7. The Thermal Windrose at the Ben Nevis Observatory.

By A. Rankine.

The Table, showing the Thermal Windrose, accompanying this paper, was computed from the observations made at the Ben Nevis Observatory during the three years ending May 1887. It shows the mean temperatures, on the mean of the three years, of the different winds for each month, for the year, and for the seasons. The direction of the wind is observed to the thirty-two points of the compass, but in this table the temperatures are only shown for eight points, the intermediate points having all been added on to these eight points in the same way as that described by Mr Omond in his paper on "Winds and Rainfall" in the *Journal of the Scottish Meteorological Society*, namely, the *by* winds were added to their adjacent octants, and the points half-way between the octants were on the odd day of each month added to the octant to their right, looking out from the centre of the compass card, *i.e.*, they were veered two points, and on the even days to that on their left, *i.e.*, they were backed two points. The mean temperature of each direction of wind for each month was found by tabulating the hourly observations of temperature under the direction of wind observed at the same time, or under its octant as above, and then taking the arithmetical mean. When the wind was variable, or its direction doubtful, the temperature was entered in the column for calms and variables. These variable winds belong chiefly to the northern half of the compass, their existence being principally due to the abrupt and precipitous character of the north side of the Ben. The temperatures given in the table are those indicated by thermometers which in summer and autumn are protected in the regulation Stevenson screen, and in winter and spring in a smaller pattern of the same, which can be shifted up or down a ladder-like stand, so as to be always at or near the standard height of 4 feet above the surface of the snow.

There are two columns of monthly means in the table, one giving the mean temperature for each month, deduced in the ordinary manner from the daily means, and the other giving the mean of the temperatures in the table under the eight wind directions. It will be seen that there is a considerable difference between these mean

temperatures in certain months, which difference is obviously due to the inequality of the frequency of the different winds.

As the character and relative frequency of each wind have already been discussed by Mr Omond, it only remains to add a few words regarding wind-temperature, as far as the accompanying table sheds any light on the subject.

The first point to be noticed is, that on the mean of the year the south is the warmest wind, its temperature being $32^{\circ}6$; and the north-east is the coldest wind, its temperature being $26^{\circ}5$; and also that the winds in their order of highest temperature are—S., S.W., W. (N.W. = S.E.), E., N., N.E.,—the north-west and south-east winds being equal in temperature, and the east and north winds almost so. In each of the seasons the north-east wind is the coldest, and, with one exception, the south is the warmest, the exception being winter, when the warmest wind is the south-west. An inspection of the results for the different months shows that the above order of highest temperature of the directions varies considerably from month to month, as does also the difference between the temperatures of the warmest and coldest winds in each month, the maximum difference being $10^{\circ}7$ in March, and the minimum $4^{\circ}2$ in April; while the mean of all the monthly differences is $6^{\circ}7$. This difference on the mean of the seasons is greater in winter and spring than in summer and autumn, being least in summer. Though the means for the year and for the seasons show that the warmest and coldest points are almost constant, yet the monthly results show that these points oscillate, the warmest point markedly and the coldest rather less so. During the winter months the warmest point is south-west, but, as the year advances, it swings round through south to south-east, which is its direction in July and September. The coldest point is north-east for nine months; and though in February it is south-east, in June east, and in November north, it has not so well defined an oscillation as the warmest point.

The differences between the annual ranges of temperature of the different directions of wind seem to point to the cause of this oscillation in the direction of the warmest wind, as being the degree to which the yearly march of temperature affects the areas over which these winds blow. The south-east wind has an annual range,

in mean monthly temperature, of $24^{\circ}3$, its temperature in February, for which month it is the coldest wind, being $19^{\circ}7$; and in July, when it is not only the warmest for that month, but also for the whole year, its temperature is $44^{\circ}0$. The wind having the least annual range is the north-west, its temperature in January being $24^{\circ}1$, and in August $35^{\circ}8$, thus giving it a range of $14^{\circ}4$. The mean annual range for the directions S.W., W., N.W., is $15^{\circ}6$, and that for S.E., E., N.E., is $20^{\circ}7$. The difference between these ranges is apparently due to the fact that the easterly winds blow over land, and the westerly winds over sea,—land areas being subject to greater extremes of temperature than sea areas, and this is apparently the cause of the oscillation above referred to. In the tables given with Mr Omond's paper on "Winds and Rainfall" in this number of the Journal,* it is seen that the greater number of south-east winds belong to anticyclonic systems, and this also may have a good deal to do with the great annual range of temperature of the south-east wind. A comparison of the temperatures of the same direction of wind in cyclonic and anticyclonic systems has not as yet been made; but I could see, when working up this table, that such a comparison would probably result in interesting and useful knowledge. It may be noted that each of the directions, S., S.W.,

Thermal Windrose, Ben Nevis Observatory. (Computed from the Observations of the three Years, June 1884 to May 1887.)

