XXVII. *Results of the Thermometrical Observations made at Leith Fort, every Hour of the Day and Night, during the whole of the Years 1824 and 1825.* By DAVID BREWSTER, LL.D. F. R. S. Lond. & Sec. R. S. Ed. Corresponding Member of the Academy of Sciences of Paris, &c.

(Read January 23. 1826.)

IN the year 1820, I had occasion to suggest to the Royal Society the propriety of establishing Registers of the Thermometer in various parts of Scotland.

In a country embracing so many varieties of soil, climate and elevation, and extending over nearly six degrees of latitude, it was an object worthy of a public body to determine the Law of the Distribution of Temperature, even if such a subject had not possessed a separate interest in relation to the Horticulture and Agriculture of the Country. The Society did not hesitate in adopting this suggestion, and many intelligent individuals were found, who undertook to observe the thermometer twice a-day, and to measure occasionally the temperature of Springs and Wells. During the first year, viz. 1821, nearly sixty Meteorological Journals were regularly kept in different parts of Scotland. The number diminished considerably in subsequent years; but, notwithstanding this diminution, there is now in our possession a rich series of observations during *five* complete years, the results of which are nearly ready to be submitted to the Society.

In directing these observations, it became necessary to select two hours of the day most convenient for marking the state of the Thermometer, and the Mean Temperature of which approached nearest to the Mean Temperature of the day. The hours adopted were 10 o'clock A. M. and 10 P. M., which had been previously recommended by the Reverend Mr GORDON. The observations were accordingly made at these hours, during three years ; but it appeared to me, upon a more attentive consideration of the subject, that the Thermometer should be observed at the two times of the day at which the Mean Temperature occurred ; for if one of the observations was omitted, the other still possessed considerable value, as an approximation to the Mean Temperature. Unfortunately, however, there were almost no observations in existence from which the times of the daily Mean Temperature could be deduced. Professor DEWEY of New York had observed the Thermometer once every hour during *five* days at a time, in the months of *March, April, July* and *October* of the year 1816, and during *eight* days of *January*, and *two* of *February* in the year 1817* ; and Mr COLDSTREAM of Leith registered the Temperature of 24 successive hours once every month, from July 1822 to July 1823. From this last series of observations the Mean Temperature appeared to occur at $\frac{1}{2}$ past 7 o'clock in the morning, and $\frac{1}{2}$ past 8 in the evening ; and these hours were accordingly used in most of the registers for 1824 and 1825. It was very obvious, however, that these observations, though made with great care, were too limited to afford any thing like an accurate result ; and hence it became a desirable object to extend the hourly observations of the Thermometer over a greater portion of the seasons, or, if possible, to record its indications for every hour of a complete year.

* *Memoirs of the American Academy of Arts and Sciences*, Vol. IV. Part II. p. 392.

As such a plan could only be carried on with effect at a military station, Leith Fort was considered the most eligible. Application was therefore made to Colonel THACKERAY, commanding the Engineers, and to Colonel YOUNGHUSBAND and Mr STREET of the Artillery ; and, as these gentlemen entered warmly into the scheme, preparations were made to begin the register on the 1st of January 1824. A large and accurate thermometer was constructed by Mr ADIE for the purpose, and it was placed in a situation as free as possible from all disturbing causes. Its height above the level of the sea is 25 feet, and its distance from the sea 200 yards.

The register commenced on the 1st day of January 1824, and has been regularly and zealously carried on by the non-commissioned officers of the Fort for two complete years. The observations themselves are recorded in the two Folio volumes now submitted to the Society, and they may justly be regarded as possessing a high value, not only from the scientific results which they afford, but as being the only complete series of hourly observations which have been made in any part of the world *.

In reducing these observations, Mr FOGGO *junior* of Leith computed all the hourly, monthly, and annual means for the year 1824, and Mr CHRISTOPHER BELL made the same calculations for 1825. These Mean Results are given in the following Tables.

* Since this was written, we understand that similar observations, suggested by the present series, are now carrying on at Toulon and at Montreal, the last of which will possess a peculiar interest. The first example of this class of observations having been set in Scotland, we may be here allowed to express a hope, that similar hourly registers will be established by learned Societies both in Europe and America.

HOURLY REGISTER FOR 1824,

The Mean Temperature of the Winter months, viz. *Dec. Jan. Feb.* is 40.67
 of the Spring months, viz. *March, April May,* 45.38
 of the Summer months, viz. *June, July, Aug.* 57.24
 of the Autumn months, viz. *Sept. Oct. Nov.* 47.91
 The Mean Temperature of the Year 1824, from 8784 observations, is..... 47.81

TABLE I.—Containing the Daily and Monthly Mean Temperatures for 1824.

Day.	January.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	42.55	42.60	35.19	33.49	55.00	57.12	55.85	57.00	62.80	56.00	44.58	32.07
2	43.52	42.60	32.72	39.36	52.25	55.10	57.98	56.86	67.69	51.15	44.80	32.34
3	40.47	42.52	38.77	37.39	47.00	58.64	55.95	57.05	67.78	53.25	39.83	30.92
4	43.79	40.82	35.25	39.50	47.80	56.80	57.97	57.54	60.86	52.72	36.23	28.11
5	44.83	38.69	38.34	43.62	49.84	56.07	55.44	55.89	56.69	51.42	35.87	28.83
6	40.69	40.03	44.52	44.33	46.81	52.63	58.29	55.70	54.10	52.90	35.63	38.54
7	36.50	49.63	43.29	45.06	50.67	60.98	58.75	57.38	58.18	53.79	49.30	38.39
8	45.30	46.40	38.83	44.58	51.98	55.83	63.64	61.37	50.00	54.09	45.76	35.39
9	50.08	41.76	36.50	45.01	51.23	53.00	62.22	58.88	49.96	48.42	44.76	35.39
10	45.67	43.21	35.83	37.92	49.94	51.63	58.18	57.43	51.79	44.39	45.94	34.79
11	39.90	40.04	38.32	37.55	47.38	50.15	58.92	56.79	57.09	46.42	48.32	48.15
12	43.31	43.86	36.82	39.87	47.15	53.87	60.27	55.94	57.00	41.60	39.52	50.28
13	42.26	39.51	36.15	39.27	47.25	55.45	57.75	56.48	57.29	39.03	49.00	48.40
14	39.30	39.37	38.41	40.60	45.25	51.78	66.24	57.22	59.36	44.15	43.23	48.60
15	32.41	34.91	44.22	41.42	47.70	51.86	64.51	58.73	58.89	38.34	35.78	46.10
16	33.37	36.53	46.16	37.88	48.16	53.37	58.81	56.67	60.40	37.44	45.90	38.59
17	38.26	37.65	46.02	41.68	51.34	53.01	58.35	55.58	61.61	37.56	52.15	37.79
18	44.01	38.07	48.00	46.35	47.64	54.45	57.23	54.39	61.78	44.22	42.49	44.09
19	40.56	41.30	45.05	51.52	43.63	53.12	58.13	57.07	54.30	49.98	41.12	49.24
20	41.93	41.07	50.03	54.93	42.50	52.87	61.29	56.03	51.81	48.48	41.52	36.94
21	39.33	41.07	45.34	55.47	44.77	54.03	60.99	53.79	51.06	49.00	41.39	37.53
22	39.32	42.01	38.95	52.27	48.09	55.38	65.73	52.82	56.66	54.50	40.06	35.45
23	38.60	41.51	38.67	48.90	52.77	54.09	63.35	56.10	54.44	53.53	42.64	34.11
24	40.31	41.36	41.37	51.46	54.54	54.57	56.92	58.35	53.44	52.97	45.27	40.33
25	48.04	40.72	42.29	52.64	57.18	56.57	58.72	56.63	50.51	53.96	41.68	46.94
26	51.58	37.83	41.15	53.95	56.75	57.75	59.04	56.67	42.79	48.88	39.12	35.99
27	43.59	38.19	39.99	51.01	59.75	58.78	58.70	55.69	39.70	42.22	36.44	44.39
28	38.69	40.05	39.18	53.58	56.29	59.45	60.53	54.33	40.30	40.28	40.48	39.80
29	36.47	40.73	41.68	55.16	49.62	60.49	61.97	57.62	41.90	38.80	40.04	39.78
30	38.54		37.85	57.90	55.16	60.69	55.37	54.23	55.33	39.17	34.20	41.18
31	45.20		33.86		52.46		56.06	57.01		48.87		46.93
Means,	41.599	40.83	40.12	45.79	50.24	55.65	59.46	56.62	54.57	47.23	41.94	39.57

