			+4.66
			−4.66

II			
6.61			
9.64	3.03	2.89	−.14
8.53	5.889	1.29	+2.40
7.32	5.879	5.58	−0.21
7.77	0.45	5.907	−1.38
6.31	5.854	5.9.25	+.71
5.89	5.958	5.9.17	−.41
2.73	5.684	5.693	+.09
2.85	0.12	6.0.80	+.78
1.78	5.893	5.8.75	−.18
3.70	1.92	6.0.78	−1.14
5.05	1.35	6.0.48	−.87
6.61	1.56	6.1.97	+.41
			+4.30
			−4.30

Reciprocal realm

I	II	III	V
+.55	−.14	−.70	−.06
+.99	+2.40	+1.00	−.27
−.17	−.21	−.16	−.09
+.73	−1.38	−1.64	−.99
−.08	+.71	+1.37	+1.93
+.90	−.41	−.03	−.26
−.67	+.09	−.40	+.42
+1.02	+.78	+1.17	−.32
−1.03	−.18	−.92	−.41
−1.60	−1.14	+.08	−.10
+.47	−.87	−.58	+.66
−1.11	+.41	+.81	−.59

Mean Σ Σ separate

−.09	−.09	−.10	−.35
+1.03	+.94	+.93	−.01
−.16	+.78	+.77	+.13
−.82	−.14	−.06	−.28
+.81	+.77	+.75	+.87
+.05	+.62	+.79	+1.10
−.14	+.68	+.64	+.18
+.66	+1.34	+1.30	+.32
−.63	+.71	+.66	−.35
−.69	+.02	−.03	−.64
−.08	−.06	−.12	−.54
+.12	+.06	.00	+.01

Notice that the combinations 1 and 2 and 3 agree by two methods, but that a similar combination for R Vb does not give a good agreement.

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III

11.85			
14.95	3.10	2.40	−.70
14.45	59.50	0.50	+1.00
13.32	58.87	58.71	−.16
14.15	0.83	59.19	−1.64
11.67	57.82	58.89	+1.37
11.00	59.33	59.30	−.03
8.65	57.65	57.25	−.40
8.32	59.67	60.84	+1.17
7.70	59.38	58.46	−0.92
8.60	0.95	61.03	+.08
10.25	1.60	61.02	−.58
11.85	1.60	62.41	+0.81
			+4.35
			−4.43

V

20.12			
22.55	2.83	2.77	−.06
24.25	1.30	1.57	−.27
22.83	58.58	58.49	−.09
23.55	0.72	59.73	−.99
19.85	56.30	58.23	+1.93
19.32	59.47	59.21	−.26
16.90	57.58	58.00	+.42
17.02	1.12	0.80	−.32
17.05	59.03	58.62	−0.41
18.02	0.97	60.87	−.10
18.27	0.25	60.91	+.66
22.12	1.85	61.26	−.59
			+3.91
			−.09

$\frac{1}{2}(\Sigma+\Gamma)$	$\frac{1}{2}(\Gamma+\Upsilon 6)$	$\frac{1}{4}(\Sigma+\Gamma+\Upsilon+\Upsilon 6)$ separate	$\frac{1}{4}(\Sigma+\Gamma+\Upsilon+\Upsilon 6)$ combined
−.16	−.10	−.13	−.25
+1.30	+.93	+1.12	+.65
+1.29	+.77	+1.03	+.71
+.56	−.06	+.25	+.14
+.73	+.75	+.74	+.60
+.75	+.79	+.77	+.92
+.88	+.64	+.76	+.53
+1.75	+1.30	+1.52	+1.03
+.76	+.66	+.76	+.26
+.16	−.03	+.07	−.24
−.24	−.12	−.18	−.59
+.01	+.00	+.00	−.00

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Aug 10 1879

Scheme for new series of measures & errors of circle.

(a) With the tangent-screw bring each 15° division under microscope E, commencing with $P=0=E=45^\circ$

For each setting of E, read G

(b) Let $R = E_0 - G_{180^\circ} = +a$

$R' = G_0 - E_{180^\circ} = +a$ see page 88

Then $R - R' = 2a$

$\frac{1}{2}(R - R') = a$

~~The correction~~ The correction, a, will thus be found for the following values of P

1	1	0°	180°
2	24	15°	195°
3	2	30	210
4	3	45	225
5	4	60	240
6	5	75	255
7	6	90	270
8	7	105	285
9	8	120	300
10	9	135	315
11	10	150	330
12	11	165	345
13	12	180	360

Since for any reading of E the error must be reckoned from $E=45^\circ$ or $P=0$, some means must be found for connecting the errors arising from the subdivision into two equal parts with the new point of revolution

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In order to avoid the errors introduced by the summation of the separate errors, for always part of a revolution the following scheme is proposed.

(b) Let microscope at A be set on E and compare each 15° in succession with the constant distance E A. The error of each interval of 15° will then be found relatively to the whole arc of revolution. These errors include all the errors by which the graduation is affected. viz More accurately

Eccentricity
Ellipticity of pivots
Irregularity of pivots
Flexure of Circle
Systematic errors of division
Accidental Errors of division

Denote these errors as follows

P	Errors in divisions
0°	0
15°	15_1
30	18_2
45	15_3
60	15_4
75	15_5
90	15_6
105	15_7
120	15_8
135	15_9
150	15_{10}
165	15_{11}
	Σe
345	16_{23}

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(c) Let A at 30° from E towards G
We have then from Errors

P	Error
0	0
30	30
60	30
90	30
120	30
150	30
180	30
330	30

(d) Let A at 45° from E towards G.
We then have

P	Error
0	0
45	45
90	45
135	45
~~180~~	~~45~~
315	45

(e) Let A at 60° from E towards G
We then have

P	Error
0	0
60	60
120	60
180	60
240	60
300	60

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6 Let A at 90° from E towards G
the Sun have

P	Error of —
0	0
90	90_1
180	90_2
270	90_3

6 Let A at 120° from E towards G
the Sun have

P	Error of —
0	0
120	120_1
240	120_2

I To get the error of division for P = 90° (or the A E = 90° as a coördinate) Let C = the Correction to be applied to any division to reduce it to an aliquot part of a revolution. We then have for P = 90°

C

$C = 90_1 = 45_1 + 45_2 =$
$= 30_1 + 30_2 + 30_3$
$= 60_1 + 30_{30}$
~~$= 45_1 + 30$~~

For P = 180°

$C = 180_1 = 90_1 + 90_2$
$= 60_1 + 60_2 + 60_3$
$= 120_1 + 60_1$

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198° $C = 180_1 + 15_1$

210 $= 180_1 + 30_1$

225 $= 180_1 + 45_1$

240 $= 180_1 + 60_1$

255 $= 180_1 + 60_1 + 15_5$ ~~$= 180_1 + 15_1 + 60_1$~~

270 $= 180_1 + 90_1$

285 $= 180_1 + 90_1 + 15_7$

300 $= 180_1 + 90_1 + 30_4 = 180_1 + 120_1$

315 $= 180_1 + 90_1 + 45_3 = 180_1 + 120_1 + 15_8$

330 $= 180_1 + 120_1 + 30_{10} = 180_1 + 120_1 + 30_5$

345 $= 180_1 + 120_1 + 30_4 + 15_{10} = 180_1 + 120_1 + 60_2 - 15_{12} = 180_0 + 90_1 + 45_2 + 15$

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Aug 11 1879

Investigation of 15° zone P = 0 15° 30° 45° 30° 15° N & S Poles. W Winlock observer
Micrometer & telescope

Let A 15° zone E in direction of motion of zin towards N

E	A	G	P = 0
0′ 0″	3′ 7.3 dia.	0′ 15.7	
	5.1	15.7	
	10.1	15.2	
	22 5	15.5	
	7.6	46.4	
		15.47	
0	3 3.5	16.1	P = 15°
	4.5	16.0	
	2.0	16.2	
	10.0	48.3	
	3.33 + 4.17	16.10 − 0.63	
	2 55.9	19.0	P = 30
	55.1	19.2	
	56.9	19.8	
	167.9	58 0	
	55.97 + 7.36	19.33 − 3.23	
	3 0.1	21.9	P = 45
	2 58.3	21.1	
	58.8	21.3	
	177.2	4 3	
	59.07 − 3.10	21.43 − 2.10	
	3 14.7	22.8	P = 60°
	14.2	23.0	
	15.8	22.9	
	44.7	8 4	
	14.90 − 15.83	22.90 − 1.47	

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	A 1490	G 2290	
3	15.3	20.1	P = 75
	17.3	20.3	
	19.6	20.3	
	2.2	7	
	17.40 − 2.50	20.23 + 2.67	
3	21.3	21.9	P = 90
	21.1	22.0	
	18.2	21.8	
	60.6	57	
	20.30 − 2.90	21.90 − 1.67	
3	8.2	19.9	P = 105°
	9.8	20.6	
	7.2	20.1	
	25.2	60.6	
	8.40 + 1.190	20.20 + 1.70	
3	6.9	19.0	P = 120°
	3.7	18.8	
	4.9	19.2	
	15.5	27.0	
	5.17 + 3.23	19.00 + 1.20	
3	10.1	18.0	P = 135°
	10.2	18.3	
	12.2	18.4	
	25	7	
	10.83 − 5.66	18.23 + 6.77	

