

XXII. *An Account of Experiments made with an Invariable Pendulum at New South Wales, by Major-General Sir THOMAS BRISBANE, K. C. B. F. R. S. Communicated by Captain HENRY KATER, F. R. S. in a Letter to Sir HUMPHRY DAVY, Bart. Pres. R. S.*

Read June 19, 1823.

SIR,

IN compliance with the request of Major General Sir THOMAS BRISBANE, I have the honour to lay before the Royal Society the results which I have deduced from his experiments, made with an invariable pendulum at London and at Paramatta.

The pendulum employed belongs to the Board of Longitude, and is of the same construction as that which I used at certain stations of the Trigonometrical Survey of Great Britain. Before Sir THOMAS BRISBANE's departure, I observed the following series of coincidences at Mr. BROWNE's house in Portland Place, London, in order to determine the number of vibrations made by this pendulum in twenty-four hours.

April 18th, 1821, London.								
Clock gaining 0, <sup>s</sup> 83					Barometer, 29,70 Inches.			
Temp.	Time of co- incidence.	Arc of Vibra- tion.	Mean Arc.	Interval in Seconds.	No. of Vibra- tions.	Observed Vibrations in 24 hours.	Correc- tion for Arc.	Vibrations in 24 hours.
56,3	h. m. s.	°	°					
	10 36 6	1,30	1,26	542			2,61	
	45 8	1,23	1,20	543			2,36	
	54 11	1,17	1,14	543			2,13	
	11 3 14	1,12	1,09	543			1,95	
	12 17	1,06	1,03	543			1,74	
	21 20	1,01	0,98	543			1,58	
	30 23	0,96	0,93	545			1,42	
	39 28	0,91	0,89	544			1,30	
	48 32	0,87	0,85	544			1,18	
	57 36	0,83	0,80	544			1,05	
58,6	12 6 40	0,78						
57,5	Mean			543,4	541,4	86082,83	1,73	86084,56
April 19. Barometer 29,60 Inches.								
56,4	11 22 30	1,34	1,30	542			2,78	
	31 22	1,27	1,23	543			2,48	
	40 35	1,20	1,16	543			2,21	
	49 38	1,13	1,09	543			1,95	
	58 41	1,06	1,03	543			1,74	
	12 7 44	1,01	0,97	544			1,54	
	16 48	0,94	0,92	544			1,38	
	25 52	0,90	0,88	544			1,27	
	34 56	0,86	0,84	544			1,15	
	44 0	0,82	0,79	544			1,02	
58,2	53 4	0,77						
57,3	Mean			543,4	541,4	86082,83	1,75	86084,58
April 20. Barometer 29,58 Inches.								
57,7	10 40 22	1,24	1,21	542			2,40	
	49 24	1,18	1,15	544			2,17	
	58 28	1,12	1,09	544			1,95	
	11 7 32	1,06	1,03	542			1,74	
	16 34	1,00	0,97	545			1,54	
	25 39	0,94	0,92	543			1,38	
	34 42	0,90	0,88	545			1,27	
	43 47	0,87	0,85	545			1,18	
	52 52	0,83	0,80	542			1,05	
	12 1 54	0,78	0,75	542			0,92	
59,2	10 56	0,73						
58,4	Mean			543,4	541,4	86082,83	1,56	86084,39