TABLE II.—*Shewing the Mean Temperature of each Hour for each Month of 1824, and for the whole Year.*

Hour.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean Temp. of each hour for the whole year.
1 A.M.	41.19	39.9	38.3	42.63	46.56	52.6	55.4	53.3	52.3	46.17	40.4	38.69	45.62
2.....	40.8	40.03	38.3	41.6	46.03	52.3	55.2	53.2	52.1	46.17	40.4	38.71	45.40
3.....	40.8	39.95	38.07	41.00	45.3	52.1	55.1	52.9	51.4	46.07	40.5	39.02	45.18
4.....	40.28	39.68	37.9	40.08	44.7	51.8	54.9	52.5	51.1	46.2	40.47	38.9	44.93
5.....	40.07	39.62	37.65	39.8	44.9	51.8	55.2	52.7	51.2	45.6	40.45	38.8	44.82
6.....	40.1	39.44	37.45	39.9	45.7	52.7	55.8	53.3	51.6	44.8	40.50	38.9	45.00
7.....	40.23	39.27	37.77	42.2	46.9	53.1	56.9	54.5	52.1	45.3	40.7	38.8	45.64
8.....	40.3	39.02	38.3	43.1	48.3	54.3	58.2	55.5	53.4	45.9	40.8	38.8	46.32
9.....	40.64	39.93	39.13	45.9	49.8	55.2	59.7	56.8	55.0	46.6	41.3	39.0	47.41
10.....	41.15	40.74	39.47	47.3	51.1	56.2	60.56	57.9	55.6	47.5	42.1	39.3	48.24
11.....	41.54	41.35	41.13	48.2	52.3	57.3	61.5	58.7	56.5	48.5	43.1	40.4	49.21
12.....	42.3	42.22	42.23	48.9	53.3	57.8	63.2	59.5	57.5	49.3	43.9	41.0	50.09
1 P.M.	42.83	42.7	42.7	49.3	54.2	58.0	63.2	59.8	58.5	49.9	44.2	41.2	50.45
2.....	43.15	42.7	42.8	49.8	54.7	58.9	63.2	60.0	58.7	49.9	44.7	40.9	50.79
3.....	43.18	42.67	42.9	50.1	54.7	59.9	63.5	60.0	58.8	49.6	44.7	40.33	50.89
4.....	43.00	42.03	42.6	49.9	54.7	59.1	63.6	60.1	57.8	49.07	43.4	39.9	50.43
5.....	42.22	41.4	41.9	49.5	54.1	58.7	63.4	59.7	57.8	48.4	42.8	39.72	49.97
6.....	41.98	40.9	41.07	49.1	53.2	57.7	62.6	59.1	57.0	47.9	42.4	39.52	49.38
7.....	41.7	40.53	40.2	47.8	52.4	56.9	61.7	58.0	55.8	47.2	42.1	39.19	48.64
8.....	41.35	40.2	39.6	46.5	50.9	55.7	60.3	56.8	55.07	46.73	41.7	39.00	47.90
9.....	41.3	40.2	39.2	45.3	49.4	54.5	58.9	55.9	54.3	46.7	41.3	39.09	47.17
10.....	41.26	40.03	38.8	44.6	48.9	53.8	57.6	55.0	53.7	46.0	40.8	39.09	46.64
11.....	41.12	39.9	38.3	43.1	47.8	53.2	56.9	54.3	53.4	45.8	40.4	39.1	46.20
12.....	40.92	39.9	38.3	42.7	47.1	52.7	56.03	53.8	52.7	45.7	40.3	39.29	45.79

The Mean Temperature obtained from the last column in the above Table, is 47°.588.

It occurred at 9^h 13' A. M. and at 8^h 26' P. M.

every Hour of the Day at Leith Fort in 1824 and 1825. 367

HOURLY REGISTER FOR 1825.

The Mean Temperature of the Winter months, viz. *Dec. Jan. Feb.* is 40.312
 of the Spring months, viz. *March, April, May,* 46.121
 of the Summer months, viz. *June, July, Aug.* 59.306
 of the Autumn months, viz. *Sept. Oct. Nov.* 49.907
 The Mean Temperature of the year 1825, from 8760 observations, is..... 48.911