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	$A_{10.83}$	G_{1823}	
3	21.1	16.3	$P = 180°$
	22.0	16.6	
	22.9	16.8	
	60	1.7	
	22.00 − 11.17	16.57	+1,66
3	19.5	14.8	$P = 165°$
	22.3	14.9	
	22.2	15.1	
	64.0	14.8	
	21.33 + 0.67	14.93	+1,64
3	14.0	12.1	$P = 180°$
	12.6	12.2	
	9.0	11.8	
	35.6	61	
	11.87 + 9,46	12.03	+2,90
3	20.9	10.1	$P = 195°$
	21.8	9.2	
	22.1	9.8	
	48	29.1	
	21.60 − 9.73	9.70	+2,33
3	8.1	8.9	$P = 210$
	9.2	8.8	
	11.4	9.2	
	28.7	26.9	
	9.57 + 12.03	8.97	+0.77

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	A	G	
3	23.8	9.8	P = 230°
	24.9	9.2	
	23.9	9.2	
	12.6	1.2	
	24.20 − 14,63	9.40 − 0,43	
3	1.8	7.6	P = 245°
	2.1	7.7	
	3.1	7.9	
	7.0	22	
	2,33 + 21,87	7.73 + 1,67	
3	9.2	9.4	P = 260°
	10.1	9.8	
	9.2	10.0	
	28.5	29.2	
	9.50 − 7,13	9.73 − 2,00	
3	3.3	10.6	P = 275
2	59.0	10.4	
3	1.8	10.8	
	1841	18	
3	1.37 + 8,13	10.60 − 0,87	
3	20.6	11.8	P = 290
	19.2	12.0	
	20.2	12.1	
	60.0	35.9	
	20.00 − 18,63	11.97 − 1.37	

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	A 2000	G 11.97	
3	5.3	13.1	P = 305
	0.2	11.9	
	2.3	12.2	
	7.8	7 2	
	2.60 + 17,40	12.40 − 0,43	
	9.0	14.9	
3	~~0.8~~	~~+3.8~~	P = 320
	9.9	14.6	
	9.0	14.9	
	9	24	
	9.30 − 6,70	14.80 − 2,40	

Found that the setting did not come out at the same point at which it was started. A mistake of 5° at some point.

Value of 1 div of A

A = 3 14.8 = 0′ 0″

11 12.0 ⟩ 57.2 = 1′ 0″ : 0″

3 10.9 = 0′ 0″

11 11.6 8 0.7 = 1′ 0

3 5.2

11 10.8 8 5.6

1835

8 1.17

451,2 div = 60″

1 div = .125

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Aug 11, 1879 Series I

	E_0	A									
0	0' 0"	Σ	3	20.2			+16.8	16.2	+0.6	0.03	0°
15	1	+1.45 +1.45	3	8.6	15	+11.64 +11.67	+8	16.0	16.0	+0.0	+.00	15	+.8
30	2	−0.13 +1.32		9.6		−1.00 −1.03	−45	20.5	13.0	+7.5	+3.75	30	+4.5
45	3	+4.05 +1.37		9.2		+0.40 +.37	−1.6	22.1	11.5	+10.3	+5.15	45	+1.6
60	4	−3.24 −.65		27.1		−17.90 −17.53	−11	23.2	5.9	+4.3	+7.15	60	−1.1
75		−.07 −.92		27.6		−.50 −.53	+1.4	21.8	11.3	+10.5	+5.25	75	+1.4
90		−.07 −1.55		32.9		−5.30 −5.33	−2.1	23.9	8.6	+15.3	+7.65	90	+1.4
105		−.07 −1.66		33.4		−.50 −.53	+2.2	21.7	9.2	+12.5	+6.25	105	−1.1 +2.2
120		+1.65 −.01		20.2		+13.20 +13.17	+1.5	20.2	11.1	+9.1	+4.55	120	+1.5
135	9	−.62 −.63		25.1		−4.90 −4.93	−4.2	20.4	12.5	+7.9	+3.95	135	−0.2
150	10	+.78 +.15		18.8		+6.30 +6.27	+1.4	19.0	12.0	+7.0	+3.50	150	+1.4
165	11	−1.57 −1.42		31.3		−12.50 −12.53	+0.4	18.6	14.6	+3.8	+1.90	165	+0.4
180	12	−2.15 −3.57		14.1		+17.32 −17.87	+2.4	16.2	17.7	−1.5	−0.75	180	+2.4
195	13	−3.39 −6.96		41.2		−27.10 −27.13	+0.2	16.0				195	+0.2
210	14	+1.62 −5.34	28.2	+3.0		+13.0 +12.97	+3.0	13.0				210	+3.0
225	15	−0.30 −6.04		33.8		−5.60 −5.63	1.2	11.8				225	+1.2
240	16	+2.68 −3.41		12.7		+21.10 +21.07	+2.9	8.9				240	+2.9
255	17	−3.93 −7.34		44.1		−31.40 −31.43	−2.4	11.3				255	−2.4
270	18	+3.11 −4.23	(29.2)?	19.2		+24.90 +24.87	+2.7	8.6				270	+2.7
285	19	+.66 −3.58		14.0		+5.20 +5.17	−0.6	9.2				285	−0.6
300	20	−.23 −3.81		15.8		−1.80 −1.83	−1.9	11.1				300	−1.9
315	21	−.79 −4.60		22.1		−6.30 −6.33	−1.4	12.5				315	−1.4
330	22	+1.51 −3.09		10.0		+12.10 +12.07	−0.5	12.0				330	+0.5
345	23	−.78		16.2		−6.20 −6.23	−2.8	14.8				345	−2.8
360	24	+.26		14.1		+2.10 +2.07	−2.9	17.7				360	
				12.2		+12.72		14.0				15	
				539.5		−10.10		404.3					
						+0.62							
						+.02							

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Aug 12, 1879. W. A. Hobs. W. C. Hosc

Series I

E		A	G	P	L
0	0°	2 2.8	5.6	0°	30
1	15	1 51.6 +11.2	4.9 +0.7	15	15
2	30	1 52.1 −0.5 ?	9.4 −4.5	30	00
3	45	51.7 +0.4	10.6 −1.2	45	345
4	60	2 ?100.0 − [8.3] ?	11.7 −1.1	60	330
5	75	2 10.6 − [10.6]	11.2 +0.5	75	315
6	90	1 57.2 +13.4	8.1 +3.1	90	300
7		2 9.1 −11.9	8.8 −0.7	105	
8		2 (12) 30.5 (105) +18.6	7.9 +0.9	120	
9		2 (52) 28.7 (52) −25.2 ?	7.7 +0.2	135	
10		1 54.0 +21.7	5.5 +2.2	150	
11		2 24.4 −30.4	6.8 −1.3	165	
12	180	2 13.9 +10.5	3.2 +3.6	180	
13		2 5.0 +8.9	0.1 +3.1	195	
14		1 49.6 +15.4	58.0 +2.1	210	
15		2 23.1 −33.5	59.8 −1.8	225	
16		2 1.8 +21.3	58.8 +1.0	240	
17		1 58.0 +3.8 ?	58.7 +0.1	255	
18		1 59.3 −1.3 ?	0.8 −2.1	270	
19		2 0.9 −1.6 ?	1.1 −0.3	285	
20		1 53.7 +7.2	1.2 −0.1	300	
21		1 59.0 −5.3 ?	4.0 −2.8		
22		1 52.4 +6.6	5.9 −1.9		
23					
24					

A space of 15° having been skipped somewhere about 4 or 5, the means of Series I Aug 11 and Series II Aug 12, are inserted in 6 and 7 for Series I Aug 11

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Aug 12, 1879.

Series II

		A	G	A
0	3	15.9	17.9	30°
15	1	14.0 +11.9	16.2 + 1.7	15
30	2	13.3 - 9.3	20.9 - 4.7	0
45	3	13.7 - 0.4	22.8 - 1.9	345
60	4	28.4 - 14.7 ?	24.1 - 1.3	330
75	5	31.6 - 3.2	21.7 + 2.4 ?	315
90	6	33.8 - 2.2	23.0 - 1.3	300
105	7	29.5 + 4.3	21.0 + 2.0	285
120	8	22.8 + 6.7	19.5 + 1.5	270
135	9	25.1 - 2.3	19.8 - 0.3	255
150	10	26.3 - 1.2	19.3 + 0.5	240
165	11	33.2 - 6.9	17.9 + 1.4	225
180	12	17.2 + 16.0	15.8 + 2.1	210
	13	46.8 - 29.6	17.9 - 2.1	195
	14	29.8 + 17.0	14.1 + 3.8	180
	15	27.8 + 2.0	11.0 + 3.1	165
	16	6.8 + 21.0	8.9 + 2.1	150
	17	35.4 - 28.6	10.4 - 1.5	135
	18	16.8 + 18.6	8.7 + 1.7	120
	19	29.5 - 12.7 ?	9.4 - 0.7	105
	20	23.6 + 5.9 ?	11.9 - 2.5	90
	21	29.9 - 6.3 ?	12.0 - 0.1	75
	22	21.0 + 8.9	12.8 - 0.8	60
	23	16.5 + 4.5 ?	14.3 - 1.5	45
	24	18.0 - 1.5	17.4 - 3.1	30