April 21.					Barometer 29,80 Inches.			
Temp.	Time of co- incidence.	Arc of Vibra- tion.	Mean Arc.	Interval in Seconds.	No. of Vibra- tions.	Observed Vibrations in 24 hours.	Correc- tions for Arc.	Vibrations in 24 hours.
° 58,8	h. m. s.	°	°				°	
	10 24 41	1,33	1,28	541			2,69	
	33 42	1,24	1,21	542			2,40	
	42 44	1,18	1,15	542			2,17	
	51 46	1,13	1,10	542			1,99	
	11 0 48	1,07	1,04	542			1,77	
	9 50	1,02	0,99	542			1,60	
	18 52	0,97	0,94	543			1,45	
	27 54	0,92	0,89	544			1,30	
	36 58	0,87	0,85	542			1,18	
	46 0	0,83	0,81	542			1,08	
60,6	55 2	0,80						
59,7	Mean			542,2	540,2	86082,13	1,76	86083,89
April 22.					Barometer 29,98 Inches.			
58,8	10 25 59	1,29	1,26	542			2,61	
	31 1	1,23	1,19	542			2,33	
	44 3	1,16	1,13	543			2,09	
		1,10	1,03	544			1,74	
59,5	11 2 10	1,03						
59,1	Mean			542,75	540,75	86082,44	2,19	86084,63
April 23.					Barometer 29,53 Inches.			
59,6	10 19 8	1,31	1,27	540			2,65	
	28 8	1,23	1,20	542			2,36	
	37 10	1,17	1,14	540			2,14	
	46 10	1,11	1,08	542			1,91	
	55 12	1,05	1,02	542			1,71	
	11 4 14	1,00	0,97	542			1,54	
	13 16	0,95	0,93	540			1,42	
	22 16	0,91	0,89	543			1,30	
	31 19	0,87	0,84	542			1,15	
	40 21	0,82	0,80	542			1,05	
62,0	49 23	0,78						
60,8	Mean			541,5	539,5	86081,61	1,72	86083,33

From the preceding observations we have the following results.

Vibrations of the Pendulum at London.					
Date.	Barom.	Therm.	Vibrations in 24 hours.	Corr. for Temp.	Vibrations in 24 hours, at 60 degrees.
	Inches.	°			
April 18	29,70	57,5	86084,56	— 1,06	86083,50
19	29,60	57,3	86084,58	— 1,14	86083,44
20	29,58	58,4	86084,39	— 0,68	86083,71
21	29,80	59,7	86083,89	— 0,13	86083,76
22	29,98	59,1	86084,63	— 0,38	86084,25
23	29,53	60,8	86083,33	+ 0,34	86083,67
	29,70	58,8			86083,72

The mean height of the barometer being 29,70 inches, and that of the thermometer 58°,80, if the specific gravity of the pendulum be taken at 8, the correction for the buoyancy of the atmosphere will be 6,45. Adding this to the mean number of vibrations before found, we obtain 86090,17 for the number of vibrations which would be made in a mean solar day at the temperature of 60°, and in a vacuum. The corrections applied for temperature are calculated on the supposition of the expansion of this pendulum being the same as that of the one before alluded to, which, as both are constructed of plate brass, will probably not occasion any sensible error.

On the completion of the preceding observations, the following were made by Sir THOMAS BRISBANE, and Mr. RUMKER.

April 25th, 1821, by Sir THOMAS BRISBANE, London.								
Clock, mean time.					Barometer 29,62 Inches.			
Temp.	Time of co- incidence.	Arc of Vibra- tion.	Mean Arc.	Interval in Seconds.	No. of Vibra- tions.	Obs. Vibrations in 24 hours.	Corr. for Arc.	Vibrations in 24 hours.
63,0	h. m. s.	°	°				°	
	10 51 14	1,55	1,51	538			3,74	
	11 0 12	1,48	1,44	540			3,39	
	9 12	1,40	1,36	538			3,03	
	18 10	1,32	1,28	540			2,69	
	27 10	1,24	1,21	538			2,39	
	36 8	1,19	1,15	540			2,16	
	45 8	1,12	1,10	541			1,98	
	54 9	1,08	1,05	540			1,80	
	12 3 9	1,02	1,00	540			1,64	
	12 9	0,98	0,95	541			1,48	
	21 10	0,92						
64,4								
63,7	Mean			539,6	537,6	86079,76	2,43	86082,19
April 26, by Mr. RUMKER.								
Clock losing 0°,3.					Barometer 29,70 Inches.			
64,5	11 16 21	1,29	1,27	539,5			2,64	
	25 20,5	1,25	1,22	538,5			2,44	
	34 19	1,20	1,14	541			2,13	
	52 20	1,08	1,06	540			1,84	
	12 1 20	1,04	1,00	540			1,64	
	10 20	0,97	0,95	539			1,48	
	19 19	0,93	0,90	543			1,33	
	28 22	0,88	0,85	540			1,18	
	37 22	0,83	0,80	540,5			1,05	
	46 22,5	0,78	0,75	542,5			0,92	
	65,7	0,73						
	55 25							
65,1	Mean			540,4	538,4	86079,94	1,67	86081,61
April 27, by Sir THOMAS BRISBANE.								
Clock losing 0°,3.					Barometer 29,70 Inches.			
65,0	10 50 9	1,28	1,24	539			2,53	
	59 8	1,21	1,17	540			2,25	
	11 8 8	1,14	1,11	540			2,02	
	17 8	1,09	1,06	541			1,84	
	26 9	1,03	1,01	541			1,67	
	35 10	0,99	0,96	540			1,51	
	44 10	0,93	0,91	541,5			1,36	
	53 11,5	0,89	0,86	541,5			1,21	
	12 2 13	0,83	0,81	541			1,07	
	11 14	0,80	0,78	543,5			0,99	
	20 17,5	0,77						
	66,2							
65,6	Mean			540,85	538,85	86080,21	1,65	86081,86