TABLE III.—*Containing the Daily and Monthly Mean Temperatures for 1825.*

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	45.15	41.31	39.78	42.38	44.71	56.88	55.50	63.77	60.40	53.63	46.35	33.79
2	39.83	41.81	37.29	45.89	46.09	58.41	57.81	63.56	59.19	60.36	42.08	36.85
3	43.47	32.99	36.13	47.46	49.14	53.61	58.54	63.27	59.30	60.03	42.53	34.59
4	37.35	28.72	36.20	49.74	52.73	50.52	59.56	59.60	57.07	58.81	40.36	37.84
5	30.32	33.08	36.50	54.18	48.69	49.43	58.66	59.71	55.39	58.38	43.04	37.09
6	39.26	34.99	38.24	47.26	52.59	52.35	59.24	58.21	55.99	57.57	41.52	40.72
7	44.17	38.51	39.55	49.80	53.19	58.30	58.09	59.06	58.79	53.79	36.04	43.21
8	39.80	38.81	44.20	52.11	54.63	57.46	57.05	59.88	55.45	54.48	36.82	44.71
9	38.11	42.78	52.46	47.04	54.27	55.24	56.05	57.71	58.30	55.49	35.73	42.95
10	35.55	47.11	52.48	48.55	50.77	59.59	55.25	59.37	60.26	56.79	32.37	43.35
11	41.48	46.28	44.97	50.13	48.32	65.67	56.26	57.34	58.21	54.00	36.22	44.12
12	39.91	46.06	44.18	41.03	48.75	62.71	61.09	56.41	60.55	57.80	33.78	43.90
13	42.03	46.98	43.41	40.79	47.50	59.09	65.45	59.74	56.27	54.09	42.32	42.45
14	44.75	41.82	37.83	48.62	48.91	60.14	69.94	56.78	56.30	53.57	40.82	38.56
15	46.73	41.48	36.40	52.50	49.74	58.85	65.51	57.91	56.79	52.51	36.49	41.06
16	43.99	41.79	36.04	50.49	49.05	63.52	66.77	56.88	61.21	54.65	44.12	46.04
17	39.38	43.52	36.75	45.06	51.95	60.51	69.63	57.17	62.40	47.16	44.61	45.40
18	41.22	41.26	39.07	40.54	53.55	58.45	66.63	59.01	62.59	46.75	45.56	47.05
19	39.15	41.78	43.31	42.30	53.41	52.46	62.23	59.07	60.95	46.23	41.14	42.66
20	40.09	43.73	40.58	50.49	50.41	52.70	60.02	65.40	59.87	40.24	45.56	42.44
21	39.30	40.91	39.78	53.04	49.01	52.09	59.07	64.35	60.34	41.47	45.22	45.92
22	37.02	42.63	42.55	46.81	52.14	53.16	59.83	60.41	54.95	42.47	40.76	40.02
23	36.33	40.88	40.61	42.76	50.48	57.68	56.63	65.44	49.44	51.07	44.74	40.22
24	38.03	40.17	38.12	42.37	46.01	57.59	57.10	57.88	63.49	48.97	43.30	39.75
25	34.45	39.08	42.03	42.80	45.60	57.14	63.29	58.04	62.16	40.65	40.48	43.85
26	41.30	37.69	42.81	45.28	48.55	52.44	61.01	57.23	56.29	39.26	44.80	35.14
27	47.65	38.61	48.70	45.88	47.02	54.35	64.94	58.45	56.59	45.58	35.81	33.00
28	38.83	36.75	45.39	47.35	45.18	54.70	60.22	59.21	53.00	52.41	36.44	35.86
29	43.88		47.47	47.88	47.96	55.95	61.05	61.92	55.45	50.98	39.84	35.01
30	47.62		44.78	48.51	50.17	55.05	68.53	65.35	54.66	51.90	34.63	32.81
31	42.93		42.29		52.74		68.20	65.72		46.81		28.58
Mean Temp. of each month.	40.583	40.412	41.610	46.968	49.785	56.531	61.262	60.125	58.055	51.223	40.443	39.940

TABLE IV.—*Shewing the Mean Temperature of each Hour for each Month in 1825, and for the whole Year.*

Hour.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean Temp. of each hour for the whole year.
1 A. M.	39.073	39.437	39.604	43.350	47.016	52.575	56.935	57.355	55.358	49.984	39.325	39.194	46.648
2	39.968	39.500	39.162	42.742	46.750	52.200	56.798	56.936	55.058	49.782	38.800	39.331	46.466
3	39.823	39.598	38.516	42.050	46.460	52.133	56.087	56.661	54.792	49.685	38.975	39.105	46.198
4	39.855	39.509	38.355	41.500	46.161	51.975	55.403	56.629	54.333	49.476	38.858	39.032	45.969
5	39.814	39.089	38.275	41.317	46.210	52.067	56.121	56.565	53.992	49.516	39.050	39.016	45.968
6	39.774	39.018	38.404	41.542	46.944	52.958	57.637	56.758	54.117	49.484	39.183	39.234	46.307
7	39.831	39.321	38.718	43.050	47.476	54.150	58.855	57.542	55.192	49.797	39.417	39.194	46.927
8	39.927	39.518	39.524	44.725	48.597	55.250	60.032	58.887	56.442	50.451	39.383	39.468	47.738
9	40.121	39.589	40.661	46.842	49.653	56.883	61.298	59.960	58.050	51.137	39.825	39.718	48.700
10	40.508	40.473	41.605	48.892	50.702	58.117	62.693	61.170	59.342	52.484	40.825	40.089	49.784
11	41.161	41.670	42.701	49.992	51.363	59.017	63.500	61.895	60.667	53.258	41.833	40.645	50.691
12	41.748	42.241	44.404	51.142	51.863	59.508	64.484	63.008	61.500	53.766	42.258	41.016	51.464
1 P. M.	42.000	42.848	44.661	51.617	52.186	60.050	64.670	63.629	62.100	54.008	42.667	41.169	51.848
2	42.032	42.821	45.226	51.817	52.540	60.500	65.468	63.826	62.575	54.137	42.708	41.532	52.150
3	42.009	42.928	45.259	52.275	52.686	60.533	65.798	63.830	62.258	53.855	42.808	41.250	52.174
4	41.371	42.482	45.484	51.858	53.315	60.517	65.807	64.210	62.075	53.193	42.250	41.105	52.049
5	41.153	41.562	45.210	51.175	53.645	60.450	66.250	64.387	62.042	52.557	41.517	40.652	51.774
6	40.920	41.089	44.630	50.767	53.493	60.591	66.742	64.387	60.333	51.613	41.192	40.355	51.208
7	40.475	40.705	43.556	49.275	52.484	59.867	65.975	61.927	58.875	51.065	40.667	39.798	50.449
8	40.404	40.250	42.711	47.300	51.137	57.608	62.807	60.589	58.008	50.477	40.442	39.758	49.348
9	40.258	39.625	41.718	46.117	49.637	56.242	60.742	59.476	57.283	50.202	40.350	39.532	48.488
10	40.395	39.286	41.083	45.425	49.097	55.167	59.492	58.409	56.575	50.129	39.867	39.411	47.913
11	40.283	39.170	40.523	44.733	48.508	54.225	58.581	57.779	56.042	49.742	39.492	39.153	47.407
12	40.339	39.143	40.242	44.133	47.927	53.675	57.605	57.234	55.517	49.670	39.117	38.855	47.007

The Mean Temperature obtained from the last column of the above Table is $48^{\circ}.944$. It occurred at $9^h 13'$ A. M. and $8^h 23'$ P. M.

MEAN RESULTS OF THE HOURLY REGISTER FOR 1824 AND 1825.

The Mean Temperature of the Winter months, viz. *Dec. Jan. Feb.* is 40.491
 of the Spring months, viz. *March, April, May,* 45.751
 of the Summer months, viz. *June, July, Aug.* 58.273
 of the Autumn months, viz. *Sept. Oct. Nov.* 48.908

The Mean Temperature of the years 1824 and 1825, from 17,544 observations, is 48.360

TABLE V.—Containing the Average of the Daily and Monthly Temperatures of the Years 1824 and 1825.

