

Division.	Circle A.			Circle B.		
	50°.	55°.	Concluded — ϵ .	50°.	55°.	Concluded — ϵ .
0	0.00	0.00	0.00	0.00	0.00	0.00
5	+ 1.44	+ 0.20	0.22	0.86	1.06	+ 0.24
10	+ 1.55	+ 1.39	0.37	0.99	0.76	+ 0.22
15	+ 0.17	0.12	0.04	2.08	2.13	+ 0.52
20	+ 0.93	1.10	0.26	1.96	1.91	+ 0.48
25	+ 1.55	2.05	0.45	1.88	2.02	+ 0.48
30	+ 0.34	0.31	0.08	1.22	1.33	+ 0.32
35	+ 0.64	0.96	0.20	2.77	3.07	+ 0.72
40	+ 1.41	0.83	0.28	3.19	2.62	+ 0.74
45	+ 1.19	1.19	0.30	2.93	2.03	+ 0.73
50	+ 1.09	0.02	0.14	3.80	3.33	+ 0.90
55	+ 1.08	2.29	0.49	3.35	3.44	+ 0.85
60	+ 2.22	2.18	0.55	3.92	3.84	+ 0.97
65	+ 2.20	2.32	0.56	3.47	4.06	+ 0.93
70	+ 0.88	0.36	0.16	3.22	3.03	+ 0.88
75	+ 1.79	1.70	0.44	1.27	1.31	+ 0.32
80	+ 1.79	2.25	0.51	0.18	0.96	+ 0.12
85	+ 0.66	0.38	0.13	0.24	0.91	+ 0.06
90	+ 1.12	1.12	0.28	0.80	0.80	+ 0.20
95	+ 2.05	1.78	0.48	1.34	1.46	+ 0.35
100	+ 2.24	1.36	0.45	1.81	0.88	+ 0.36
105	+ 0.22	0.13	0.04	1.06	1.04	+ 0.26
110	+ 0.71	0.09	0.10	+ 0.28	0.29	+ 0.01
115	+ 1.09	1.04	0.27	1.32	1.30	+ 0.33
120	+ 1.51	1.43	0.36	2.07	1.96	+ 0.51
125	+ 2.26	0.90	0.40	1.10	1.81	+ 0.34
130	+ 1.79	2.07	0.48	0.84	0.78	+ 0.20
135	+ 0.63	0.67	0.16	0.43	0.43	+ 0.11
140	+ 1.48	1.51	0.37	+ 0.56	0.03	+ 0.08
145	+ 0.27	0.08	0.04	0.16	+ 0.10	+ 0.02
150	+ 1.50	1.53	0.38	1.30	1.21	+ 0.32
155	+ 0.40	0.44	0.10	1.19	1.41	+ 0.32
160	+ 1.61	0.97	0.32	0.22	0.44	+ 0.08
165	+ 0.97	1.09	0.26	0.18	0.20	+ 0.05
170	+ 0.89	0.65	0.19	0.38	0.11	+ 0.07
175	+ 0.87	0.51	0.17	0.28	0.78	+ 0.12

We have here two entirely independent determinations of each division error, except those which are multiples of 15°. The mean difference between the two values of 4ϵ is 0".52 for circle A, and 0".41 for circle B. The difference of accuracy between the circles arises from differences in the eye-sight of the observers. It appears then that the probable value of a concluded ϵ is about 0".065 for circle A, and 0".051 for circle B. The probable error of the mean reading of four microscopes, when these divisions are under them, will therefore be about 0".046 for circle A, and 0".036 for circle B, a quantity smaller than the probable accidental error of the isolated divisions. Little advantage would therefore be gained by making the determination more exact.

(70) When the mean of divisions, 90° apart, is taken, the progression of the errors in the case of circle B are so regular that a determination of the intermediate divisions was supposed to be hardly necessary. But, as circle A was used for all the observations in 1866, it was thought desirable to determine at least some intermediate points on that circle. Accordingly, the microscopes of that circle were placed at the distance 43°20', and one complete series of readings were made, which gave the error of every 10°40'. *The result showed that the errors of the intermediate divisions were systematically greater than those of the 5° divisions, the mean difference being +0".39.*

This was supposed to indicate a cyclical inequality in the error, the period of which was 5°. In order to determine it accurately, it was necessary to determine the error of every degree of both circles. This was done on September 17–19, 1866. The microscopes of each circle were placed at the distance 48°, and the circles were both read once in each position. Again the result was anomalous, and the cyclic hypothesis had to be modified or abandoned. The systematic mean difference between the 5° divisions and the intermediate even degrees was only 0".14 for circle A, and 0".08 for circle B.