April 28, by Mr. RUMKER.								
Clock losing, 0 <sup>s</sup> .5.				Barometer, 29,82 Inches.				
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Corrections for Arc.	Vibrations in 24 hours.
65,7	h. m. s.	°	°					
	11 26 34	1,22	1,19	539,5			2,31	
	35 33,5	1,17	1,12	541			2,03	
	44 34,5	1,08	1,06	540			1,84	
	53 34,5	1,04	1,02	542			1,70	
	12 2 36,5	0,99	0,96	541,7			1,51	
	11 38,2	0,93	0,91	540,4			1,36	
	20 38,6	0,90	0,86	543,6			1,21	
	29 42,2	0,82	0,81	541			1,07	
	38 43,2	0,79	0,76	542			0,95	
	47 45,1	0,73	0,71	544			0,83	
66,1	56 49,0	0,70						
65,9	Mean			541,52	539,52	86080,39	1,48	86081,87

April 29, by Mr. RUMKER.								
Clock losing 0 <sup>s</sup> .7.				Barometer 29,84 Inches.				
65,0	11 17 44,5	1,31	1,27	539,7			2,64	
	26 44,2	1,23	1,20	540,3			2,35	
	35 44,5	1,17	1,14	540,5			2,13	
	44 45,0	1,12	1,08	539,0			1,92	
	53 44,0	1,04	1,01	541,2			1,67	
	12 2 45,0	0,98	0,95	543,1			1,48	
	11 48,3	0,93	0,90	540,8			1,33	
	20 49,1	0,88	0,85	542,0			1,18	
	29 51,0	0,83	0,81	539,7			1,07	
	28 50,7	0,79	0,76	541,5			0,95	
65,6	37 52,2	0,74						
65,3	Mean			540,78	538,78	86079,76	1,67	86081,43

April 30, by Sir THOMAS BRISBANE.								
Clock losing 0 <sup>s</sup> .5.				Barometer 30,20 Inches.				
64,0	11 8 16	1,38	1,34	541			2,95	
	17 17	1,31	1,27	541			2,64	
	26 18	1,23	1,19	541			2,33	
	35 19	1,16	1,13	540			2,10	
	44 19	1,10	1,06	542			1,84	
	53 21	1,03	1,01	542			1,67	
	12 2 23	0,99	0,95	542			1,48	
	11 25	0,92	0,90	542			1,33	
	20 27	0,89	0,86	543			1,21	
	29 30	0,83	0,81	542,5			1,08	
64,9	38 32,5	0,80						
64,4	Mean			541,65	539,65	86080,47	1,86	86082,33

May 1, by Sir THOMAS BRISBANE.								
Clock losing 0 <sup>s</sup> .3.					Barometer 30,07 Inches.			
Temp.	Time of coincidence.	Arc of Vibration,	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Corrections for Arc.	Vibrations in 24 hours.
62,8	h. m. s.	°	°					
	11 24 54	1,32	1,28	540			2,69	
	33 54	1,24	1,21	541			2,39	
	42 55	1,18	1,14	541			2,31	
	51 56	1,11	1,07	541,5			1,88	
	12 0 57,5	1,04	1,02	543,5			1,70	
	10 1	1,00	0,97	541			1,54	
	19 2	0,94	0,92	541,5			1,38	
	28 3,5	0,90	0,87	542			1,24	
	37 5,5	0,84	0,82	543,5			1,10	
	46 9	0,80						
63,6								
63,2	Mean			541,66	539,66	86080,67	1, 80	86082,47