Day.	January.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
1	43.85	42.00	37.48	37.93	49.85	57.00	55.67	60.38	61.60	54.82	45.44	32.93
2	41.67	42.25	35.01	42.62	49.17	56.75	57.86	60.21	63.44	55.75	43.44	34.59
3	41.47	37.75	34.95	42.42	48.07	56.12	57.23	60.16	63.54	56.64	41.18	32.75
4	40.57	34.77	35.72	44.62	50.26	53.66	58.76	58.57	58.71	55.76	38.34	32.97
5	37.35	35.88	37.42	48.90	49.26	52.75	57.05	57.80	56.04	54.90	39.45	82.96
6	39.97	37.51	44.38	45.79	49.70	52.49	58.76	56.95	55.04	55.23	38.58	39.63
7	40.33	44.07	41.42	47.43	51.93	59.64	58.42	58.22	56.48	58.79	42.67	40.80
8	42.55	44.61	41.52	48.34	53.30	56.64	60.35	60.62	52.72	54.29	41.29	40.05
9	44.09	42.27	44.48	46.03	52.75	54.12	59.13	58.29	54.13	51.95	40.24	39.17
10	40.61	45.16	44.15	43.23	50.35	55.61	56.71	58.40	56.02	50.59	39.15	39.07
11	40.69	43.16	41.64	43.84	47.85	57.91	57.59	57.07	57.65	50.21	39.77	46.13
12	41.61	44.71	40.50	40.45	47.95	58.29	60.68	56.17	58.77	49.70	36.62	47.09
13	42.15	43.24	39.78	40.03	47.37	57.27	61.60	58.11	56.78	46.56	45.66	45.42
14	42.02	40.59	38.12	44.61	47.08	55.96	68.09	57.00	57.83	48.86	42.02	43.58
15	39.57	38.19	40.31	46.96	48.72	50.35	65.01	58.32	57.59	45.42	36.13	43.58
16	38.68	39.16	41.10	44.19	48.60	58.44	62.79	56.77	60.80	46.04	45.01	42.31
17	38.82	40.58	41.38	43.37	51.64	56.26	63.99	56.37	62.01	42.36	48.38	41.59
18	42.61	39.66	43.53	43.45	50.59	56.45	61.93	56.70	62.18	45.48	44.02	45.57
19	39.85	41.54	44.18	46.91	48.52	52.79	60.18	58.07	57.62	48.10	41.13	45.95
20	44.01	42.40	45.30	52.71	46.45	52.78	60.65	60.72	55.84	44.36	43.54	39.69
21	39.31	40.99	42.56	54.25	46.81	53.06	60.03	59.07	55.70	45.23	43.30	41.72
22	38.16	42.32	40.75	49.54	50.11	54.27	62.78	56.61	55.81	48.48	40.41	37.73
23	37.46	41.19	39.64	45.83	51.62	55.88	59.99	60.77	51.94	52.30	43.69	37.16
24	39.17	40.76	39.74	46.92	50.27	56.06	57.01	58.11	58.46	50.97	44.28	40.04
25	41.24	39.90	42.16	47.72	51.39	56.85	61.01	57.33	56.33	47.30	41.05	45.39
26	46.44	37.76	41.98	49.61	52.65	55.09	60.02	56.95	49.54	44.07	41.96	35.56
27	45.62	38.40	44.34	48.45	53.39	56.56	61.82	57.07	48.14	43.90	36.12	38.69
28	38.76	38.40	42.28	50.46	50.73	57.07	60.37	56.77	46.65	46.34	38.46	37.83
29	40.18		44.57	51.52	48.79	58.22	61.51	59.77	48.67	44.89	39.94	37.39
30	43.08		41.31	53.20	52.66	57.87	61.95	59.79	54.99	45.53	34.42	36.99
31	44.06		38.07		52.60		62.13	61.36		47.84		37.75
Means,	41.091	40.621	40.865	46.379	50.012	56.091	60.361	58.372	56.312	49.226	41.191	39.775

TABLE VI.—*Shewing the Average Mean Temperature of each Hour for each Month in 1824 and 1825, and the average of these Two Years.*

Hour.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean Temp. of each hour for the whole two years.
1 A. M.	40.131	39.668	38.952	42.990	46.788	52.587	56.167	55.327	53.829	48.077	39.862	38.942	46.134
2	40.384	39.751	38.731	42.171	46.390	52.250	55.999	55.068	53.579	47.976	39.600	39.020	45.933
3	40.311	39.774	38.293	41.525	45.880	52.116	55.593	54.780	53.096	47.877	39.737	39.062	45.689
4	40.067	39.594	38.127	40.794	45.430	51.887	55.152	54.564	52.716	47.838	39.664	38.966	45.449
5	39.942	39.354	37.962	40.558	45.550	51.933	55.660	54.632	52.596	47.558	39.750	38.908	45.394
6	39.932	39.229	37.927	40.721	46.322	52.829	56.718	55.029	52.858	47.142	39.841	39.062	45.653
7	40.030	39.295	38.244	42.625	47.188	53.625	57.877	56.021	53.646	47.548	40.058	38.997	46.283
8	40.113	39.269	38.912	43.912	48.449	54.775	59.116	57.193	54.921	48.175	40.092	39.134	47.029
9	40.381	39.759	39.895	46.371	49.726	56.041	60.499	58.380	56.525	48.868	40.562	39.359	48.055
10	40.829	40.606	40.537	48.096	50.901	57.158	61.626	59.535	57.470	49.992	41.462	39.694	49.012
11	41.350	41.510	42.915	49.096	51.830	58.158	62.500	60.297	58.583	50.879	42.466	40.522	49.950
12	42.024	42.230	43.317	50.021	52.581	58.654	63.842	61.254	59.500	51.533	43.079	41.008	50.777
1 P. M.	42.415	42.774	43.680	50.458	53.193	59.025	63.935	61.714	60.300	51.954	43.433	41.184	51.149
2	42.591	42.761	44.013	50.808	53.620	59.700	64.334	61.913	60.637	52.018	43.704	41.216	51.470
3	42.594	42.799	44.079	51.187	53.693	60.216	64.649	61.915	60.529	51.727	43.754	40.790	51.532
4	42.185	42.256	44.042	50.879	54.007	59.808	64.703	62.155	59.937	51.132	42.825	40.502	51.239
5	41.686	41.481	43.555	50.337	53.872	59.575	64.825	62.043	59.921	50.478	42.158	40.186	50.872
6	41.450	40.994	42.850	49.933	53.346	59.145	64.671	61.743	58.666	49.756	41.796	39.937	50.294
7	41.082	40.617	41.878	48.537	52.442	58.383	63.837	59.963	57.337	49.132	41.383	39.494	49.544
8	40.877	40.225	41.155	46.900	51.019	56.654	61.553	58.694	56.539	48.603	41.071	39.379	48.624
9	40.792	39.913	40.459	45.708	49.518	55.371	59.821	57.688	55.791	48.451	40.825	39.311	47.829
10	40.827	39.658	39.941	45.012	48.998	54.483	58.546	56.704	55.137	48.064	40.333	39.250	47.276
11	40.702	39.535	39.411	43.916	48.154	53.712	57.740	56.039	54.721	47.771	39.941	39.126	46.803
12	40.629	39.521	39.271	43.416	47.513	53.187	56.817	55.517	54.109	47.635	39.708	39.072	46.398

The Mean Temperature obtained from the last columns of the preceding Table is 48°.266. It occurred at 9^h 13' A. M. and 8^h 27' P. M.