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	Aug 11, 1879 Series I $A_0 - A_1$	Aug 12 Series II $A_0 - A_1$	Aug 11 Series II $A_0 - A_1$		Mean	−0.5	Mean Aug 10-11	Mean Aug 12	Mean	Σ
							"	"	"	
1	+ 11.6	+ 11.9	+ 11.2	+ 34.7	+ 11.57	+11.52	+1.44	+1.53	+1.66	+1.54
2	− 10.0	− 9.3	− 0.5	− 19.8	− 6.60	−6.65	+0.83	−0.32	−0.42	−0.52
3	+ 0.4	− 0.4	+ 0.4	− 0.4	− 0.13	−0.18	−0.02	+0.36	−0.15	−0.06
4	− 17.9	− 11.7	− 18.3	− 50.9	− 16.97	−17.02	−2.13	−2.21	−1.81	−2.05
5	− 0.5	− 3.2	− 0.6	− 4.3	− 1.43	−1.48	−0.18	−0.15	−0.08	−0.24
6	− 3.3	− 2.2	−3.8	− 11.3	− 3.77	−3.82	−0.48	−0.73	−0.55	−0.59
7	− 0.5	+ 4.3	+1.9	+ 5.7	+ 1.90	+1.85	+0.23	+0.26	+0.26	+0.25
8	+ 13.2	+ 6.7	+ 13.4	+ 33.3	+ 11.10	+11.05	+1.38	+1.59	+1.53	+1.50
9	− 4.9	− 2.3	− 11.9	− 19.1	− 6.37	−6.42	−0.80	−0.63	−0.96	−0.80
10	+ 6.3	− 1.2	−1.5	+ 4.6	+ 1.53	+1.48	+0.18	+.10	+0.32	+0.21
11	− 12.5	− 6.9	−5.2	− 24.6	− 8.20	−8.25	− 1.03	−1.27	−1.14	−1.15
12	+ 17.2	+ 16.0	+ 21.7	+ 54.9	+ 18.30	+18.25	+2.28	+1.83	+2.64	+2.25
13	− 27.1	− 29.6	− 30.4	− 87.1	− 29.03	−29.08	− 3.64	−3.71	−4.01	−3.78
14	+ 13.0	+ 17.0	+ 10.5	+ 40.5	+ 13.50	+13.45	+1.68	+2.26	+2.33	+2.09
15	− 5.6	+ 2.0	+ 8.9	+ 5.3	+ 1.77	+1.72	+0.21	+0.19	+0.03	+0.14
16	+ 21.1	+ 21.0	+ 15.4	+ 57.5	+ 19.17	+19.12	+2.39	+2.11	+2.18	+2.23
17	− 31.4	− 28.6	− 33.5	− 93.5	− 31.17	−32.22	− 4.03	− 3.47	−3.72	−3.71
18	+ 24.9	+ 18.6	+ 21.3	+ 64.8	+ 21.60	+21.55	+2.69	+2.63	+2.83	+2.72
19	+ 5.21	− 12.7	+ 3.8	− 3.7	− 1.23	−1.28	−0.16	−0.13	−0.03	−0.11
20	− 1.8	+ 5.9	− 1.3	+ 2.8	+ 0.93	+0.88	+0.11	−0.16	−0.37	−0.14
21	− 6.3	− 6.3	− 1.6	− 14.2	− 4.73	−4.78	−0.60	+0.03	+0.37	−0.06
22	+ 12.1	+ 8.9	+ 7.2	+ 28.2	+ 9.40	+9.35	+1.16	+.44	+0.92	+0.94
23	− 6.2	+ 4.5	− 5.3	− 7.0	− 2.33	−2.38	−0.30	−0.32	−0.53	−0.38
24	+ 2.1	− 1.5	+ 6.6	+ 7.2	+ 2.40	+2.35	+0.29	+0.39	+0.05	+0.24
					+113.17		+14.04	+11.79	+15.12	44.81
					−111.96		−14.20	−13.12	−13.77	−13.59
					+1.21		−0.16	−1.33	+1.35	0.52
					+0.5					+.02

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1879phae.proj.1760R

Aug 12 1879

Measures of 15° prism taking Sun P=0

Σ = Σ = 45°

Σ	E	Dir.	A rev.	G₁₁	P	A
+1.54						
+1.02	E		A	G_{11}	P	A
+.96	00	3	16.5	16.8	45°	30
-1.19			19.0	17.1		
-1.43			19.2	17.6		
-2.02			21.6	17.9		
-1.77			18.7	17.5		
-0.27			95 0	36 9		
-1.07			19.00	17.38		
-.86						
-2.01		3	6.8	16.9	~~30~~	15
+.24			8.8	17.2		
-3.54			4.1	16.8		
-1.46			6.1	16.6		
-1.31			7.8	17.0		
+0.92			33 6	34 5		
-2.79			6.72+12.28 +1.535	16.90+0.48		
-.07						
-6.18		3	7.8	20.9	15	0
-0.32			9.7	21.2		
+.38			9.7	21.8		
+.56			9.8	21.0		
+.18			9.2	21.0		
+.42			46 2	9		
			9.24-2.52 -0.315	21.18 -4.28		

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		924 A	21.18 G	P	A
	3	4.1	22.1		345°
		7.1	22.4		
		7.5	22.4		
		7.2	22.7		
		5.7	22.3		
		31 6	19		
3		6.32+2,92 +0.365"	22.38 − 1,20		
	3	24.1	24.1		330
		25.9	23.9		
		21.2	23.4		
		24.9	23.8		
4		23.8	23.9		
		19 9	41		
		23.98−17.66−2.207"	23.82 − 1,44		
	3	24.1	21.4		315
		25.1	21.5		
		26.8	21.0		
		23.8	20.9		
		26.2	211		
		260	59		
5		25.20−1.22 −0.15	21.18 +2,64		

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1879phae.proj.1760R

25 20 — 21.16

	A	G	A
3	31.9	23.7	300°
	32.7	23.2	
	31.3	23.2	
	31.0	23.1	
	28.3	23.2	
	155 2	14	
6	31.04 − 5.84 − 0.73	23.28 − 2.10	
3	28.2	21.7	285
	29.1	21.3	
	29.0	21.9	
	28.0	21.5	
	30.7	22.0	
	450	84	
7	29.00 +2.04 +0.26	21.68 +1.60	
3	16.7	20.7	270
	18.4	20.4	
	15.1	20.0	
	16.0	19.9	
	15.0	20.0	
	312	10	
8	16.24 +12.76 +1.59	20.20 +1.48	

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1879phae.proj.1760R

		1624 A	20.20 G	A
	3	20.7	19.8	255°
		20.1	19.4	
		22.0	19.7	
		21.1	19.2	
		22.3	19.6	
		6 2	27	
9		21.24 − 5.00 − 0.63″	19.54 + 0.66	
	3	21.0	19.0	240
		20.1	19.0	
		20.2	18.8	
		19.4	18.9	
		19.5	18.8	
		10 02	45	
10		20.04 + 1.20 + 0.15″	18.90 + 0.64	
	3	29.8	18.9	225
		30.2	18.3	
		31.2	18.2	
		30.0	18.7	
		29.8	18.3	
		15 10	24	
11		30.20 − 10.16 − 1.27″	18.48 + 0.42	

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1879phae.proj.1760R

30.20 | 1848

A | G | A

3 | 15.2 | 16.2 | 210
15.9 | 16.2
17.1 | 16.4
14.8 | 16.2
14.9 | 16.3
13
279
12 | 15.58+14.62 +1.83 | 16.26 +2.22

3 | 36.8 42.8 | 17.8 16.6 | 195
37.3 46.8 | 17.8 17.6
38.8 43.8 | 17.2 17.1
39.0 45.8 | 16.9 17.7
37.7 47.2 | 16.7 17.3
264
39.1 45.28 −29.70 | 17.4 13
13 | 37.82 −2.24 −3.71 | 17.28 17.26 −1.00

3 | 27.2 26.1 | 13.9 13.8 | 180
28.0 26.1 | 13.9 13.4
27.8 23.8 | 14.0 13.0
28.7 28.8 | 14.1 13.9
25.2 29.1 +18.20 | 13.9 13.8 13.77
33.9
369 26.78 −17.90 2.28 use | 198 29 9
14 | 27.38+17.90+18.50 | 13.96 13.58 +3.49
154
77
mean 27.08

!

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1879phae.proj.1760R

		27.08	13.77	
		A	G	A
	3	27.8	11.3	165°
		26.1	11.6	
		23.2	11.2	
		26.0	11.2	
		24.7	10.9	
		27 8	12	
15		25.56+1,52 +0.19"	11.24 +2,53	
	3	8.8	8.7	150
		6.4	9.0	
		10.6	9.3	
		9.5	8.9	
		7.9	8.8	
		43 2	47	
16		8.64+6,92 +2.11"	8.94 +2,30	
	3	35.6	10.2	135
		36.8	10.4	
		38.0	10.2	
		36.0	10.2	
		35.4	10.1	
		318	11	
17		36.36-27.72 - 3.47"	10.22 - 1,28	

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1879phae.proj.1760R

36.36 | 10.22

	A	G	A
3	13.8	8.7	120
	16.1	8.6	
	15.2	8.8	
	~~10.9~~ 16.1	~~8.7~~ 8.8	
	15.2	8.9	
	264	38	
18	15.28+2.08 +2.63"	8.76 +1.46	
3	16.6	9.2	105
	16.9	9.8	
	18.0	9.7	
	16.0	9.7	
	14.1	9.7	
	31.6	31	
19	16.32-1.04 -0.13"	9.62 -0.86	
3	18.7	11.4	90
	19.8	11.3	
	15.4	~~11.8~~	
	16.8	12.1	
	18.0	11.9	
	387	85	
20	17.74-1.42 -0.18"	11.70 -2.08	75

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1879phae.proj.1760R

17.74 | 11.70

A | g | A

3 16.9 | 12.8 | 75°

18.7 | 13.2

16.8 | 12.8

18.2 | 13.0

16.0 | 12.9

366 | 147

21 17.32 + 0.42 + 0.05'' | 12.94 − 1.24

3 13.8 14.6 | 13.2 13.7 | 60

13.2 13.7 | 13.2 13.8

12.3 14.0 | 13.1 13.8

12.2 13.4 | 13.1 13.3

15.7 15.0 | 13.2 13.6 — 13.40

207 | 8 32

17 2 ~~14.14~~ mean + 3.53

22 13.4 + 3.88 ~~14.14~~ + 3.18 + 0.44'' mean | 13.16 13.64 − 0.46

mean 13.79 | 80.