Vibrations of the Pendulum at London.					
Date.	Barom.	Therm.	Vibrations in 24 hours.	Correc- tion for Temp.	Vibrations in 24 hours at 60 degrees.
	Inches	°		+	
April 25	29,62	63,7	86082,19	1,57	86083,76
26	29,70	65,1	86081,61	2,16	86083,77
27	29,70	65,6	86081,86	2,37	86084,23
28	29,82	65,9	86081,87	2,50	86084,37
29	29,84	65,3	86081,43	2,24	86083,67
30	30,20	64,4	86082,33	1,86	86084,19
May 1	30,07	63,2	86082,47	1,35	86083,82
Mean	29,85	64,74			86083,97

The mean height of the barometer being 29,85 inches, and that of the thermometer 64°,74 during the preceding experiments, we have 6,40 for the correction for the buoyancy of

the atmosphere, and 86090,17 (the same as the former result), for the number of vibrations which would be made by the pendulum at London in latitude  $51^{\circ}31'8''$ ,<sub>4</sub> in a mean solar day at the temperature of  $60^{\circ}$ , and in a vacuum.

From a slight sketch and an accompanying description, every care has evidently been taken by Sir THOMAS BRISBANE, that no suspicion of a want of solidity should attach to the support built for the pendulum at Paramatta. This is constructed of solid masonry, upwards of five feet in width, on a foundation five feet below the level ground, and is insulated from the floor. The square part of the cast iron frame, to which the bell-metal support of the pendulum is attached, is let into a stone nearly six inches thick, which surmounts the whole mass.

The following are the details of the observations made by Sir THOMAS BRISBANE at Paramatta, the latitude being  $33^{\circ}48'43''$  south, and the longitude  $151^{\circ}0'15''$  East from Greenwich.

### FIRST SERIES:

August 27th, 1822.					Paramatta.			
Clock going mean time.					Barometer 29,55 Inches.			
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
$53,0$	h. m. s.	°	°					
	7 15 56	1,52	1,50	448			3,70	
	23 24	1,48	1,45	449			3,45	
	30 53	1,42	1,39	451			3,17	
	38 24	1,37	1,35	449			2,98	
	45 53	1,34	1,31	449			2,82	
	53 22	1,29	1,26	450			2,61	
	8 0 52	1,23	1,21	451			2,40	
	8 23	1,20	1,18	449			2,28	
	15 52	1,17	1,15	448			2,17	
	23 20	1,13	1,10	449			1,98	
	53,4 30 49	1,08						
53,2			Mean	449,3	447,3	86015,40	2,76	86018,16



August 28, 1822.					Paramatta.			
Clock going mean time.					Barometer 28,60 Inches.			
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
51,3	h. m. s. 7 14 40 22 10 29 40 37 10 44 40 52 10,5 59 41 8 7 10 14 40,5 22 10 29 42	° 1,31 1,26 1,20 1,16 1,10 1,07 1,02 1,01 0,95 0,90 0,88	° 1,28 1,23 1,18 1,13 1,08 1,04 1,02 0,98 0,92 0,89	450 450 450 450 450,5 450,5 449 450,5 449,5 452			2,68 2,48 2,28 2,10 1,92 1,77 1,71 1,58 1,39 1,30	
52,0			Mean	450,2	448,2	86016,18	1,92	86018,10
August 29.					Barometer 29,70 Inches.			
52,0	6 59 41 7 7 10 14 40 22 10 29 40 37 9,5 44 40,5 52 12 59 42 8 7 13,5 14 45,5	1,31 1,25 1,20 1,17 1,12 1,09 1,05 0,99 0,96 0,92 0,89	1,28 1,22 1,18 1,14 1,10 1,07 1,02 0,97 0,94 0,90	449 450 450 450 449,5 451 451,5 450 451,5 452			2,69 2,45 2,28 2,14 1,99 1,88 1,71 1,54 1,45 1,33	
52,2			Mean	450,5	448,5	86016,43	1,95	86018,38
52,1			Mean	450,5	448,5	86016,43	1,95	86018,38
August 30.					Barometer 29,67 Inches.			
53,0	7 22 13,5 29 42,5 37 11,5 44 41,5 52 10 59 38 8 7 6 14 38 22 9,5 29 41,5 37 13	1,13 1,09 1,06 1,02 0,98 0,93 0,91 0,87 0,83 0,81 0,78	1,11 1,07 1,04 1,00 0,95 0,92 0,89 0,85 0,82 0,79	449 449 450 448,5 448 448 452 451,5 452 451,5			1,98 1,88 1,77 1,64 1,48 1,39 1,30 1,18 1,10 1,02	
54,0			Mean	449,9	447,9	86015,92	1,47	86017,39
53,5			Mean	449,9	447,9	86015,92	1,47	86017,39

