Meteorological Instructions for the use of inexperienced Observers resident abroad.

The Council of the Meteorological Society invite the cooperation of those who may be willing and qualified to furnish the meteorological elements of places, in the neighbourhood of which no adequate observations have hitherto been made.

They are prepared to publish tabular statements of the accompanying form, on receiving not only the necessary materials in a

Place.				
Lat.		Long.		Elev^{n}
	Mean temp.	Monthly range.	Rain, &c.	Period. winds.
Jan.				
Feb.				
Mar.				
April				
May				
June				
July				
Aug.				
Sept.				
Oct.				
Nov.				
Dec.				
Year				
No. of years' observation.....				
Hours and mode of observation...				

shape ready for publication, but also copies of the limited observations hereafter alluded to, and of subsequent calculations. These are intended to be retained in the Library of the Society, and are required as permanent records, to give evidence of the sufficiency of the data whence the printed results have been obtained, and to afford opportunity of investigating such anomalies as may at any future time call for inquiry.

GALTON/2/13/3/15

The following instructions have been framed to facilitate the labours of those who have little leisure and experience in conducting meteorological observations, and show the minimum of effort with which trustworthy results can be obtained.

In the desire of lightening the expenses of their accepted contributors and of ensuring the trustworthiness of the instruments they employ, the Council of the Society will be happy to forward, through one of their Secretaries, a simple outfit of the necessary thermometers and rain-gauges, verified and packed in readiness for immediate shipment and use, on receiving a prepayment of £2 10*s.* to meet their cost. The cost is liable to vary within small limits, according to the varying charges of the makers and the introduction of new classes of instruments, but it will in no case exceed the above-mentioned sum, and the surplus, whatever it may be, will be returned. The instruments included in the outfit are 1 maximum and 1 minimum thermometer; 1 ordinary thermometer, with a range adapted to the proposed station; 1 rain-gauge. The case or cases that contain them will be about 10 inches long, and 4 to 5 inches wide and deep. Their weight will be about 2 lbs., and they will travel securely as an ordinary package.

Geographical Position.

Latitude, Longitude, and Elevation above the sea-level.—The authorities whence these have been taken, or the method by which the observer has determined them for himself, must be stated.

Observations on Heat.

1. *To Expose Thermometers.*—The instruments must be placed in a carefully selected position, or all their results will be vitiated. Choose an airy place, where there is continuous, dense, and ample shade. There set up a box of not less than 2 feet in height, width, and depth. It must be constructed precisely on the principle of an ordinary meat-safe; that is to say, it must be roofed (and better still, double roofed) from the rain, and have perforated sides, whether of gauze, trellis-work, or Venetian blinds, through which the air may pass with perfect freedom. It must be fixed on a stand or be suspended 4 feet above the ground. The thermometers should be hung on supports placed in the middle of the box, except where otherwise mentioned in the 1st method, § 3.

2. *Monthly Mean Temperatures.*—The average of the daily means,

taken by one of the methods described in the next paragraph during an entire month, gives the monthly mean. If occasionally a day or a month be dropped, a gap must be left in the record and no attempt be made to fill it.

3. *Daily Mean Temperatures.*

1st Method: This is the more accurate, but requires observations to be made *twice* in each day.

Procure a jar or box, of not less than 8 inches in length, width, and depth; fill it with dry sand, and set it in a properly exposed box (§ 1). Place a thermometer upright in the middle of the sand, with its bulb buried from 3 to 4 inches below its surface. Note its readings twice a day, at intervals of twelve hours, say at 9 A.M. and 9 P.M.; the mean of these readings may be accepted as the daily mean.

2nd Method: By observations made *once* in each day.

Hang a maximum and a minimum thermometer on supports, as described in § 1, and note their readings once daily, either in the morning or in the afternoon, and readjust the indexes. The mean of the maximum and minimum usually differs from the mean temperature of the day by less than half a degree; but occasionally (as at Barnaul in Central Asia) the difference exceeds $1\frac{1}{2}°$. The liability to a constant error of this amount is too serious to be passed over without investigation, especially as the approximate correction due to each month can be readily ascertained by making occasional use of the 1st method as a standard of comparison. When the year's work is completed, it will be easy to estimate the corrections due to the several months, and to apply them to the monthly means obtained by this 2nd method.

4. *Monthly Range* is the difference between the lowest and highest readings during the month.

5. *Yearly Means,* whether of *temperature* or of *range,* are the averages of the monthly means.

"The enclosure of a maximum and minimum self-registering thermometer in a large cask of dry sand, which might be opened and read off twice a year, would also probably afford a very accurate mean result."—*Sir John Herschell.*

Rain, Snow, and Dew.

6. These must be measured by a Gauge, which should be placed on the ground or on a low stand in an exposed situation. The relation of the units of length and weight is such that the tenth of an

inch of rain falling into a vessel whose mouth is a circular area of about two inches and nine-tenths in diameter (1·4467 inch radius) will weigh an ounce (Troy). Every medicine-chest contains a fluid ounce (Troy) measure; and, failing this, it will suffice to mark the space occupied in a small vessel by 480 drops of water, whose weight is one fluid ounce. A properly made rain-gauge and graduated measure is, however, preferable to any makeshift.

Wind.

7. Practised observers rarely use a weathercock, but watch the way the clouds (when any) are drifting. These are far steadier in their course than anything driven by the surface currents of wind. For the requirement of the tabular statement now desired, it will be sufficient to note the prevalence of periodical weather.

The Meridian, or True North and South Line, is obtainable as follows:—Set a straight stick or pole upright in a plot of level ground, by the help of a plummet. Loop a string to it, and, with the base of the pole as a centre and the string as a radius, scratch a circle on the ground of such a size that the shadow of the pole shall fall somewhat within it at noon. Keep a sufficient watch on the shadow of the pole to ensure your being present when its top enters the circle in the forenoon and leaves it in the afternoon. Mark the places where it cuts it. Lastly, bisect the interval between the two marks, and drive in a peg to note the place permanently. The pole and the peg will be in the same Meridian Line. It is best to draw three or four concentric circles, and to drive the peg in the line that corresponds most closely with the mean of the several independent determinations.

If the compass be used, allowance must of course be made for the variation of the needle.

Foot-notes.

The *No. of years' observations* would be printed thus:—

3 years; viz. 1860, 1861, and 1862–3.

The *Hours and mode of observation* would be printed thus:—

9 A.M. and 9 P.M., or max. and min. read in forenoon (as the case might be).

The description should be recorded more in detail in the MSS., where the spelling should be unabbreviated.