HAVING given, in the preceding Tables, all the numerical results of the hourly Register for 1824 and 1825, I shall now proceed to consider some of the most important conclusions which may be deduced from them. These relate,

1. To the form and character of the annual and monthly daily curve, or the daily progression of temperature.
2. To the determination of the two times of the day when the mean temperature occurs.
3. To the relation between the mean temperature of the 24 hours, and that of any single hour, or pair of similar hours, &c.
4. To the average daily range for each month.
5. To the Parabolic form of the branches of the Annual Daily Curve.

1. *On the Form and Character of the Annual and Monthly Daily Curve, or the Daily Progression of Temperature.*

The daily curve for 1824 is projected in Plate XIV., from the numbers in the last column of Table II., and forms the lowest curve. The point of the curve for each of the 24 hours is the mean of 366 observations. The temperature is lowest between 4 and 5 o'clock in the morning; it then increases with great regularity till three o'clock in the afternoon, when it descends till it reaches its minimum at 5 o'clock in the morning. The period during which it performs its ascending motion is 9^h 40', and the period of its descending motion is 14^h 20'; the heat of the day, therefore, advances with more rapidity than the cold of the night.

The daily curve of 1825 is projected in a similar manner in Plate XIV. from the first column of Table IV., and forms the

upper curve of the Plate. Each point of it is the mean of 365 observations. Its resemblance and general parallelism to that of 1824, cannot fail to strike the reader, and proves how nearly these observations have conducted us to the form of the daily curve.

The intermediate curve, which is laid down from the last column of Table VI., and is the mean of the two curves, is nearly free from the very slight inequalities in the afternoon branch of both curves, and may be considered as representing with great accuracy the mean annual daily curve for the Latitude of Leith, and at the level of the sea.

In order to observe the variation in the form of the daily curves for different seasons, I have given in Plate XV. and XVI. their projections for every month in 1824 and 1825; and in Plate XVII. the mean of the monthly curves in 1824 and 1825. These curves obviously divide themselves into *three* groupes or classes, viz. 1. The *Curves of High Temperature*, such as those of *June, July, August and September*; 2. The *Curves of Low Temperature*, such as those of *November, December, January, February, March*; and, 3. The *Curves of Moderate Temperature*, such as those of *April, May, and October*.

But though the curves thus group themselves into three varieties of temperature, yet it is obvious that those of April and May have the same form as those of the summer months, while the curve of October resembles the flat curves of the winter months. In order, therefore, to obtain a type of the daily curves of summer and winter, I have joined October to the winter months, and April and May to the summer ones, as in the following Table for 1824 and 1825*.

* It is probable that the Royal Society of Edinburgh will publish a series of Plates representing the daily curve for each day of 1824 and 1825.

TABLE, shewing the Mean Temperature of each Hour for Six Summer Months, from April to September inclusive, and for Six Winter Months from October to March inclusive.

Hours.	Six Summer Months.	Six Winter Months.
1 A. M.	51.27	40.77
2	50.90	40.91
3	50.50	40.84
4	50.09	40.70
5	50.15	40.57
6	50.77	40.52
7	51.83	40.69
8	53.06	40.94
9	54.59	41.46
10	55.80	42.19
11	56.74	43.27
12	57.64	43.86
1 P. M.	58.10	44.24
2	58.50	44.38
3	58.70	44.29
4	58.58	43.83
5	58.43	43.26
6	57.92	42.80
7	56.75	42.26
8	55.22	41.88
9	53.98	41.62
10	53.15	41.34
11	52.38	41.08
12	51.91	40.97
Mean,	54.59	40.63

By means of this Table I have projected the summer and winter curves, as in Plate XVIII. These curves are beautifully regular, and may be regarded as an accurate type of the daily progression of temperature in summer and winter, each point of each curve being the mean of about 180 observations.

The summer curve descends regularly from midnight till 4 o'clock in the morning, when the coldest time of the day occurs, and it ascends with great regularity till 3 o'clock, when it commences a very rapid descent to its minimum; the total mean range being about $8^{\circ}.61$.

The winter curve, on the contrary, has a gentle rise from 1 A. M. till 2 A. M. It then descends till 6, when it commences its ascent, reaches its maximum at 2, and again descends, but more slowly than it rose, the greatest difference of temperature being about $3^{\circ}.86$. By examining the individual curves which compose the winter group, especially in the means of 1824 and 1825, the rise of temperature after midnight, and its subsequent fall, will be very apparent,—an effect which never takes place in the curves of summer.

The difference of character in the curves of April and October deserves to be noticed. Although these months are considered as giving nearly the mean of the year, and therefore as resembling each other in temperature, yet there is a singular difference in the mode of its distribution. In October the mornings and evenings are comparatively warm, while in April these times of the day are remarkably cold. April, in short, unites the low temperature of a winter month, with the great range of a summer month; while October unites the temperature of a summer month, with the low range of a winter one.

II. *On the Determination of the two times of the Day, when the Mean Temperature occurs.*

I am not aware of any observations made in our climate, by which the hours, when the mean temperature of the day occurs, could be determined. It has generally been believed that it occurs at 8 o'clock in the morning; and Professor PLAYFAIR not

only considers this as nearly the hour of mean temperature for Edinburgh, but he regards the maximum as occurring "from 1 to half past 2, or even 3 o'clock *;" and upon these principles he has selected his three hours, viz. 8 A. M., the time of maximum, and 10 o'clock P. M.

It appears, however, from Tables II., IV. and VI. that the mean temperature of the 24 hours occurs at the following times :

	Hours of Morning Mean Temperature.	Hours of Evening Mean Temperature.
1824,	H. 9 13'	H. 8 26'
1825,	9 13	8 28
Mean of two years,	9 13	8 27

This very extraordinary agreement between the results of 1824 and 1825, shews how nearly we have approximated to the true form of the daily curve, and how much confidence may be placed in the general result. The following may therefore be regarded as the leading points of the annual daily curve.

Time of Minimum Temperature, a little before	-	H. 5 0 A. M.
Time of the Morning Mean Temperature,	-	9 13 A. M.
Time of Maximum Temperature,	-	2 40 P. M.
Time of Evening Mean Temperature,	-	8 27 P. M.
Interval between Minimum and following Maximum,		9 40
Interval between Maximum and following Minimum,		14 20
Interval between Morning and Evening Mean,	-	11 14
Interval between Minimum and Morning Mean,	-	4 13
Interval between Evening Mean and following Minimum,		8 33

* *Edinburgh Transactions*, vol. iv. p. 214, and vol. v. p. 293, 294. Mr PLAYFAIR also adds, that 10 o'clock P. M. is "as near as circumstances will allow to the time of greatest cold." These opinions prove how little was then known of the form of the daily curve. It will be seen from Plate XVIII. that, both in the winter and the summer curve, the maximum temperature is never before 3 o'clock, and that 10 o'clock at night is nearer the mean than the minimum temperature of the day.