August 31.				Barometer 29,52 Inches.				
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	Number of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
57,7	h. m. s.	°	°					
	10 6 59	0,92	0,90	447			1,33	
	14 26	0,88	0,85	449,5			1,18	
	21 55,5	0,83	0,82	446,5			1,10	
	29 22	0,82	0,81	450			1,08	
	36 52	0,80	0,78	452			1,00	
	44 24	0,77	0,75	449,5			0,92	
	51 53,5	0,73	0,72	450,5			0,85	
	59 24	0,71	0,70	452			0,80	
	11 6 56	0,69	0,68	450			0,76	
	14 26	0,68	0,65	452			0,69	
	21 58	0,63						
58,8								
58,2		Mean		449,9	447,9	86015,92	0,97	86016,89
September 1.				Barometer 29,86 Inches.				
55,2	7 31 58	1,07	1,05	452			1,81	
	39 30	1,03	1,02	446			1,71	
	46 56	1,01	0,99	450			1,61	
	54 26	0,98	0,95	448			1,48	
	8 1 54	0,93	0,91	446			1,36	
	9 20	0,89	0,88	445			1,27	
	16 45	0,87	0,85	445			1,18	
	24 10	0,84	0,83	445			1,13	
	31 35	0,82	0,80	448			1,05	
	39 3	0,79	0,76	451			0,95	
	46 34	0,74						
56,6								
55,9		Mean		447,6	445,6	86013,94	1,36	86015,20
September 2.				Barometer 29,86 Inches.				
53,0	8 17 25	0,78	0,77	449			0,97	
	24 54	0,77	0,76	452			0,94	
	32 26	0,75	0,73	450,3			0,87	
	39 56,3	0,72	0,70	449,7			0,80	
	47 26	0,69	0,68	454			0,76	
	55 00	0,67	0,65	450			0,69	
	9 2 30	0,64	0,62	451,5			0,63	
	10 1,5	0,61	0,59	452			0,57	
	17 33,5	0,58	0,57	452,5			0,53	
	25 06	0,56	0,55	452			0,49	
	32 38	0,55						
55,0								
54,0		Mean		451,3	449,3	86017,01	0,73	86017,74