3 ~~9.8~~ 18.7 | ~~14.2~~ 15.8 | 45

16.2 | 15.1

13.3 | 14.3

16.4 | 15.2

17.2 | ~~14.8~~

318 | 252

23 16.36 − 2.57 − 0.32 | 15.04 − 1.64

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1879phae.proj.1760R

16.36 | 15.04

A | G | A

3 | 12.8 | 18.8 | 30°

14.2 | 18.9

12.0 | 18.7

13.2 | 18.6

14.1 | 18.7

34 | 163 | 37

24 | 13.26+3.10 +0.39 | 18.74 −3.70

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1879phae.proj.1760R

1879 Aug. 13 Sun

ε	A		G		A
00	2	54.8	18.7		30°
		51.4	18.5		
		49.2	18.2		
		53.2	18.7		
		51.4	18.4		
		100	25		
		52.00	18.50		
	2	37.7	17.7		15
		39.5	18.2		
		38.9	17.8		
		39.2	17.8		
		38.2	17.3		
		435	38		
1		38.70	+13,30 +1.66	17.76	+0.74
	2	42.8	22.0		0
		41.4	22.1		
		442	22.2		
		39.0	21.9		
		43.0	22.1		
		104	3		
2		42.08	−3,38 −0.42	22.06	−4,30

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1879phae.proj.1760R

4208 — 22.06

A — G — A

2 45.8 — 24.2 — 345

45.2 — 24.2

41.0 — 23.7

40.2 — 23.8

42.8 — 23.9

150 — 48

3 43.00 − 0.92 − 0.15″ — 23.96 − 1.90

2 59.1 58.2 — 25.6 25.3 — 330

59.5 56.1 — 25.0 24.9

58.8 55.3 — 24.7 24.9

56.0 59.8 — 24.9 25.2

56.7 55.0 — 24.8 25.1

401 344 — 0 4 mean 25.04

4 11490 — 58.02 − 56.88 − 13.88 — 25.00 25.08 − 1.08

mean 57.45 − 15.02 — mean 14.45 − 1.81″

−14.45

2 ~~62.1~~ 58.4 — ~~22.8~~ 21.9 — 315

59.0 — 23.1

57.5 — 22.9

56.8 — 22.1

58.8 — 22.0

405 — 20

5 −0.65 — 58.10 − 0.65 − 0.08 — 22.40 + 2.64

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1879phae.proj.1760R

	58.10		22.40	
	A		G	A
2	63.8		24.7	300°
	63.2		24.9	
	62.8		24.6	
	61.2		24.2	
	61.7		24.5	
	12.7		2.9	
6	62.54-1.44	−0.55	2458	−2.18
2	61.5		22.8	285
	61.0		22.9	
	61.0		23.2	
	59.7		22.9	
	59.1		22.7	
	2.3		4.5	
7	60.46+2.08	+0.26	22.90	+1.68
2	49.4		20.9	270
	46.0		20.7	
	47.0		21.3	
	47.8		21.3	
	46.0		20.8	
	36.2		5.0	
8	47.24+3.22	+1.53	21.00	+1.90

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1879phae.proj.1760R

47.24 | 21.00

A | G | A

2 ~~60~~ 54.2 | ~~22.6~~ 21.5 | 255

57.0 | 21.3

57.0 | 21.7

54.0 | 21.0

52.2 | 21.0

24 4 | 15

9 | 54.86 7.64 −0.96 | 21.30 −0.30

2 52,0 | 21.1 | 240

52,2 | 20.8

51.4 | 20.8

52.3 | 21.0

53.7 | 21.1

116 | 48

10 | 52.32 +2.56 +0.32 | 20.96 +0.34

2 60.0 | 19.2 | 225

~~57.7~~ 60.0 | ~~18.7~~ 19.3

64.8 | 20.4

61.7 | ~~19.7~~

608 | 19.5

73 | 981

11 | 61.46 −~~0.14~~ −1.14 | 19.62 +1.34

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1879phae.proj.1760R

		61.46	1962	
		A	G	A
	2	40.0	17.2	210°
		44.7	17.8	
		40.0	17.0	
		37.1	17.0	
		40.0	17.1	
		18	11	
12		40.36 + 21.10 + 2.64"	17.22 + 2.40	
	3	12.9	18.9	195
		12.2	18.5	
		12.8	18.9	
		12.3	18.8	
		12.1	18.8	
		23	34	
13	3	12.46 - 32.10 - 4.01	18.78 - 1.56	
	2	54.2	14.8	180
		53.2	14.8	
		54.0	14.6	
		53.3	14.50	
		54.2	14.7	
		189	34	
14		53.78 + 18.68 + 2.33	14.68 + 4.10	

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1879phae.proj.1760R

	5378		1468	
	A		G	A
2	54.1		12.8	165°
	52.4		12.2	
	53.5		12.2	
	53.9		12.3	
	53.9		12.3	
	178		18	
15	53.56 + 0.22 + 0.03″		12.36 +2.32	
2	36.0		10.3	150
	35.1		10.3	
	36.0		10.2	
	36.7		9.9	
	36.8		9.9	
	6		6	
16	36.12 + 17.44 +2.18		10.12 +2.24	
3	5.8		12.0	135
	5.8		12.1	
	6.7		12.0	
	6.0		12.0	
	5.0		11.9	
	293		0	
17	5.86 − 29.74 − 3.72		12.00 −1.88	

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1879phae.proj.1760R

	3 5.86		12,00	
	A.		S	A
	2	42,8	10.0	120
		43.8	10,1	
		43.7	9.5	
		43.0	10,0	
		42.8	9.9	
		16 1	49 5	
18		43.22 +2264 +2,83	9.90 +2,10	
	2	43.3	10.8	105
		43.8	10.4	
		43.2	10,5	
		44.1	10.3	
		42.9	10.2	
		17 3	22	
19		43.46 -0,24 -0.03	10.44 -0,54	
	2	46.6	12.9	90
		46.0	12,8	
		46.2	12.4	
		46.0	12.9	
		47.2	12.9	
		20	39	
20		46.40 -2,94 -0.37	12.78 -2,34	

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46.40 12.78

A G A

2 46.8 13.2 75

42.3 12.3

43.2 12.8

42.1 12.7

43.0 12.8

174 38

21 43.48 +2.92 +0.37" 12.76 +0.02

2 36.2 13.7 60

35.3 13.8

35.0 13.8

36.8 13.4

37.2 13.3

305 30

22 36.10 +7.38 +0.92" 13.60 −0.84

12

34.13 40.4 14.9 16.1 45

2 34.8 39.7 15.0 15.9

35.2 40.0 15.0 15.7

35.8 40.7 15.1 15.8

35.9 40.8 14.9 15.9

10 16 44

23 35.210 40.32 −4.22 −0.53" 15.88 −2.28

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40.32 — 15.88

A		G		A
2 41.7	40.8	18.9	19.2	30°
40.0	38.2	18.8	19.6	
39.8	40.1	18.5	19.0	
39.0	39.7	19.0	19.0	
40.0	39.9	18.8	18.9	
1884	05 39.74	40	7 1794	
24 mean 39.92	40.10 ~~+0.22~~ +0.40 +0.05	18.80	19.14 mean 18.97	−3.09

1954

2	30.9	19.2	15°
	29.3	19.2	
	31.2	19.6	
	31.0	19.2	
	31.6	19.3	
	40		
	30.80		

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1879phae.proj.1760R

Rapid-motion Micrometers

	1.2	I 17	II 12	12	13	Sep 11–12 Mean	Mean
1	+0.7	+0.8	+1.7	+0.48	+0.74	+1.07	+0.76
2	−4.5	−4.5	−4.7	−4.28	−4.30	−4.57	−4.38
3	−1.2	−1.6	−1.9	−1.20	−1.90	−1.57	−1.56
4	−1.1	−1.1	−1.3	−1.44	−1.08	−1.17	−1.23
5	+2.4	+1.4	+2.4	+2.64	+2.64	+2.07	+2.45
6	−1.7	−2.1	−1.3	−2.10	−2.18	−1.70	−1.99
7	+2.1	+2.2	+2.0	+1.60	+1.68	+2.10	+1.79
8	+3.1	+1.5	+1.5	+1.48	+1.90	+2.03	+1.80
9	−0.7	−0.2	−0.3	+0.66	−0.30	−0.40	+0.01
10	+0.9	+1.4	+0.5	+0.64	+0.34	+0.93	+0.64
11	+0.2	+0.4	+1.4	+0.42	+1.34	+1.67	+0.81
12	+2.2	+2.4	+2.1	+2.22	+2.40	+2.23	+2.28
13	−1.3	+0.2	−2.1	−1.00	−1.56	−1.07	−1.21
14	+3.6	+3.0	+3.8	+3.49	+4.10	+3.47	+3.69
15	+2.1	+1.2	+3.1	+2.53	+2.32	+2.48	+2.44
16	+2.1	+2.9	+2.1	+2.30	+2.24	+2.37	+2.30
17	−1.8	−2.4	−1.5	−1.28	−1.88	−1.90	−1.69
18	+1.0	+2.7	+1.7	+1.46	+2.10	+1.80	+1.79
19	+0.1	−0.6	−0.7	−0.86	−0.54	−0.40	−0.60
20	−2.1	−1.9	−2.5	−2.08	−2.34	−2.17	−2.20
21	−0.3	−1.4	−0.1	−1.24	+0.02	−0.60	−0.61
22	−0.1	−0.5	−0.8	−0.46	−0.84	−0.47	−0.59
23	−2.8	−2.8	−1.5	−1.64	−2.28	−2.37	−2.10
24	−1.9	−2.9	−3.1	−3.70	−3.09	−2.63	−3.14
				+22.3	+19.92	+21.82	
				−21.8	−21.28	−22.29	
				+0.5	−1.36	−0.47	