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm or Vari- able.	Mean of Month.	Mean of 8 Winds
January	20.6	18.7	18.8	20.5	23.3	25.3	24.2	24.1	22.1	22.9	21.9
February	21.5	21.5	21.9	19.7	24.3	27.8	27.4	24.8	21.1	24.0	23.6
March	19.9	18.2	19.5	19.7	28.9	28.8	27.9	26.5	23.1	22.8	23.2
April	24.3	24.1	24.4	27.8	27.9	28.3	27.1	26.0	26.2	26.5	26.5
May	27.9	27.4	29.5	31.4	31.5	31.8	30.0	29.0	29.9	29.9	29.8
June	35.5	33.6	33.5	37.5	38.1	37.3	36.5	35.8	36.7	36.2	36.0
July	37.3	33.9	38.9	44.0	42.8	41.1	40.1	38.0	38.5	40.6	39.5
August	36.2	35.8	36.2	40.7	42.5	41.8	39.5	38.5	37.9	40.7	38.9
September	31.9	31.1	34.4	40.5	39.5	37.8	36.7	34.7	34.1	36.9	35.8
October	29.9	28.6	29.0	31.4	33.8	32.7	31.8	31.1	30.6	31.2	31.0
November	25.2	25.4	26.3	26.6	30.2	31.3	30.2	29.5	25.8	28.2	28.1
December	21.4	19.5	21.1	22.9	27.9	27.0	25.8	25.8	23.5	23.4	23.9
Year	27.6	26.5	27.8	30.2	32.6	32.5	31.4	30.2	29.1	30.3	29.8
Spring	23.7	23.2	24.5	26.3	30.0	29.5	28.3	27.2	26.4	26.4	26.5
Summer	36.3	34.4	36.2	40.7	41.1	40.1	38.7	37.4	37.7	39.2	38.1
Autumn	29.0	28.4	29.9	32.8	34.5	33.9	32.9	31.8	30.2	32.1	31.6
Winter	21.2	19.9	20.6	21.0	25.2	26.7	25.5	24.9	22.2	23.4	23.1

* See *Journal of Scottish Meteorological Society*, vol. vii. p. 275, and vol. viii. p. 18.

W., and N.W., attains its minimum temperature in January, and each of the directions, N., N.E., E., and S.E., in March; while all the directions except N.E. and N.W. have their maxima in July, the two exceptions occurring a month later.

8. On Ferric Ferricyanide as a Reagent for Detecting Traces of Reducing Gases. By Professor Crum Brown.

The brown solution obtained when solutions of ferric chloride and potassium ferricyanide are mixed, which may be regarded as containing ferric ferricyanide, is, as is well known, very readily turned blue by reducing agents, Prussian blue or Turnbull's blue being formed. The author uses strips of filter paper dipped in the freshly prepared solution to test for traces of reducing gases, such as sulphuretted hydrogen, sulphurous acid, &c. As nitrous fumes also blue the brown solution, reducing it, traces of them can be detected by using together a piece of paper prepared as above and a piece of iodised starch paper.

9. On the Compressibility of Water, of Mercury, and of Glass. By Professor Tait.

10. An Account of some Experiments which show that Fibrin-Ferment is absent from circulating Blood-Plasma, and which support the view, first advanced by Sir Joseph Lister, that the Blood has no spontaneous tendency to Coagulate. By Professor John Berry Haycraft.

(*Abstract.*)

Sir Astley Cooper and Turner Thackrah taught that blood was a fluid tending to coagulate, but inhibited from doing so by the living vascular walls. This view is erroneously ascribed to Brücke, who himself only professes to support it.

Sir Joseph Lister considers that blood of itself does not tend to