September 3.					Barometer 29,73 Inches.			
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	Number of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
57,5	h. m. s.	°	°					
	7 5 16,5	0,97	0,94	446,5			1,45	
	12 43	0,92	0,90	448			1,32	
	20 11	0,89	0,86	449			1,21	
	27 40	0,84	0,82	450			1,10	
	35 10	0,81	0,80	451,5			1,05	
	42 41,5	0,79	0,76	450			0,95	
	50 11,5	0,74	0,72	451			0,85	
	57 42,5	0,71	0,70	451,5			0,80	
	8 5 14	0,69	0,67	451,5			0,73	
	12 45,5	0,65	0,63	450,5			0,65	
58,2	20 16	0,62						
57,8		Mean		450,0	448	86016,00	1,01	86017,01
September 4.					Barometer 29,80 Inches.			
55,1	7 2 58	0,83	0,82	446,5			1,10	
	10 24,5	0,81	0,80	449,5			1,05	
	17 54	0,79	0,78	450			1,00	
	25 24	0,78	0,75	450,5			0,92	
	32 54,5	0,73	0,72	451			0,85	
	40 25,5	0,71	0,70	451			0,80	
	47 56,5	0,70	0,69	451			0,78	
	55 27,5	0,69	0,68	451			0,76	
	8 2 58,5	0,67	0,64	451,5			0,67	
	10 30	0,62	0,61	450,5			0,61	
55,9	18 00,5	0,60						
55,5		Mean		450,3	448,3	86016,25	0,85	86017,10
September 4.					Barometer 29,64 Inches.			
60,0	0 17 16,5	0,99	0,96	445,5			1,51	
	24 42	0,94	0,92	445			1,39	
	32 07	0,91	0,89	443			1,30	
	39 30	0,87	0,84	448			1,16	
	46 58	0,82	0,80	450			1,05	
	54 28	0,79	0,76	448,5			0,95	
	1 1 56,5	0,74	0,73	450			0,87	
	9 26,5	0,72	0,71	449,5			0,83	
	16 56	0,70	0,68	449			0,76	
	24 25	0,67	0,65	449,5			0,69	
61,0	31 54,5	0,63						
60,5		Mean		447,8	445,8	86014,12	1,05	86015,17

From the above details are obtained the following results,

Vibrations of the Pendulum at Paramatta.					
1st Series.					
Date.	Barom.	Thermo- meter.	Vibrations in 24 hours.	Correction for Tem- perature.	Vibrations in 24 hours at 60 degrees.
	Inches	°			
Aug. 27	29,55	53,2	86018,16	— 2,88	86015,28
28	26,60	52,0	86018,10	3,38	86014,72
29	29,70	52,1	86018,38	3,34	86015,04
30	29,67	53,5	86017,39	2,75	86014,64
31	29,52	58,2	86016,89	0,76	86016,13
Sept. 1	29,86	55,9	86015,20	1,73	86013,47
2	29,86	54,0	86017,74	2,54	86015,20
3	29,73	57,8	86017,01	0,93	86016,08
4	29,80	55,5	86017,10	1,90	86015,20
	29,64	60,5	86015,17	+ 0,21	86015,19
Mean	29,69	55,27			85015,10

The mean height of the barometer during these experiments was 29,69 inches, and the mean temperature 55°,27, from which, and the specific gravity of the pendulum, we have 6,49 for the correction on account of the buoyancy of the atmosphere.

Adding this to the mean number of vibrations before found, we obtain 86021,59 for the number of vibrations which would be made by the pendulum at 60° in a vacuum in a mean solar day.

In addition to the experiments already given, Sir THOMAS BRISBANE has forwarded another series made at Paramatta with the same pendulum, by Mr. DUNLOP, a gentleman of whose zeal and scientific abilities Sir THOMAS BRISBANE expresses himself in the highest terms.

The following are the details.

## SECOND SERIES.

August 31, 1822.					Paramatta.			
Clock going mean time.					Barometer 29,55 Inches.			
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
58,0	h. m. s.	°	°					
	1 19 8	1,45	1,41	461			3,26	
	26 49	1,37	1,33	438			2,90	
	34 7	1,30	1,26	450			2,60	
	41 37	1,23	1,19	449			2,32	
	49 6	1,16	1,13	449			2,08	
	56 35	1,10	1,08	442			1,91	
	2 3 57	1,07	1,05	449			1,80	
	11 26	1,04	1,02	441			1,70	
	18 47	1,00	0,98	450			1,57	
	26 17	0,96	0,94	450			1,44	
	33 47	0,92						
58,0	Mean			447,9	445,9	86014,20	2,16	86016,36
September 1.					Barometer 29,87 Inches.			
57 0	0 40 45	0,94	0,92	447			1,38	
	48 12	0,90	0,88	446,5			1,26	
	55 38,5	0,87	0,85	447,5			1,18	
	1 3 6	0,83	0,80	449			1,04	
	10 35	0,78	0,76	448			0,94	
	18 3	0,75	0,73	451			0,87	
	25 34	0,72	0,70	449			0,80	
	33 3	0,69	0,68	450			0,75	
	40 33	0,67	0,65	451			0,69	
	48 4	0,63	0,61	450,5			0,61	
	55 34,5	0,60	0,58	449,5			0,55	
	2 3 4	0,57	0,56	451			0,51	
	10 35	0,55						
57, 5								
57,25	Mean			449,2	447,2	86015,32	0,88	86016,20

