MISCELLANEOUS DEDUCTIONS FROM THE OBSERVATIONS OF SEVERAL YEARS COMBINED.

Several documents embracing the observations of several years have been placed at the disposal of the office at Toronto; but as most of them did not arrive in time to allow of their complete reduction, this part of the present article will be confined to some deductions from a valuable contribution from Mr. F. Allison, of Halifax.

One of the offices of a Chief Station, as already explained, is to furnish corrections for Diurnal Variation, whereby observations at other stations, and made at longer and less regular intervals, may be rendered fit for intercomparison.

This contribution of Mr. Allison includes a series of thermometric readings made by him or under his direction, at every even hour (with very few exceptions) during the three years 1867-69.

In a few instances, when readings at 2 a.m. and 4 a.m. were not taken, the observations of the whole day were set aside. As these, *including Sundays*, were only 22, the unbroken days in the three years amounted to 1,074, and the readings employed in the calculation were 12,888; giving, for each month, 80 or 90 readings for each of the twelve bi-hourly means.

The primary object of the computation being to learn for each month the quantity by which the temperature at each hour differs from the mean temperature of the month for all hours collectively, interpolating formulæ for each month were constructed, by aid of which the most probable temperature could be computed for any instant in the twenty-four hours.

The following is the general type of the formulæ, where T_n represents the required temperature at any time (n) reckoned from midnight, the unit of time being one hour, t_0, t_1, t_2, &c., certain constant temperatures, and c_1, c_2, &c., certain constant angles derived from the twelve bi-hourly mean temperatures for the particular month under consideration.

$$T_n = t_0 + t_1 \sin(n \times 15^\circ + c_1) + t_2 \sin(2n \times 15^\circ + c_2) + t_3 \sin(3n \times 15^\circ + c_3) + t_4 \sin(4n \times 15^\circ + c_4) + t_5 \sin(5n \times 15^\circ + c_5) + t_6 \sin(6n \times 15^\circ + c_6)$$

The values of the constants t_0, t_1, &c., c_1, c_2, &c., are given for each month in the following table:—

TABLE I.

	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	°	°	°	°	°	°	°	°	°	°	°	°
t_0	19 83	23 18	27 13	37 20	48 15	58 52	64 35	64 13	58 19	46 01	36 02	25 21
t_1	8 38	4 55	6 11	6 86	7 81	8 42	8 64	8 18	6 87	5 58	2 77	2 64
t_2	1 32	1 37	1 72	1 35	1 13	0 66	0 99	1 35	1 81	1 78	1 25	1 08
t_3	0 32	0 25	0 12	0 36	0 60	0 78	0 78	0 74	0 42	0 07	0 20	0 36
t_4	0 15	0 16	0 23	0 02	0 17	0 39	0 21	0 21	0 28	0 22	0 04	0 08
t_5	0 15	0 13	0 11	0 14	0 21	0 07	0 10	0 13	0 14	0 30	0 17	0 07
t_6	0 02	0 02	0 08	0 02	0 03	0 06	0 06	0 01	0 10	0 03	0 02	0 06
c_1	221 03	225 59	233 03	237 34	242 33	240 14	238 41	240 39	241 46	239 32	235 16	240 42
c_2	60 32	52 43	72 43	67 48	83 23	77 40	69 55	68 21	64 26	71 58	72 17	59 51
c_3	204	191	24	84	54	54	60	54	76	333	261	224
c_4	101	210	182	153	123	99	127	183	225	243	104	97
c_5	82	23	75	164	275	286	276	129	0	17	33	16
c_6	270	270	90	270	270	270	270	90	90	90	270	270

Taking formula for each separately, and giving to n successively the values 0, 1, 2, 3, &c., we obtain for that month the mean normal temperatures for each of the twenty-four hours, as far as the normals can be procured from the observations of only three years.

The results are given in the following table, in which the numbers in the final column for the year are the arithmetic means from the corresponding twelve monthly numbers:—