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1879phae.proj.1760R

Aug 14 1879

Measures of B.D. spots from $\varepsilon = 45^\circ$ $P = 0$

I

E		A		G	H
1	0	337		15.8	15°
2	0	21.3	+12.4	21.2 − 5.4	345
3	0	52.3	−31.0	23.8 − 2.6	315
4	0	59.6	− 7.3	23.2 + 0.6	285
5	0	47.3	+12.3	25.0 − 1.8	255
6	0	69.2	− 21.9	20.2 + 4.8	225
7	0	55.3	+13.9	16.2 + 4.0	195
8	0	61.6	− 6.3	14.4 + 1.8	165
9	0	49.0	+12.6	9.2 + 5.2	135
10	0	39.9	+10.1	8.7 + 0.5	105
11	0	37.8	+2.1	11.3 − 2.6	75
12	0	24.9	+12.9	11.2 + 0.1	45
13	0	27.2	−2.3	17.0 − 5.8	15

			Mean	My	15°+15°	4
1	+12.4	+7.4	+7.4	+9.1	+1.14	+1.02	+.12
2	−31.0	−26.0	−26.0	−27.7	−3.46	−2.11	−1.35
3	−7.3	−8.2	−8.2	−8.2	−1.15	−.83	−.32
4	+12.3	+10.2	+10.2	+10.9	+1.36	+1.75	−.39
5	−21.9	−15.5	−15.5	−20.3	−2.54	−.59	−1.95
6	+13.9	+11.6	+11.6	+12.4	+1.55	+1.10	+.45
7	−6.3	−3.1	−3.1	−4.2	−0.52	−1.69	+1.17
8	+12.6	+9.5	+9.9	+8.1	+1.01	+2.37	−1.36
9	+10.1	+12.2	+12.4	+11.5	+1.44	−.99	+2.43
10	+2.1	−1.4	−1.4	−0.2	−0.02	−.25	+.23
11	+12.9	+11.6	+11.6	+12.0	+1.50	+.88	+.62
12	−2.3	−2.0	−2.0	−2.1	−0.26	−.14	−.12

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II

		A				G			A
1	0	32.2	33.4	32,8		17.1	17.6	17.35	15°
2	0	26.8	24.8	25.8	+7,0	21.3	21,0	21.15 −3,80	345
3	0	50.8	52.8	51,8	−26,0	23.8	20.9	22.35 −1,20	315
4	0	59.7	60.9	60.3	−8,2	23.9	23.9	23.90 −1,55	285
5	0	51.3	49.0	50.1	+10,2	20,6	20.1	20.35 +3.55	255
6	1	10,2	9,0	9.6	−19,5	20.7	20.7	20.70 −0.35	225
7	0	59.1	57.0	58.0	+11,6	16.2	15.9	16.05 +4.65	195
8	0	59.0	63,2	61.1	−3,1	13.5	14.6	14.05 +2,00	165
9	0	51.0	51.5	51.2	+9.9	9.3	9.1	9.20 +4.85	135
10	0	37.8	40.2	39.0	+12,2	9.1	9.8	9.45 −0.25	105
11	0	41.2	39.7	40.4	−1.4	12.0	11.8	11.90 −2.45	75
12	0	27.8	29.9	28.8	+11,6	12.6	12.8	12.70 −0.80	45
13	0	32.6	29.0	30.8	−2.0	18.0	17,0	17.50 −4.80	15
	0	20.2	22.3	21,2	+9.6	21.3	21.4	21.35 −3.80	345°

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		A			mean	G				
1		0	26.4	31.5	28.0	28.63	17.3	18.2	17.4	17.63	15°
2	2	0	23.3	21.4	23.0	22.57 +6.06	22.0	21.4	21.3	21.57 −3.94	345
3	3	0	54.2	53.8	54.3	54.10 −31.53	25.3	25.2	24.9	25.13 −3.56	315
4	4	0	65.3	66.1	66.1	65.83 −11.73	25.0	24.8	24.8	24.87 +0.26	285
5	5	0	47.8	46.1	47.4	47.10 +18.73	21.3	20.8	21.1	21.07 +3.80	255
6	6	0	66.1	67.0	68.3	67.13 −20.03	21.2	21.3	21.2	21.23 −0.16	225
7	7	0	55.1	57.2	58.2	56.83 +10.30	17.2	17.4	17.0	17.20 +4.03	195
8	8	0	48.8	51.8	54.3	51.63 +5.20	13.9	14.0	14.3	13.73 +3.47	165
			48.2	49.5	53.3	50.33 +6.50	13.7	14.0	14.2	13.83 +3.37	
9	9	0	48.4	48.9	49.9	49.07 +1.58	10.0	10.2	10.2	10.13	135
10	10	0	36.1	38.0	37.4	37.17 +1.90	9.9	9.9	9.7	9.83	105
11	11	0	38.3	39.8	41.5	39.87 −2.75	13.3	13.3	13.0	13.20	75
12	12	0	~~24.8~~	~~36.8~~	~~38.8~~	~~39.13 +0.74~~	~~15.2~~	~~15.2~~	~~15.2~~		45
			36.0	35.2	36.0	35.73 +4.14	14.0	14.1	14.3	14.13	
13	13	0	~~31.1~~	~~31.0~~	~~30.5~~	~~30.83 +9.60~~	~~19.8~~	~~19.9~~	~~18.6~~		15
			35.0	36.1	35.0	35.37 0.36	18.8	18.9	18.8	18.77	

	15°+15°	4½ 4,	Mean 4+4½ / 2
1	+6.06 +.76	+10.2 −.26	+12 −.07
2	−31.53 −3.94	−2.11 −1.83	−1.35 −1.59
3	+11.73 −1.47	−.83 −.64	−.32 −.48
4	+16.23 +2.34	+1.75 +.59	−.39 +.10
5	−20.13 −2.50	−.59 −1.91	−1.95 −1.93
6	+10.30 +1.29	+1.10 +.19	+.45 +0.32
7	+5.85 +.73	−1.69 +2.42	+1.17 +1.79
8	+1.58 +.20	+2.37 −2.17	−1.36 −1.76
9	+11.90 +1.49	−.99 +2.48	+2.43 +2.45
10	−2.70 −.34	+.25 −.59	+.23 −0.18
11	+2.44 +.30	+.88 −.58	+.62 +0.02
12	+11.98 +.62	−.14 +.76	−.12 +0.32

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	A			G		A
			mean			
	0 19.2	16.1	17,65	20,3	20.0 20,15	15°
1	0 6.1	9.1	7.60+10,05	23,3	24.1	345
2	0 37.4	38.9	38,15-30,55	26.9	26.7	315
3	0 42.0	43.6	47,80-9,65	25,6	25.7	285
4	0 34.9	32.2	33,55+4,25	22,3	22,2	255
5	0 47.8	47.1	47,45-13,90	21.7	21.6	225
6	0 48.0	49.1	48,55-0,10	19.6	19.8 19,70	195
7	0 45.1	45.8	45,45+3,10	16.1	16.2	165
8	0 33.0	34.8	33,90+11,55	10.6	11,2	135
9	0 19.2	19.0	19,10+4,80	9.8	9.8	105
10	0 21.8	18.0	19,90-0,80	12,9	13.0	
11	0 27.7	30.0	28,85-8,95	14.9	14.9	
12	0 25.8	25.0	25,40+3,45	19.3	19.2	

	mean	$(15° \pm 15°)$	Δ_3	Δ_2	Δ_1	$\frac{\Delta_1+\Delta_2+\Delta_3}{3}$
~~+10~~	+1,26	+1,02	+,24	-,26	+,12	+,03
	-3.82	-2,11	-1,71	-1,83	-1,35	-1.63
	-1,21	-,83	-0,38	-0,64	-0,32	-,45
	+1,78	+1,75	+0,03	+0,59	-,39	+,08
	-1,74	-,59	-1,15	-1,91	-1,95	-1,67
	-0,14	+1,10	-1,24	+,19	+,40	-,20
	+0,39	+1,69	+2,08	+2,42	+1,17	+1,89
	+1,44	+2,37	-0,93	-2,17	-1,36	-1,49
	+1,85	-,99	+2,84	+2,48	+2,43	+2,58
	-0,10	+,25	-,35	-,59	+,23	-,24
	-1,12	+,88	-2,00	-,58	+,62	-,65
	+,46	-,14	+0,60	+,76	-12	+,32

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May 18 1879

Zenith of E

Measures of Distances from Σ = 45° and G = 22°

Of A 33° from Σ and B 33° from I Dark lines (nearly)