The determination of the exact times of mean temperature throughout the year, furnishes us with the two best times of the day for recording the indications of the thermometer. These times at Leith are obviously 9^h 13' A. M. and 8^h 27' P. M.; for, if any of the observations is accidentally omitted at one of the hours, the mean of the remainder will approach nearer to the mean temperature of the year, than if any other two hours had been taken, and similar omissions made.

There is, however, another advantage of this determination, namely, that the mean temperature of the year may be obtained with great accuracy by a single observation made every day at one of the times of mean temperature. Let us suppose that we wished to determine the mean temperature of the year 1825 at Leith, and that we had possessed no other observations than a single daily one made at 9^h 13', then the mean of these 365 daily ones would have been 48°.944, the very same result that has been obtained in 1825 from 24 observations every day.

If we examine the annual curve, and also the monthly curve, it will be seen, that the ascending or morning branch is more regular in its progression than the descending or evening branch. On this account, *we would prefer a single observation every day, made at the time of the morning mean, to a single observation made every day at the time of the evening mean.*

It must be carefully observed, that the hours of mean temperature which we have now been considering, are only mean results for the whole year. If we wished to deduce the mean monthly temperatures from an observation made once a-day, it would not answer to take 9^h 13' A. M. and 8^h 27' P. M.; for the times of mean monthly temperature occur at different hours of the day throughout the year, as will appear from the following Table :

at Leith Fort every Hour of the Day in 1824 and 1825. 377

TABLE, shewing the Hours of the Morning and Evening when the Mean Monthly Temperature occurs.

	1824.		1825.		Mean of 1824 & 1825.	
	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
	H.	H.	H.	H.	H.	H.
January,	11 4	7 17	10 7	6 37	10 34	6 57
February,	10 9	6 11	9 56	7 40	10 2	6 56
March,	10 19	7 8	10 1	9 9	10 10	8 8
April,	8 58	8 35	9 4	8 17	9 1	8 26
May, -	9 21	8 26	9 7	8 54	9 14	8 40
June, -	9 27	8 2	8 47	8 47	9 7	8 24
July, -	8 51	8 36	8 59	8 45	8 55	8 40
August,	8 51	8 13	9 8	8 25	9 0	8 19
September,	8 44	8 39	9 0	7 57	8 52	8 18
October,	9 46	6 54	9 4	6 42	9 25	6 48
November,	9 56	7 21	9 23	8 0	9 39	7 41
December,	10 15	5 45	9 37	6 45	9 56	6 15

The following are the results for the six winter months, from October to March inclusive, and for the six summer months, from April to September inclusive :

	1824.		1825.		Mean of 1824 & 1825.	
	H.	H.	H.	H.	H.	H.
Six Summer months,	9 2	8 25	9 1	8 31	9 1½	8 28
Six Winter months,	10 12	6 49	9 42	7 29	9 57	7 9

III. On the relation between the Mean Temperature of the 24 Hours and that of any single Hour, or any similar Pair of Hours. &c.

It was long the practice of meteorologists to observe the thermometer three times a-day, on the supposition that the mean of these three observations gave the mean temperature of the 24 hours. Observations of this kind are still continued in many

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parts of Europe. To the following short Table of some of these, I have added the deviations from the mean temperature, as computed from the results of the preceding Tables :

	Morning.	Afternoon.	Night.	Deviation from Mean Temp. of day.	
Edinburgh,	8 ^h	<i>Maximum.</i>	10 ^h	+ 0.346	Professor Playfair.
Williamstown,	7	2	9	+ 0.510	Professor Dewey.
	8	1	6	+ 1.225	Proposed by the Phil. Soc. of New York.

As three daily observations are not convenient for many meteorologists, who are engaged in professional pursuits, it became desirable to select those two hours, the mean of whose temperatures approached nearest to that of the whole day. The following times have been used in this country, and many of them give results that differ very considerably from the mean temperature of the 24 hours :

	Morning.	Afternoon.	Deviation from Mean Temp. of Day.
Hawkhill,	8	2	+ 0.982
Gordon Castle,	8	2	+ 0.982
Kinfauns,	8	10	— 1.114
Ditto,	10	10	— 0.122
Leadhills,	6	1	— 0.134
Isle of Man,	9	11	— 0.838
Royal Society, London,	9	3½	+ 1.453
.....	9	3	+ 1.526
.....	9	2½	+ 1.511
.....	8½	3	+ 1.273
.....	8½	2½	+ 1.258
.....	8	3	+ 1.013
.....	8	2	+ 0.982
.....	7	3	+ 0.641
.....	7	2	+ 0.610
Royal Society, Edinburgh,	10	10	— 0.120
.....	7½	8½	— 0.805
.....	9¼	8½	0.000

I have given these examples principally with the view of shewing the application of the results of the hourly register, and not with the design of contrasting the hours employed by different observers; for it yet remains to be determined how far the form and dimensions of the daily curve, as determined for Leith, are applicable to places in different latitudes, and situated at different heights above the sea. At Paris, for example, the mean temperature of the day occurs before 9 o'clock in the morning; and at Tweedsmuir * in Scotland, 1300 feet above the sea, it happens before $7\frac{1}{2}^{\text{h}}$ A.M.; but it must be remarked, that the observations at 9 o'clock in the one case, and at $7\frac{1}{2}^{\text{h}}$ in the other, are compared with a calculated mean temperature, and not with the mean temperature of the whole 24 hours †.

It is curious to remark, that, with the exception of the hours of 10 A.M., and 10 P.M., no similar pair of hours has been used by meteorologists. The following Table will shew how nearly at Leith the mean of every similar pair of hours approaches to the mean temperature of the day.

* At Salem, Massachussets, where a very accurate register has been kept by Dr Holyoke for twenty-six years, the morning mean temperature always occurs before 8 o'clock in the morning.

† According to a very accurate register kept by Mr FAIRLIE, schoolmaster of this parish, the results for 1825 are,

Mean Temp. at $7\frac{1}{2}^{\text{h}}$ A. M.	Mean Temp. at $8\frac{1}{2}^{\text{h}}$ P. M.	Mean Temp. deduced from these.
45°.167	43°.825	44°.494

TABLE, showing the Deviations of the Mean Temperature of every similar Pair of Hours from that of the Day.