September 2.				Barometer 29,71 Inches.				
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
56, 5	h. m. s	°	°					
	11 28 51	0,90	0,88	449			1,26	
	36 20	0,87	0,85	449			1,18	
	43 49	0,83	0,81	451			1,07	
	51 20	0,80	0,78	451			0,99	
	58 51	0,77	0,75	449,5			0,92	
	0 6 20,5	0,73	0,71	450,5			0,82	
	13 51	0,70	0,68	452			0,75	
	21 23	0,67	0,65	451			0,69	
	28 54	0,64	0,62	450,5			0,63	
	36 24,5	0,61	0,60	451,5			0,59	
	43 56	0,59	0,58	451			0,55	
	51 27	0,57	0,56	450,5			0,51	
	58 57,5	0,55	0,54	450,5			0,47	
	1 6 28	0,53	0,52	450,5			0,44	
	13 58,5	0,51	0,50	450,5			0,41	
53, 8	21 29	0,49						
55,15	Mean			450,5	448,5	86016,43	0,75	86017,18
September 3.				Barometer 29,80 Inches.				
59,6	10 50 12	0,92	0,90	448			1,32	
	57 40	0,89	0,87	449			1,23	
	11 5 9	0,85	0,83	450			1,13	
	12 39	0,82	0,80	449			1,04	
	20 8	0,78	0,76	450			0,94	
	27 38	0,74	0,72	450			0,85	
	35 8	0,71	0,69	450			0,78	
	42 38	0,68	0,66	450			0,71	
60,0	50 8	0,65	0,63	450			0,65	
	57 38	0,62	0,61	449			0,61	
	0 5 7	0,60	0,59	450			0,57	
	12 37	0,58	0,56	449			0,51	
	20 6	0,55	0,53	449			0,46	
	27 35	0,52	0,51	449,5			0,42	
	35 4,5	0,50	0,49	449,5			0,39	
	42 34	0,48	0,47	449,5			0,36	
61,0	50 3,5	0,47						
60,2	Mean			449,5	447,5	86015,57	0,75	86016,32

September 4.				Barometer 29,74 Inches.				
Temp.	Time of coincidence.	Arc of Vibration.	Mean Arc.	Interval in Seconds.	No. of Vibrations.	Observed Vibrations in 24 hours.	Correction for Arc.	Vibrations in 24 hours.
56, 5	h. m. s.	°	°					
	9 4 1	0,88	0,86	448			1,20	
	11 29	0,84	0,83	449			1,12	
	18 58	0,82	0,80	449			1,04	
	26 27	0,78	0,77	450			0,97	
	33 57	0,76	0,73	450			0,87	
	41 27	0,71	0,70	450,5			0,80	
	48 57,5	0,69	0,67	450,5			0,73	
	56 28	0,65	0,64	451			0,67	
	10 3 59	0,64	0,62	451,5			0,63	
	11 30,5	0,60	0,60	451,5			0,59	
	19 2	0,60	0,57	451			0,53	
58, 0	26 33	0,54						
57,25	Mean			450,2	448,2	86016,17	0,83	86017,00
September 4.				Barometer 29,64 Inches.				
58, 0	10 39 22	0,85	0,83	448			1,12	
	46 50	0,81	0,80	450			1,04	
	54 20	0,79	0,76	450			0,94	
	11 1 50	0,74	0,73	450			0,87	
	9 20	0,72	0,70	450			0,80	
	16 50	0,69	0,68	451			0,75	
	24 21	0,67	0,65	450			0,69	
	31 51	0,63	0,62	450			0,63	
	39 21	0,61	0,59	450			0,57	
	46 51	0,58	0,57	449,5			0,53	
59, 7	54 20,5	0,57						
58,85	Mean			449,9	447,9	86015,92	0,79	86016,71
September 4.				Barometer 26,56 Inches.				
61, 8	2 15 10	0,95	0,93	446			1,42	
	22 36	0,92	0,90	446			1,32	
	30 02	0,89	0,87	447			1,24	
	37 29	0,86	0,84	450			1,15	
	44 59	0,82	0,80	448			1,04	
	52 27	0,78	0,76	449			0,94	
	59 56	0,74	0,72	449			0,85	
	3 7 25	0,71	0,69	447			0,78	
	14 52	0,68	0,66	450			0,71	
	22 22	0,65	0,63	447			0,65	
62, 5	29 49	0,62						
62,15	Mean			447,9	445,9	86014,20	1,01	86015,21