Lamp illumination

	E		A		and	G		H		A
0.00	45	4	52.2	51.8	52.00	15.3	15.2	15.25	14.30	15
15		4	39.0	40.2	39.60+12.40	18.3	18.6	18.45	11.40	345
25		5	10.8	17.2	9.00−29.40	20.7	21.0	20.85	6.75	315
30		5	21.3	17.8	19.55−10.55	21.3	20.9	21.10	6.75	285
4		5	8.8	10.1	9.45+10.10	17.8	18.0	17.90	9.25	255
5		5	16.3	16.9	16.60−17.15	17.1	17.0	17.05	10.25	225
6		5	18.0	16.0	17.00+0.96	14.7	13.9	14.30	15.20	195
7		5	9.3	11.8	10.55+6.45	11.0	11.8	11.40		165
8		5	5.0	3.9	4.45+6.10	7.0	6.5	6.75		135
9		4	55.0	55.0	55.00+9.45	6.7	6.8	6.75		105
10		4	46.9	57.5	57.20+7.26	9.1	9.4	9.25		75
11		5	13.5	13.8	13.65−16.45	19.2	19.3	19.25		45
12		5	17.1	15.1	16.10−2.45	15.2	15.2	15.20		15

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II

		A			G			A
	4	18.0	6.8	7.40	15.0	14.9	14.95 1425	15
1	3	56.2	56.0	56.10 +1.30	18.8	17.8	18.30 1140	345
2	4	32.2	28.0	30.10 -3.00	21.4	21.2	21.30 780	315
3	4	38.2	38.8	38.50 -8.40	21.2	21.3	21.25 1080	285
4	4	22.8	18.7	20.75 +1.75	17.4	17.8	17.60 1000	255
5	4	36.8	36.3	36.55 -1.80	17.2	17.1	17.15 1030	225
6	4	33.6	35.8	34.70 +1.85	14.1	14.4	1425 1510	195
7	4	28.2	28.0	28.10 +6.60	11.3	11.5	11.40 -	165
8	4	27.4	24.7	26.05 +2.05	7.8	7.8	7.80	135
9	4	16.0	13.0	14.50 +1.55	7.8	7.8	7.80	105
10	4	15.1	16.1	15.60 -1.10	9.9	10.1	10.00	75
11	4	6.1	4.8	5.45 +10.15	10.3	10.3	10.30	45
12	4	3.0	4.2	3.60 +1.85	15.1	15.1	1510	15

I	II	Mean			15°+15°	A,,		
						Aug 18	Aug 11-13	Mean
+12.40	+11.80	+11.55	+1.48	+1.02	+.46	+.03		+0.25
-29.40	-34.00	-31.70	-3.96	-2.11	-1.85	-1.63		+.74
-10.55	-8.40	-9.47	-1.18	-.83	-.35	-.45		-0.40
+10.10	+17.75	+13.92	+1.74	+1.75	+.01	+.08		+.04
-7.15	-15.80	-11.47	-1.43	-.59	-.84	-1.67		-1.25
-0.40	+1.85	+.72	+0.09	+1.10	-1.01	-.20		-.60
+6.45	+6.60	+6.52	+.81	-1.69	+2.50	+1.89		+2.30
+6.10	+2.05	+4.07	+0.51	+2.37	-1.86	-1.49		-1.67
+9.45	+11.55	+10.00	+1.25	-.99	+2.24	+2.58		+2.41
-1.10	-1.00	-1.10	-0.14	-.25	+.11	-.24		-.06
+10.15	+10.15	+10.15	+1.27	+.88	+.37	+.65		+.14
+1.85	+1.85	+1.85	+0.23	-.14	+.37	+.38		+.37

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1879, Aug. 18

E	A	G	B	A
00	0 45.1	15.6	0 35.7	15
	44.0	15.3	39.2	
	43.2	15.4	38.2	
	44.0	15.2	38.0	
	42.3	15.2	39.0	
	186		401	
	0 43.72		38.02	
	0 33.0	18.6	a 43.3	345
	33.1	18.2	45.0	
	33.8	18.3	43.3	
	32.0	18.1	46.0	
	33.9	18.0	45.2	
	81		228	
	33.16 +1056			
	1 5.8	21.3	1 5.0	315
	8.2	21.0	4.3	
	7.2	20.9	4.6	
	10.0	21.0	5.0	
	9.8	21.0	4.3	
	410		23 2	
	8.20 −35.04		4.64	

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	A		G		B		A
1	43.2		14.7	2	34.3		15
	42.0		14.9		36.2		
	43.2		14.8		38.0		
	42.0		14.9		39.0		
	44.0		15.0		38.2		
	14 4		14.86		357		
	42,88				37.14	+4.26	
1	37.2		18.9	3	1.9		345
	36.2		18.8		2.8		
	36.3		19.0		3.9		
	36.0		18.9		4.1		
	36.0		18.8		5.0		
	17		18.86		17 7		
	36,34	+6,54		-4.02	3,54	-2640 -3.30 -8720	
2	7.2		21.0	3	17.3		315
	7.3		20.9		15.1		
	8.7		20.9		15.9		
	8.1		21.0		18.0		
	8,6		21,0		17.8		
	49		20,96	-2,08	341		
	7.98	-31,64			16.82	-1328 -1,66 -6884	

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Aug 18

7.98

E	A	G	B	A
	2 18.0	20.8	3 4.9	285
	17.2	20.3	4.8	
	16.9	20.6	4.1	
	16.7	20.2	3.7	
	16.6	20.4	5.1	
	35 4	23	22.6	
	17.08 - 9.10	20.46	4.52 - 4744	
	2 2.6	17.1	2 36.2	255
	3.2	17.2	37.0	
	3.1	17.2	37.0	
	4.0	17.4	40.0	
	5.0	17.2	39.2	
	17 9	11	39 4	
	3.58 + 13.50	17.22	37.88 - 3430	
	2 12.9	16.2	2 20.8	225
	15.0	16.2	20.0	
	15.0	15.9	22.0	
	15.9	16.0	24.2	
	16.2	15.9	23.2	
	25 0	16.04	10 2	
	15.00 - 11.42		22.04 - 7.04	

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15.00

E	A	G	B	A
	2 11.8	13.0	1 58.0	195
	12.8	13.0	54.8	
	12.8	13.0	54.0	
	12.9	13.1	54.5	
	12.2	13.0	55.2	
	12.5	1302	265	
	12.50 +2.50		55.30 +7.20	
	2 8.0	10.0	1 16.3	165
	7.8	9.9	16.0	
	8.1	10.0	15.9	
	7.0	10.0	17.2	
	9.1	10.1	17.3	
	400	1000	327	
	8.00 +4.50		16.54 +5.46	
	2 6.0	6.6	1 16.9	135
	6.2	6.2	18.9	
	4.8	6.1	20.2	
	4.3	6.3	20.7	
	5.8	6.5	19.2	
	271	6.34	959	
	5.42 +2.58		19.18 +4.82	

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5.42

E	A	G	B	A
1	51.8	6.0	1 24.7	105
	54.2	5.7	24.3	
	54.9	5.5	23.4	
	51.8	5.3	23.1	
	53.5	5.9	25.1	
	16 2	5.68	206	
	53.24+12,18	1	24.12+2,12	
1	47.3	7.9	1 28.1	75
	49.1	7.9	29.8	
	48.3	8.0	31.0	
	47.9	8.0	30.7	
	47.0	8.0	30.5	
	39 6	5.96	0 1	
	47.92+5,32	1	30.02+17,90	
1	43.1	9.2	2 ~~58.8~~	45
	43.2	9.9	1.3	
	43.6	9.7	1.0	
	43.0	9.8	0.8	
	41.8	9.8	1.0	
	14 7	9.68	1.6	
	42.94 +4,98	1	5 1	
			1.02 -180.8	

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E	42.94 A	G	B	A
	1 42.8	14.3	2 35.2	15
	45.1	14.3	36.3	
	44.1	14.5	37.0	
	45.2	14.5	37.0	
	43.0	14.5	35.4	
	202	14.2	309	
	44.04 -1.80		36.18 -52.14	

Focus good throughout - Thy det

	A I	A II	mean					B-A			
1	+6.5	+7.7	+7.1	+7.0	+0.88	+1.02	-.14	-44.26	+17.20	-13.53	-8.93
2	-31.6	-34.7	-33.1	-33.2	-4.15	-2.11	-2.04	-8.20	+51.46	-17.87	-6.33
3	-9.1	-7.4	-8.3	-8.4	-1.05	-.83	-.22	-6.84	+46.24	-11.30	-37.54
4	+13.5	+14.4	+13.9	+13.8	+1.73	+1.75	-.02	-47.44	+29.12	-9.16	-38.28
5	-11.4	-15.5	-13.5	-13.6	-1.70	-.59	-1.11	-34.30	+17.90	-8.20	-26.10
6	+2.5	+2.9	+2.7	+2.6	+0.32	+1.10	-.78	-7.04	-18.5	-12.61	+5.57
7	+4.5	+4.6	+4.5	+4.4	+.55	-1.69	+2.24	+17.20	-52.14	-17.47	+0.27
8	+2.6	+6.7	+4.6	+4.5	+.56	+2.37	-1.81				
9	+12.2	+8.7	+10.5	+10.4	+1.30	-.99	+2.29				
10	+5.2	+1.1	+3.2	+3.1	+0.39	-.25	+.64				
11	+5.0	+4.5	+4.7	+4.6	+0.58	+.88	-.30				
12	-1.1	+4.8	+1.8	+1.7	+0.21	-.14	+.35				
			+660								
			-549								
			+1.1								
			-0.1								

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II

E	A	G	B	A
1	43.2	14.4	2 13.0	15
	43.0	14.5	14.3	
	44.9	14.4	15.0	
	43.7	14.6	14.9	
	42.7	14.4	14.7	
	17 5	14.46	21 9	
	43.50		14.38	
1	35.8	18.2	2 36.0	345
	36.3	17.9	33.6	
	35.2	17.9	35.2	
	35.9	17.8	36.0	
	35.6	17.7	36.0	
	28 8	18.10	26 8	
	35.76 +7.74		35.36	
2	9.6	20.7	2 55.3	315
	9.8	20.7	55.9	
	11.2	20.8	54.9	
	11.3	20.9	54.8	
	10.5	20.5	54.0	
	5 2 4	20.72	4 9	
	10.48_34.72		54.98	