Hours.		1824.	1825.	MEAN.
5 A. M. ...	5 P. M.	— 0.193	— 0.073	— 0.133
6	6	— 0.398	— 0.187	— 0.292
7	7	— 0.448	— 0.256	— 0.352
8	8	— 0.478	— 0.401	— 0.440
9	9	— 0.298	— 0.350	— 0.324
10	10	— 0.148	— 0.096	— 0.122
11	11	+ 0.117	+ 0.105	+ 0.111
12	12	+ 0.352	+ 0.286	+ 0.319
1	1	+ 0.447	+ 0.301	+ 0.374
2	2	+ 0.507	+ 0.364	+ 0.435
3	3	+ 0.447	+ 0.242	+ 0.345
4	4	+ 0.092	+ 0.065	+ 0.079

From this Table it follows,

1. That of all the similar pair of hours, the mean of 4^h and 4^h approaches nearer to the mean temperature of the day than any other pair.
2. That the deviation of any pair is *less than half a degree of Fahrenheit's scale*.
3. That the mean temperature of the pairs from 5^h to 11^h are less than the mean temperature of the day; and that the mean temperature of the pairs from 11^h to 5^h exceed the mean temperature of the day *.

* It now became interesting to compare with these results those deduced from Mr COLDSTREAM'S hourly register for one day in each month of the year, and also those obtained by Professor DEWEY at Williamstown in North America.

at Leith Fort every Hour of the Day in 1824 and 1825. 381

In some instances, meteorological registers have been kept, in which the thermometer has been observed only once a-day. These registers may now be rendered useful, by means of the

Results deduced from Mr COLDSTREAM's Observations in 1822 and 1823.

Hours.	Deviations from the Mean Temp. of the day.
5 and 5	+ 0.005
6 ... 6	— 0.445
7 ... 7	— 0.574
8 ... 8	— 0.580
9 ... 9	— 0.674
10 ... 10	— 0.207
11 ... 11	— 0.170
12 ... 12	— 0.106
1 ... 1	+ 0.385
2 ... 2	+ 0.385
3 ... 3	+ 0.840
4 ... 4	+ 1.018

The law of the deviations in this table is very regular, particularly when we consider that the observations were made only on twelve days in the year.

Results deduced from Professor DEWEY's Observations.

Hours.	MARCH 1816.	APRIL.	JULY.	OCTOBER.	JAN. 1817.
5 and 5	+ 0.64	— 0.41	— 0.49	— 1.77	— 1.15
6 ... 6	— 0.76	— 1.48	— 1.03	— 2.85	— 1.51
7 ... 7	— 1.39	— 1.26	— 0.91	— 3.81	— 1.91
8 ... 8	— 1.44	— 0.87	— 0.92	— 2.95	— 1.55
9 ... 9	— 1.96	— 0.44	— 0.60	— 0.64	— 0.35
10 ... 10	— 1.38	— 0.28	— 0.89	+ 0.86	+ 1.44
11 ... 11	— 0.62	+ 0.97 *	— 0.15	+ 2.60	+ 3.47
12 ... 12	+ 0.69	+ 0.07	+ 1.48	+ 1.82	+ 0.31
1 ... 1	+ 1.35	+ 1.02	+ 1.48	+ 2.10	+ 0.67
2 ... 2	+ 2.03	+ 1.23	+ 1.56	+ 2.45	+ 0.77
3 ... 3	+ 1.68	+ 0.74	+ 1.47	+ 1.91	+ 0.44
4 ... 4	+ 1.02	+ 0.57	— 0.21	+ 0.28	— 0.12

* There is an error in Professor Dewey's mean of 11 P. M.: it should be 34°.92, in place of 39°.92.

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following Table, which shews the relation between the mean temperature of each hour and that of the whole day :

Hour.	1824.	1825.	Mean of 1824 & 1825.
1 A. M.	— 1.97	— 2.296	— 2.133
2	— 2.19	— 2.478	— 2.334
3	— 2.41	— 2.746	— 2.578
4	— 2.66	— 2.975	— 2.818
5	— 2.77	— 2.976	— 2.873
6	— 2.59	— 2.637	— 2.613
7	— 1.95	— 2.017	— 1.983
8	— 1.27	— 1.206	— 1.238
9	— 0.18	— 0.244	— 0.212
10	+ 0.65	+ 0.840	+ 0.745
11	+ 1.62	+ 1.747	+ 1.683
12	+ 2.50	+ 2.520	+ 2.510
1 P. M.	+ 2.86	+ 2.904	+ 2.882
2	+ 3.20	+ 3.206	+ 3.203
3	+ 3.30	+ 3.230	+ 3.265
4	+ 2.84	+ 3.105	+ 2.972
5	+ 2.38	+ 2.830	+ 2.605
6	+ 1.79	+ 2.264	+ 2.027
7	+ 1.05	+ 1.505	+ 1.277
8	+ 0.31	+ 0.404	+ 0.357
9	— 0.42	— 0.456	— 0.438
10	— 0.95	— 1.031	— 0.990
11	— 1.39	— 1.537	— 1.463
12	— 1.80	— 1.937	— 1.868

From this table, it appears, that the mean annual temperature of any hour of the day never differs more than $3^{\circ}\frac{1}{5}$ from the mean temperature of the day for the whole year. It deserves also to be noticed, that the deviations in the year 1825 are *uniformly greater* than those in 1824, which no doubt arises from the former having been a much warmer year than the latter.

In order to obtain the mean temperature of the year from a register which contains observations made only once every day, we have only to correct the mean temperature which the regis-

ter gives, by applying, according to its sign, the correction opposite to the given hour. In place of taking the mean of the two years, it might be preferable to take the results for 1824 in cold years, and those for 1825 in warm years.

Before concluding this part of the subject, it may be interesting to ascertain, from the preceding results, the relation between the mean temperature of the day, and the results obtained from the hours used at Paris, Halle, and Abo, where the thermometer is observed more than three times :

<i>Hours used :</i>						Deviation from the Mean Temp.
	Morning.	Noon.	Afternoon.	Evening.		
Paris *,	- 9	12	3	9		+ 1.282
Halle,	- 8	12	2	6	10	+ 1.103
Abo,	- 8	11	2	5	10	+ 1.053

These deviations are very great, and shew how little is gained by multiplying observations, as in the preceding journals. Any two pair of similar hours would have given deviations less than one-third of those in the preceding table. Indeed, it is obvious, that any number of observations made during the day, can never give a correct mean, without corresponding observations made late at night and early in the morning. In the register at Paris, Halle, and Abo, it would require the addition of the minimum to obtain the proper mean, as appears from the following Table :

		Morning.	Noon.	Afternoon.	Evening.		Deviation from the Mean Temp.
Paris,	<i>Minimum,</i>	9	12	3	9		+ 0.451
Halle,	<i>Minimum,</i>	8	12	2	6	10	+ 0.441
Abo,	<i>Minimum,</i>	8	11	2	5	10	+ 0.399

* The hours of 9 and 9 being nearly those that give the mean temperature of the day, it is obvious, that the mean of 12 and 3, must give a result considerably above the mean temperature of the day, and consequently, that the mean of all the *four* observations must err considerably in excess.

Even with the addition of the minimum, it appears that the mean temperature of these hours errs in excess.

IV. On the average Daily Range for each Month.

In a climate so variable as that of Scotland, the daily range of the thermometer is often very great, both in winter and in summer; but the average daily range which we propose now to notice, is the measure of the daily change of temperature for each month, and will of course bear some relation to the sun's declination, as appears from the following Table:

TABLE, showing the average Daily Range of Temperature for each Month, and for the whole Year.

