The following table is given in illustration:—

TABLE III.

MONTHLY and annual means of the Diurnal Variations of Temperature at Toronto, derived from hourly observations continued during six years.

Toronto Astronomical Time.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Hours.	°	°	°	°	°	°	°	°	°	°	°	°	°
0	+2.5	+3.8	+4.2	+4.9	+5.9	+5.9	+6.9	+6.5	+5.9	+5.3	+3.3	+2.5	+4.8
1	+3.0	+4.7	+4.8	+5.8	+6.8	+6.6	+7.8	+7.3	+6.5	+5.7	+3.7	+3.2	+5.5
2	+3.3	+5.1	+5.4	+6.2	+7.2	+7.0	+8.6	+7.9	+6.9	+6.1	+3.8	+3.4	+5.9
3	+3.3	+5.1	+5.2	+6.3	+7.2	+7.4	+8.8	+8.2	+7.0	+5.8	+3.6	+3.1	+5.9
4	+2.7	+4.5	+4.7	+5.9	+7.2	+7.7	+8.8	+8.1	+6.7	+5.1	+2.7	+2.5	+5.6
5	+1.7	+3.3	+4.0	+5.2	+6.8	+7.0	+8.4	+7.5	+5.8	+3.4	+1.5	+1.5	+4.7
6	+0.9	+1.9	+2.3	+3.4	+5.0	+5.7	+6.9	+5.6	+3.1	+1.3	+0.7	+0.8	+3.2
7	+0.4	+0.9	+0.8	+0.8	+2.2	+3.0	+3.5	+1.7	+0.4	+0.2	+0.1	+0.5	+1.2
8	+0.1	0.0	−0.1	−0.8	−0.5	−0.3	−0.7	−1.3	−0.9	−0.5	−0.2	+0.1	−0.4
0	−0.1	−0.6	−1.1	−1.8	−2.3	−2.5	−3.1	−2.8	−1.9	−1.3	−0.5	−0.1	−1.5
10	−0.5	−1.2	−1.8	−2.6	−3.3	−3.8	−4.3	−3.9	−3.0	−2.0	−0.8	−0.5	−2.3
11	−0.8	−1.7	−2.4	−3.1	−4.2	−4.7	−5.5	−4.7	−3.6	−2.7	−1.2	−0.6	−2.9
12	−1.5	−1.8	−2.5	−3.3	−5.0	−5.3	−6.5	−5.5	−4.0	−3.3	−1.8	−0.9	−3.4
13	−2.0	−2.2	−3.0	−4.0	−5.9	−6.0	−7.4	−6.1	−4.6	−3.9	−2.1	−1.5	−4.0
14	−2.1	−2.5	−3.3	−4.7	−6.7	−6.7	−8.0	−6.8	−5.2	−4.2	−2.4	−1.9	−4.5
16	−2.2	−2.9	−3.6	−4.9	−7.4	−7.5	−8.7	−7.5	−5.6	−4.3	−2.7	−2.0	−5.0
16	−2.3	−3.3	−4.0	−5.3	−7.9	−8.0	−9.3	−7.8	−6.2	−4.6	−2.9	−2.0	−5.3
17	−2.5	−3.6	−4.5	−5.7	−7.9	−7.9	−9.4	−8.0	−6.8	−4.8	−2.8	−2.0	−5.5
18	−1.8	−4.2	−4.8	−5.6	−5.4	−5.2	−6.2	−6.6	−6.2	−4.6	−2.5	−2.5	−4.6
19	−1.9	−4.3	−3.9	−3.3	−2.4	−2.4	−2.5	−3.6	−3.6	−3.8	−2.5	−2.6	−3.1
20	−1.6	−3.3	−2.0	−1.0	−0.2	−0.1	+0.1	−0.3	−0.9	−1.6	−1.4	−2.2	−1.2
21	−0.7	−1.0	+0.2	+1.0	+2.1	+1.8	+2.3	+2.2	+1.6	+1.1	+0.1	−1.0	+0.8
22	+0.6	+1.0	+0.9	+2.5	+3.8	+3.4	+4.0	+4.1	+3.5	+3.0	+1.5	+0.4	+2.5
23	+1.7	+2.6	+3.2	+3.9	+4.9	+4.8	+5.6	+5.6	+5.0	+4.4	+2.5	+1.7	+3.8

It is commonly accepted that although two series of normals derived from two different series of years may not be identical each to each, the diurnal variations will be approximately the same in both series. It is assumed in fact that if the normals be changed they will be all changed to an equal extent and that their mutual differences therefore will be unaltered.

If this assumption be admitted, a table of diurnal variations, such as that of which table II forms a part, furnishes the means of turning to account other observations made at the same station and less frequently than at every hour and thus of rendering more perfect the normals, or, more properly, the provisional normals computed from the hourly series. A few words will explain how this is done.

It is clear that if the diurnal variation, with its sign changed, be applied to the normal of the day and hour, the mean normal of the day will be found; and it is moreover true that if the diurnal variation, with its sign changed, be applied to the *observed* temperature on a day and hour in some year not included in the same six years, the most *probable* value of the mean temperature of the day will be obtained, as far as it is possible to obtain it by a single observation; and if observations at several hours be taken in the same day, and each be corrected for diurnal variation, as many separate determinations will be made, the average of which will be the true mean of the day with a high degree of probability. If the daily means from a second and less perfect series (consisting of six years in the case discussed in General Sabine's paper) be now grouped into general monthly means, and if these be incorporated with the analogous general monthly means derived from the hourly series, twelve general monthly means will be found which are based on the observations of twelve years. With these new and more perfect means the next step is to compute the daily mean normals for every day in the year, and finally, by applying to these the diurnal variations with their *proper signs*, we obtain the normals for every hour on every day, as derived from twelve years.

Where hourly observations have been taken, the process for computing the daily and hourly normals which has been just described is the most perfect, and should be applied with certain modifications to the other elements. If the observations have been at alternate hours only, some modifications in the process will also be required.

This part of the subject has been dwelt on thus far for the purpose of explaining the course to be followed in computing normals for other stations.

If it were desired to compare the climatic condition of any place during a month or season with the condition of the same place in the same month or season of another year, or with that of some other station, it would be sufficient if the observations were taken two or three times each day, provided that the hours were constant at both the places concerned in the comparison. But this uniformity in the hours at different places can not be generally maintained. Excepting in rare cases, observers are engaged in pursuits that have a prior claim on them, and their selection of hours must usually be determined less by meteorological fitness than by inclination and convenience; so that the observations which they make are not even suited for the simple matter of comparing place and place. Moreover if the different points of observation are to be employed in detecting the presence of anything abnormal in the weather; any small atmospheric disturbance for instance, which may indicate an approaching storm, monthly means are of little direct value: normals more or less near the truth are needed for *every day* and *every hour*.

The question here arises how the computation of normals can be effected with materials so irregular in time and scanty in quantity.