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10.48

E	A	G	B	A
	2 18.8	20.7	2 38.8	285
	17.4	20.1	40.1	
	16.6	20.2	42.0	
	18.8	20.2	42.0	
	17.8	20.2	43.0	
	394	20.28	59	
	17.88 − 7.40		41.18	
	2 3.7	17.2	2 17.7	255
	3.2	16.3	17.8	
	3.5	16.8	16.2	
	3.4	16.8	16.2	
	3.7	16.3	16.8	
	25	16.68	47	
	3.50 + 14.38		16.94	
	2 18.3	16.2	2 4.0	225
	19.7	16.8	2.9	
	18.7	16.1	3.0	
	18.7	16.1	4.0	
	19.7	16.2	4.1	
	45 1	16.28	18 0	
	19.02 − 15.52		3.60	

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1879phae.proj.1760R

19.02

E	A	G	B	A
2	15.9	13.0	1 36.1	195
	16.7	13.0	37.2	
	15.7	13.3	36.3	
	16.1	13.7	35.3	
	16.2	13.2	35.6	
	30 6	13.24	30 5	
	16.12+2.90		36.10	
2	11.2	10.0	0 58.8	165
	10.8	10.0	60.7	
	11.3	10.0	60.7	
	11.7	10.0	60.9	
	12.5	9.7	61.0	
	7 5	9.94	21	
	11.50+4.62		60.42	
2	5.0	5.9	0 60.8	135
	5.2	5.9	60.9	
	4.9	5.6	59.7	
	4.8	6.0	60.9	
	4.3	5.6	60.8	
	4 2	5.80	31	
	4.84+6.66		60.62	

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484

E	A	G	B	A
	1 55.2	5.8	1 8.8	105
	57.2	5.5	8.8	
	56.4	5.7	7.7	
	56.0	5.7	8.9	
	56.0	5.5	8.2	
	8	5.64	24	
	56.16 + 8.68		8.48	
	1 54.8	8.8	1 18.7	75
	55.2	8.5	17.0	
	54.0	8.3	18.4	
	55.3	8.6	18.0	
	56.1	8.2	21.0	
	254	8.48	427	
	55.08 + 1.08		18.54	
	1 51.7	10.0	1 45.3	45
	49.8	9.8	45.8	
	51.6	9.7	49.8	
	49.9	9.8	46.4	
	49.7	9.9	47.0	
	2527	9.84	343	
	50.54 + 4.54		46.86	

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1879phae.proj.1760R

50.54

E	A	G	B	A
1	45.6	14.1	2 16.6	15
	46.2	14.2	14.7	
	45.2	14.1	16.8	
	46.2	14.2	19.7	
	45.7	14.3	18.2	
	28 9	14.18	36 0	
	45.78+4.76		17.20	

Focus good

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1879phae.proj:1760R

1879. Aug. 19

30° diameter Sky illumination

Zero of G

G		B			E			A	A	
5	6.0	4	31.4	33.2 32.30	4	46.8	46.7 46.75	0 49.9 49.5 49.45		15°
	1	4	26.1	24.3 25.20 +7.10		43.2	43.1	0 12.0 9.8 10.90	38.55	345
	2	4	15.8	14.9 15.35 +9.85		38.5	38.8	0 16.7 21.2 19.95	−9.05	315
	3	4	12.5	10.5 11.50 +3.85		39.8	39.9	0 39.3 36.0 37.50	−17.55	285
	4		18.8	18.1 18.45 −6.95		43.1	43.1	0 47.0 49.1 48.05	−10.55	255
	5		11.4	12.8 12.10 +6.35		44.1	44.0	1 5.8 4.5 5.15	−17.10	225
	6		7.2	5.0 6.10 +6.00		46.8	47.0 46.90	1 24.2 23.7 23.95	−18.80	195
	7	3	50.4	50.8 50.60 +15.50		50.0	50.1	1 44.6 45.0 44.80	−20.85	165
	8	4	27.1	26.1 26.60 −3.60		54.5	54.5	2 18.8 18.1 18.45	−33.65	135
	9		35.1	33.9 34.50 −7.90		54.8	54.3	2 11.3 11.3 11.30	+7.15	105
	10		23.1	21.2 22.15 +12.35		51.4	51.8	1 49.2 43.5 46.35	+24.95	75
	11		41.2	42.1 41.65 −19.50		49.9	50.3	1 25.8 28.8 27.15	+19.20	45
	12		38.2	34.8 36.50 +5.15		46.5	46.2	0 57.3 54.2 55.75	+31.40	15

Both A + B; focus pretty bad.

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1879phae.proj.1760R

G	B	E	A	A
00	0 44.1 43.2 4365	46.6 46.2 4640	2 4.2 5.8	15
1	0 37.2 37.0 37.10+6.55	41.8 41.9	1 26.2 28.3	345
2	0 30.0 26.0 28.00+9.10	38.3 38.3	1 29.8 29.1	315
3	0 16.5 18.8 17.65+10.35	39.4 39.2	1 43.5 43.4	285
	16.0 13.2 14.60+13.40	39.3 39.2	1 45.6 45.2	
4	0 26.4 25.5 25.95-11.35	43.2 43.0	2 2.2 3.2	255
5	0 18.0 15.2 16.60+9.35	43.1 42.8	2 17.0 17.2	225
6	0 10.1 10.8 10.45+6.15	47.0 46.7 46.85	2 41.5 42.0	195
7	5 45.2 45.2 55.20+7.25	50.0 49.7	3 0.0 0.8	165
	42.8 42.8 42.80+7.65	49.6 49.4	2 56.1 56.0	
8	0 22.7 26.3 24.5 29.35	54.2 54.2	3 26.3 27.8	135
9	0 30.8 30.0 30.40-5.90	54.0 53.9	3 23.3 23.0	
10	0 20.7 19.2 19.95+10.45	50.9 50.7	2 53.8 52.8	
11	0 33.2 36.2 34.70-14.75	50.2 50.0	2 41.2 42.0	
12	0 23.7 24.8 24.25+10.45	44.7 44.4	2 53.7 53.1	

Focus good

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1979phae.proj.1700k

G	B			E			A			A	
	2	51.6	51.2	51.40	45.0	45.1	45.05	1 39.5	58.2	58.85		15
1	2	46.9	49.0	47.95 +3.45	41.2	41.3	41.25 +3.80	1 17.8	17.2	17.50	+41.35	345
2	2	40.8	39.0	39.90 +8.05	38.0	38.0	38.00 +3.25	1 24.8	25.2	25.00	−7.50	315
3	2	30.1	32.0	31.05 +8.85	35.2	37.9	38.05 −0.05	1 32.4	34.6	33.50	−8.50	285
4	2	37.5	38.8	38.10 −7.05	41.9	41.8	41.85 −3.80	1 52.0	53.0	52.50	−19.00	255
5	2	36.8	34.5	35.65 +2.45	42.8	42.3	42.55 −0.62	2 15.1	14.2	14.65	−21.85	225
		36.7	33.3	35.00 +3.10	42.2	42.6	42.40	2 14.1	14.0	14.05		
							42.47			14.35		
6	2	28.7	28.2	28.45 +6.55	46.1	45.9	46.00 −3.53	2 35.5	34.9	35.20	−20.85	195
7	2	24.0	23.2	23.60 +4.85	48.3	48.6	48.45	2 49.8	50.1	49.95	−17.97	165
	2	31.0	31.8	31.40 −2.95	49.2	49.1	49.15	2 56.4	56.4	56.40		
							48.80 −2.80			53.17		
8	3	6.1	3.0	4.55 −40.9	53.3	53.1	53.20 −4.40	3 20.8	22.1	21.45	−28.28	135
9	3	15.1	16.6	15.85 −11.30	53.7	53.7	53.70 −0.50	3 16.7	17.8	17.25	+4.20	105
10	3	7.8	5.2	6.50 +9.35	50.9	51.2	51.05 +2.65	2 55.3	56.1	55.70	+21.55	75
11	3	20.0	18.8	19.40 −12.90	48.8	48.8	48.80 +2.25	2 34.3	35.4	34.85	+20.85	45
12	3	17.0	16.1	16.55 +2.85	44.1	44.1	44.10 +4.70	1 57.1	56.3	56.70	+38.15	15

Focus good

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1879phae.proj.1760R

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Aug 19

Lamp illuminé

G		B				E			A			A	
0.0		0	9.7	11.8	10.75	43.1	43.2	43.15	1	55.2	54.0	54.60	15
		~~0~~	~~7.2~~	~~8.0~~	~~7.60 +3.15~~	~~40.6~~	~~40.6~~		~~4~~	~~15.7~~	~~16.9~~		~~34~~
	1	0	7.2	8.0	7.60 +3.15	40.6	40.6	40.60 +2.55	4	15.7	16.9	16.30	345
	2	4	58.7	58.8	58.75 +8.85	37.1	37.0	37.05 +3.55	4	15.3	17.3	16.30	315
	3	4	53.2	52.9	53.05 +5.70	38.8	38.8	38.80 −1.75	4	38.2	38.8	38.50 −22.20	285
	4	4	56.1	56.5	56.30 −3.25	41.4	41.7	41.55 −2.75	4	48.1	50.8	49.45 −10.95	255
	5	4	~~53.3~~	~~56.5~~	~~54.40 +4.9~~	42.0	42.3	42.15 −0.60	5	4.3	4.8	4.55 −15.10	225
	6	4	48.8	46.7	47.75 +3.65	44.8	44.9	44.85 −2.70	5	21.8	21.9	21.85 −17.30	195
	7	4	40.8	46.8	44.30 +6.45	47.9	47.9	47.90 −3.05	5	49.7	52.7	50.20 −28.35	165
	8	5	20.0	21.3	20.65 −3.35	52.8	53.0	52.90 −3.00	1	20.2	19.2	19.70	135
	9	5	35.7	34.7	35.20 −14.55	53.3	53.3	53.30 −0.40	1	11.8	11.3	11.55 +8.15	105
	10	5	24.1	24.0	24.05 +1.15	49.7	49.8	49.75 +3.55	0	42.3	43.6	42.95 +28.60	75
	11	5	40.6	40.4	40.50 −16.45	48.4	48.1	48.25 +1.50	5 0	23.0	23.0	23.00 +19.95	45
	12	5	41.8	41.1	41.45 −0.95	44.2	44.2	44.20 +4.05	4	46.6	46.1	46.35 +36.65	15

Focus rather bad at the end.