	1824.			1825.			Mean of 1824 & 1825 *.		
	Hour of Min. H.	Hour of Max. H.	Daily Range.	Hour of Min. H.	Hour of Max. H.	Daily Range.	Hour of Min. H.	Hour of Max. H.	Daily Range.
January,	5	3	3.11	6	2	2.258	6	3	2.662
February,	8	1½	3.68	6	3	3.910	6	3	3.570
March,	6	3	5.45	5	4	7.209	6	3	6.152
April,	5	3	10.3	5	3	10.958	5	3	10.629
May,	4	3	10.0	4	5	7.484	4	4	8.577
June,	4½	3	8.1	4	3	8.558	4	3	8.263
July,	4	4	8.7	4	4	10.404	4	5	9.673
August,	4	4	7.5	5	5½	7.822	4	4	7.591
September,	4	3	7.6	5	2	8.573	5	2	8.041
October,	6	1½	5.1	4	2	4.661	6	2	4.876
November,	12	2½	4.4	2	3	4.008	2	3	4.154
December,	7½	1	2.4	12	2	2.677	5	2	2.308
Whole year,	5	3	6.07	5	3	6.06	5	3	6.138

* This column is computed from Table VI. and is not the mean of the two preceding columns.

From the general character of the year 1825, these results, as might have been expected, present greater uniformity in that year than they do in 1824, or even in the mean of the two years. The mean range is nearly at its maximum about the winter solstice, and gradually increases till April, when it reaches its maximum. It then declines, and again rises to a second maximum in July, after which it gradually diminishes till the end of the season. The mean range for the year is $6^{\circ}.065$, and does not vary above the 100th part of a degree in 1824 and 1825.

V. *On the Parabolic form of the different branches of the Mean annual Daily Curve.*

Before concluding this Report, I was desirous of ascertaining if the different branches of the daily curve had a resemblance to any known curve. Their similarity to the parabola is very obvious, from Fig. 2. of Plate XIV. where they are distinctly projected; and I therefore calculated the following Table, upon the supposition that AB, BC, CD, and DE, were parabolic branches of the following dimensions :

Branch AB,	Ordinate,	AH = 513
	Abcissa,	BH = 172 or $2^{\circ}.872$
Branch BC,	Ordinate,	CH = 253
	Abcissa,	BH = 172 or $2^{\circ}.872$
Branch CD,	Ordinate,	CG = 347
	Abcissa,	DG = 196 or $3^{\circ}.266$
Branch DE,	Ordinate,	EG = 327
	Abcissa,	DG = 196 or $3^{\circ}.266$

The ordinates $513 + 253 + 347 + 327$ are $= 1440' = 24$ hours; and the abscissa $BH = 2^{\circ}.872$, and $DG = 3^{\circ}.266$, when reduced to the same scale as that of the ordinates, become 172

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and 196', as one degree of temperature on the projection is equal to one hour. The abscissæ which represent the temperature were reconverted into degrees.

TABLE, shewing the Mean Annual Hourly Temperature for 1824 and 1825, as observed, and calculated on the supposition of these being the abscissæ of Parabolas.

Hours.	Observed Temp.	Calculated.	Difference.
H.			
8 27 P. M.	Mean, 48.266	Mean, 48.266	0.000
9	47.829	47.904	+ 0.075
10	47.276	47.315	+ 0.039
11	46.803	46.806	+ 0.003
12	46.398	46.374	— 0.024
1 A. M.	46.134	46.021	— 0.113
2	45.933	45.747	— 0.186
3	45.689	45.551	— 0.138
4	45.449	45.433	— 0.016
5	Min. 45.394	Min. 45.394	0.000
6	45.653	45.555	— 0.098
7	46.283	46.039	— 0.244
8	47.029	46.845	— 0.184
9	48.055	47.973	— 0.082
9 13	Mean, 48.266	Mean, 48.266	0.000
10	49.012	49.091	+ 0.079
11	49.050	49.969	+ 0.019
12	50.777	50.653	— 0.124
1 P. M.	51.149	51.141	— 0.008
2	51.470	51.434	— 0.036
3	Max. 51.532	Max. 51.532	0.000
4	51.239	51.422	+ 0.183
5	50.872	51.091	+ 0.219
6	50.294	50.544	+ 0.250
7	49.544	49.773	+ 0.229
8	48.624	48.783	+ 0.159
8 27	48.266	48.266	0.000

The numbers in column 3. were calculated by the following formulæ. From the property of the parabola, we have

$$BH : Bm = HA^2 : mn^2 ; \text{ and}$$

$$Bm = \frac{BH \times mn^2}{HA^2}.$$

But since AE is the line of mean temperature, pn the depression of the temperature below the mean at the point of time p , and $pn = Hm = HB - Bm$, then, calling μ the mean temperature, and y the ordinate mn , we have the required temperature T at the time p , thus :

$$T = \mu - HB + \frac{HB \times y^2}{HA^2};$$

or if m is the *minimum* temperature of the daily curve, then, at the point of time p , we have

$$T = m + \frac{HB \times y^2}{HA^2}.$$

For the *semi-parabola* BC, the formulæ are as follows :

$$T = \mu - HB + \frac{HB \times y^2}{CH^2}; \text{ or}$$

$$T = m + \frac{HB \times y^2}{CH^2}.$$

For the *semi-parabola* CD, in which the required temperatures *exceed* the mean, we have at any point of time p ,

$$T = \mu + GD - \frac{GD \times y^2}{CG^2};$$

or calling M the *maximum* temperature of the daily curve,

$$T = M - \frac{GD \times y^2}{CG^2}$$

For the *semi-parabola* DE, we have the following formulæ :

$$T = \mu + GD - \frac{GD \times y^2}{EG^2}; \text{ or}$$

$$T = M - \frac{GD \times y^2}{EG^2}.$$

Upon comparing the parabolic abscissæ in column 3. with the observed results in col. 2., it appears, that the greatest difference

is *a quarter of a degree of Fahrenheit*, and that the differences are most perceptible in the afternoon branch of the curve, between 4 P. M. and 8 P. M.

We have no hesitation, however, in saying, that the mean of a greater number of years will produce a close approximation to the parabola. In 1824, the afternoon branch is irregular. In 1825, which was a year of uniform character, the afternoon branch becomes more convex, and approaches closely to the parabolic branch; so that the mean of 1824 and 1825 which we have given in col. 2. of the Table, and contrasted with the parabolic abscissæ, partakes of the irregularities of 1824, and thus occasions a flatness in the curve, and consequently the differences observed between 3^h P. M. and 8^h 27' P. M.

Mean Annual Curves of Daily Temperature in 1824 and 1825

Mean Daily Curve, for each Month of 1824

Mean Daily Curve for each Month of 1825

PLATE XVII.

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Mean Daily Curve for each Month of 1824 and 1825

A.M.

P.M.

Mean Daily Curves of the six Summer & six Winter Months of 1824 and 1825

A.M.

P.M.

A.M.

P.M.