Solar and Magnetic Disturbances.

THE Kew photographic curves showed appreciable magnetic disturbances of a normal type on the evening of October 30 and early morning of October 31, but the first distinct precursor of the magnetic storm was an exceptionally sudden movement at about 6h. 3m. a.m. on October 31, shown alike in the declination, horizontal force and vertical force curves. This movement was largest in the horizontal force, where there was a sudden increase of about 60γ ($1\gamma \equiv 1 \times 10^{-8}$ C.G.S. unit). In the declination there was a simultaneous movement of about $7'$ to the west, apparently preceded by a very tiny movement to the east, lasting too short a time to be distinctly shown. The first large movements commenced about 6.45 a.m., when there was a movement of the declination needle to the west through about $34'$, and a diminution of 240γ in the horizontal force. The storm was most violent between 10 a.m. and 7 p.m. on October 31, but there was a large amount of disturbance until 3 or 4 a.m. on November 1.

The traces from the Kew magnetographs—declination, horizontal force and vertical force alike—went off the sheet repeatedly, so that the full extent of the disturbance cannot be derived from them. A declination magnetograph, however, of lesser sensitiveness recorded apparently the complete movement, and showed a range of about $2^\circ 12'$. Between 1 and 7 p.m. there were at least twenty to and fro oscillations of the declination needle—each occurring in but a few minutes of time—the amplitude of which exceeded $20'$. In addition to these there was a very large number of smaller oscillations. At times these followed one another so rapidly that they can hardly be seen apart on the photographic sheet. In the horizontal force there were also very numerous oscillations. The general tendency from 7 a.m. to 10.30 a.m. was towards a reduction of the force. From 10.30 a.m. to 1 p.m. the oscillations were about a value not far from the normal. At about 1 p.m. there commenced a rapid rise, which in twenty minutes amounted to about 690γ , the curve going off the sheet. During the next two and a half hours the trace was often off the sheet. Between 3.50 and 5.10 p.m. the trace crossed the sheet from edge to edge, representing a change of about 750γ , or somewhat more than one twenty-fifth of the value of the whole horizontal force. The vertical force disturbance was small at first, and did not become really large until nearly noon on October 31. From noon to 7 p.m. there were numerous large oscillations, the curve going off the sheet repeatedly on one side. At about 1.40 p.m. there was an oscillation where, in the course of five or six minutes, there was a decrease and increase of more than 350γ . The trace remained off the sheet from about 3.30 to 5 p.m. Between 5.10 and 5.50 p.m. the force diminished about 450γ .

The storm is much the most notable recorded at Kew since February 13–14, 1892.

CHARLES CHREE.

National Physical Laboratory, Richmond, Surrey,
November 3.

IN connection with the magnetic storm of Saturday last, October 31, it may be of interest to record that observations made between 10 and 11 a.m. on that day by Prof. Callendar and myself showed a violent distortion and reversal of the C line of hydrogen in the neighbourhood of the great sun-spot group, which was then a little past the central meridian. A notable feature was the apparent detachment of a portion of the dark C line, the separated part presenting the appearance of a cloudy patch, displaced towards the violet by about three tenths-metres. The observations were unfortunately interrupted by clouds.

A reversal of the C line over the same spot had been observed on the two preceding days, but though on these occasions the bright line was more brilliant than on October 31 there was much less distortion of the dark line.

A. FOWLER.

Royal College of Science, South Kensington, November 3.

Dr. Shaw's Address at the British Association.

I HAVE received the following letter from Sir Arthur Mitchell, K.C.B., who has been for long closely identified with the Scottish Meteorological Society, both as a scien-

tific worker and as an administrator, and who was one of the founders of the Ben Nevis Observatory, and I send it to you as it expresses what I am sure must have been the feeling of meteorologists on reading Dr. Shaw's otherwise admirable and inspiring address on methods of meteorological investigation.

34 Drummond Place,
Edinburgh,
October 15.

Dear Mr. Omond,—

Dr. Shaw's address to the subsection of astronomy and meteorology of the British Association in September last, by its appearance in NATURE of September 17 has quickly and effectively reached the whole scientific world, and it is misleading in important directions, quite unintentionally, I believe.

The absence of all reference to the meteorological work done by Buchan, Stevenson, Aitken, Buchanan, Murray, yourself and others will probably receive an interpretation which I hope is erroneous, for I cannot think that Dr. Shaw would designedly belittle the valuable work these men have done, which is recognised as being of a high character all over the world.

But it seems to me more remarkable that Dr. Shaw should have made no special reference to the work of the Ben Nevis Observatories. In that work a very great, costly and laborious effort has been made to advance meteorology and to add to knowledge, and this has been done mainly through private enterprise, under the guidance of the foremost scientific men of our time, including Kelvin, Tait, Buchan, Murray, Copeland, Aitken, Buchanan, Stevenson, and many others. The discussion of the outcome of this great experiment in connection with the physics of the atmosphere has only recently begun. It cannot be quickly finished, much time by many experts must be given to it, and it cannot fail to cost a large amount of money.

My special object in writing to you is to suggest that, as honorary secretary of the Ben Nevis directors, you should in some way supply what I regard as an incompleteness in Dr. Shaw's address by briefly stating how the work of the Ben Nevis Observatories now stands, and what prospects there are of its yielding further important additions to knowledge.

Very faithfully yours,

ARTHUR MITCHELL.

IN accordance with Sir Arthur's suggestion I beg to make the following statement explanatory of the present position of the Ben Nevis Observatories, and to note briefly the work carried on at and in connection with these observatories.

When the observatory on Ben Nevis was opened twenty years ago very little was known about the condition of the atmosphere above a few hundred feet height over the British Islands. The first object aimed at was to determine the meteorological constants for that position, and the relations of the air there to that at sea-level in the neighbourhood. This latter part of the work has only been adequately carried out since the establishment of the Fort William Observatory in 1890. The observations down to the end of 1892 have been published in two volumes of the *Transactions* of the Royal Society of Edinburgh (Nos. 34 and 42). The first of these was printed at the expense of the Royal Society of Edinburgh, and the second at the joint cost of the Royal Societies of London and Edinburgh. Another volume is in the press, and will be issued shortly.

The constants referred to are:—(1) The average value at each hour of the day for each month of the year of barometric pressure, temperature of the air, humidity, rainfall, direction and force of wind, amount of cloud and sunshine on Ben Nevis. (2) The relation of each of these to the corresponding sea-level values at Fort William. Immediately arising from these average values is the question of the changes induced on them, especially on the second series, by different conditions of weather—that is, the determination of the vertical gradients of pressure, temperature, &c., under varying atmospheric conditions. This discussion has been partly carried out, and the more important results arrived at are summarised in papers appended to the two volumes of observations.

One of the most interesting practical aspects of the Ben Nevis records is their application to the reduction of barometric readings to sea-level, a subject which is at present engaging great attention in this country, in the United