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1879phae.proj.1760k

B

	I	II	III	IV	Mean	"
1	+7.1	+6.5	+3.2	+3.2	+5.1	+0.64 +.60
2	+9.6	+9.1	+8.1	+8.8	+8.9	+1.11 +1.07
3	+3.8	+11.8	+8.9	+5.7	+7.5	+0.94 +.90
4	-7.0	-11.3	-7.1	-3.3	-7.2	-0.90 -.94
5	+6.4	+9.3	+2.8	-0.1	+6.1	+0.76 +.72
6	+6.0	+6.1	+6.5	+8.6	+6.3	+0.79 +.75
7	+15.5	+16.4	+1.0	+1.4	+8.6	+1.08 +1.04
8	-34.6	-29.3	-33.2	-34.3	-32.9	-4.11 -4.15
9	-7.9	-5.9	-11.3	-14.6	-9.9	-1.24 -1.28
10	+12.3	+10.5	+9.4	+11.2	+10.8	+1.35 +1.31
11	-19.5	-14.7	-12.9	-16.4	-15.9	-1.99 -2.03
12	+5.1	+10.4	+2.8	-1.0	+4.3	+1.08 +1.04

+7.75
-8.24
.49
± .021

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Aug 20 1879

Lamps illumination.

Pure Gas Flame

30° spectra

G	B				C				A				A
00	8	14.1	16.4	15.25	46.2	46.1	46.15		3	45.1	45.3	45.20	15
													34
1	3	9.7	9.8	9.75 +5.50	42.4	42.3	42.35	+3.80	3	5.5	7.3	6.40 +38.80	345
2	3	4.0	3.2	3.60 +6.15	39.0	39.1	39.05	+3.30	3	15.2	14.1	14.65 −8.25	315
3	2	54.5	52.0	53.25 +10.35	39.8	39.9	39.85	−0.80	3	23.9	26.3	25.10 −10.45	285
4	3	2.8	3.3	3.05 −9.80	43.6	43.2	43.40	2.55	3	44.5	45.6	45.05 −19.95	255
5	2	56.4	56.9	56.65 +6.40	43.1	43.2	43.15	+0.25	3	53.3	56.6	54.95 −9.90	225
6	2	54.9	53.8	54.35 +2.30	46.7	46.8	46.75	−3.60	4	16.0	18.1	17.05 −22.10	195
7	2	36.0	36.0	36.00 +18.35	49.5	49.7	49.60		4	38.2	39.0	38.60	165
		36.3	37.2	36.75 +18.60	49.5	49.5	49.50			37.1	38.1	37.60	
		33.7	34.8	34.25 +20.10	49.6	49.7	49.65			37.2	38.0	37.60 −20.88	
				35.67 +79.02			49.58	−2.83				37.93	
8	3	13.7	12.0	12.85 −37.18	53.8	54.0	53.90		5	8.1	8.8	8.45	135
		11.5	12.2	11.85 −36.18	54.4	54.2	54.30			10.4	11.0	10.70	
				12.35 −36.68			54.10	−4.52				9.57 −31.64	1
9	3	23.0	22.0	22.50 −10.15	54.8	54.9	54.85	−0.75	5	5.1	5.3	5.20 +4.37	105
10	3	10.3	12.7	11.50 +11.00	52.2	52.1	52.15	+2.70	4	40.0	39.9	39.95 +25.25	75
11	3	27.1	27.9	27.50 −16.00	50.2	50.0	50.10	+2.05	4	16.8	16.2	16.50 +23.45	45
12	3	23.0	23.6	23.30 +4.20	45.4	45.3	45.35	+4.75	3	41.0	41.8	41.40 +35.10	15

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H	G	B			E			A			A	
15	0.0	3	20.0	20.2	20.10			46.2	46.0	46.10	3 54.0	54.2	54.10	15
45		3	10.0 9.0	10.7 9.0	10.35 9.00 9.67	+9.75 VI.1.0 10.42		41.8 41.9	41.9 41.7	41.85 41.80 41.82 +4.28	3 9.0 10.5	9.0 11.0	9.00 10.75 9.87	345 +4.23
15			36.2	7.0	6.60	+3.07		38.4	38.8	38.60+3.22	3 17.2	20.0	18.60	315 −8.73
95		2	57.0	58.0	57.50	+9.10		39.2	39.0	39.10−0.50	3 30.1	30.8	30.45	285 −11.85
55		3	3.2	3.8	3.50	−6.00		42.4	42.5	42.45−3.35	3 42.2	43.8	43.00	255 −12.55
25		2	55.1	57.0	5605	+7.45		43.0	42.9	42.95−0.50	3 58.2	57.8	57.00	225 −16.00
95		2	56.0	53.2	54.60	+1.45		46.1	46.8	46.45−3.50	4 21.8	22.8	22.30	195 +36.70
5		2	33.2	36.2	34.70	+19.90		48.6	48.8	48.70−2.25	4 40.3	42.0	41.15	165 −18.85
5		3	12.4	12.6	12.50	−37.80		53.2	53.6	53.40−4.70	5 7.9	11.6	9.75	135 −28.60
5		3	21.0	20.8	20.90	−8.40		54.3	53.9	54.10−0.70	5 4.2	5.0	4.60	105 +5.15
5		3	7.8	7.8	7.80	+13.10		50.9	51.2	51.05+3.05	4 41.1	42.8	41.95	75 +22.65
5		3	27.2	25.0	26.10	−18.30		49.6	49.5	49.55 +1.50	4 22.3	22.8	22.55	45 +19.40
5		3	22.8	22.2	22.50	+3.60		45.1	45.2	45.15+4.40	4 45.2	44.1	44.65	15 −22.10

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Zero from E

E	A				G			B			A
0.0	2	00.0	00.0	0.00	16.2	16.1	16.15	4 29.9	31.4	30.65	15
											~~345~~
1	1	52.2	51.8	52.00 +8.00	20.1	20.0	20.05	4 50.9	48.0	49.45 −18.80	345
2	2	24.4	22.1	23.25 −31.25	22.8	22.8	22.80	5 12.6	12.8	12.70 −23.25	315
3	2	29.2	32.4	30.80 −7.55	21.8	21.7	21.75	4 52.1	52.8	52.45 +20.25	285
	2										
4	2	20.7	20.3	20.50 +10.30	18.8	18.7	18.75	4 30.9	32.0	31.45 +21.00	255
5	2	35.3	35.0	35.15 −14.65	18.3	18.4	18.35	4 23.9	24.0	23.95 +7.50	225
6	2	33.1	33.6	33.35 +1.80	15.3	15.3		3 51.3	49.0	50.15	195
	2	29.0	29.0	29.00 +6.15	14.9	14.9		3 47.0	49.1	48.05	
	2	33.0	33.0	33.00 +2.15	15.1	15.4	15.15	3 51.4	52.8	52.10 +33.85	
				31.78 +3.37	15.10	15.4				50.10	
7	2	29.1	30.0	29.55 +2.23	12.9	12.8		3 14.3	14.9	14.60	165
		25.8	25.9	25.85 +5.93	12.2	12.0		3 5.8	7.7	6.75	
		28.8	28.2	28.50 +3.28	12.2	12.2	12.37	3 11.1	8.8	9.95 +39.67	
				27.97 +3.81						10.43	
8	2	20.3	19.8	20.05 +9.50	8.0	7.9	7.67	3 18.4	20.2	19.30	135
		22.8	24.0	23.40 +4.57	7.5	7.3		3 13.8	14.0	13.90	
				21.72 +7.03						16.60 −6.17	
9	2	8.0	7.8	7.90 +13.82	6.8	6.8	7.00	3 13.5	15.3	14.40	105
		10.0	10.0	10.00 +11.72	7.2	7.2		3 14.2	14.7	14.45	
				8.95 +12.77						14.42 +2.18	
10	2	11.4	12.8	12.10 −3.15	10.3	12.3	10.60	3 30.0	28.6	29.30	75
		9.2	9.8	10.00 −1.05	9.9	9.9		3 26.0	25.3	25.65	
				11.05 −2.10						27.47 −13.05	
11	2	2.6	4.0	3.30 +7.75	11.7	11.8	11.85	4 1.3	0.8	1.05	45
	2	3.5	3.0	3.25 7.80	11.9	12.0		4 1.0	1.0	1.00	
				3.27 +7.75						1.02 −33.55	
12	2	0.1	1.6	0.85 +24.2	17.2	16.8	17.00	4 36.0	35.6	35.80 −34.78	15

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196
50.98

5705
19.02

1700
1700
35.67
35.67

343
8.57

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