From the above we have the following results.

Vibrations of the Pendulum at Paramatta. (2d. Series.)					
Date.	Barometer.	Thermometer.	Vibrations in 24 hours.	Correction for Temperature.	Vibrations in 24 hours at 60 degrees.
	Inches.	°			
Aug. 31	29,55	58, 0	86016,36	—0,85	86015,51
Sept. 1	29,87	57,25	86016,20	—1,16	86015,04
2	29,71	55,15	86017,18	—2,05	86015,13
3	29,80	60, 2	86016,32	+0,09	86016,41
4	29,74	57,25	86017,00	—1,16	86015,84
—	29,64	58,85	86016,71	—0,47	86016,24
—	29,56	62,15	86015,21	+0,89	86016,10
Mean	29,75	58,41			86015,75

The barometer being at 29,75 inches, and the thermometer at 58,41 during the experiments, we have 6,46 for the buoyancy of the atmosphere, which, added to the mean number of vibrations, gives 86022,21 for the number of vibrations which would be made by the pendulum in a mean solar day at 60°, and in a vacuum.

The height of the station at Paramatta, above mean *high* water, is stated by Sir T. BRISBANE to be seventy-seven feet, and that of the station at London being eighty-three feet above *low* water, it could only introduce error to attempt any correction for a difference which has not yet been accurately ascertained.

If the number of vibrations resulting from Sir THOMAS BRISBANE's experiments at Paramatta be compared with the mean number of vibrations made by the pendulum at London, we shall have 39,07696 inches for the length of the pendulum vibrating seconds at Paramatta ; ,0052704 for the diminution of gravity from the pole to the equator ; and  $\frac{1}{295,84}$  for the



resulting compression ; the length of the pendulum vibrating seconds at London being taken at 39,13929 inches.

The experiments at Paramatta being compared with those made by me at Unst, in latitude  $60^{\circ} 45' 28''$  north, give ,0053605 for the diminution of gravity from the pole to the equator, and  $\frac{1}{303,95}$  for the resulting compression.

If Mr. DUNLOP's experiments at Paramatta be compared with those made at London, we obtain 39,07751 for the length of the seconds pendulum at Paramatta, ,0052238 for the diminution of gravity from the pole to the equator, and  $\frac{1}{291,83}$  for the compression. Or, comparing Mr. DUNLOP's experiments with those made at Unst, we have ,0053292 for the diminution of gravity from the pole to the equator, and  $\frac{1}{301,09}$  for the resulting compression.

The compressions here deduced must not as yet be deemed conclusive, for it is well known that a very small alteration in the number of vibrations made by the pendulum would occasion a considerable difference in the fraction indicating the compression. The indefatigable zeal of Sir THOMAS BRISBANE, will, however, no doubt soon furnish additional data.

I have the honour to be,

My dear Sir,

very sincerely yours,

HENRY KATER.

*London,  
June, 1823.*

P. S. I may here take the opportunity of correcting an error in the " Account of Experiments for determining the variation in the length of the Pendulum vibrating seconds at the principal stations of the Trigonometrical Survey of Great Britain."

In the first series of observations made with the repeating circle for the latitude of Clifton,  $1' 41'',6$  has been applied as the correction for the level instead of  $141'',6 = 2' 21'',6$ . The resulting latitude, when the proper correction is made is  $53^{\circ} 27' 44'',94$  instead of  $53^{\circ} 27' 40'',94$ , and the greatest difference between the five independent latitudes of Clifton  $3'',48$  instead of  $5'',24$ .