

they can easily do more, and so complete the good work they have so well commenced. A stranger and more disheartening reason it would be hard to imagine. Our rulers appear to have yet to learn that there is such a thing as principle in the application of public money to the promotion of the real progress of the nation. We look forward to the report of the Science Commission to define the principles on which these grants should rest; and we trust we may then have a Government both capable of understanding what these principles are, and of firmness in carrying them out into practice.

J. P. E.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.]

Aurora Borealis

THE Aurora Borealis noticed in the *Times* was observed here on Saturday the 24th inst. between 9 and 11 P.M. Another was observed on Sunday the 25th between 2.30 and 3.15 A.M.; and again another on the same day about 8.30 P.M.

I did not see the first, but I did see the two last, and the Aurora of Sunday morning appears to have been the most vivid of the three.

About 2.30 A.M. a strong red glare as of blood appeared above a thick black cloud about 40° eastward of north and 30° elevation. As this faded, the red glare appeared westward of north at the same elevation. The clouds did not extend to the horizon, which was pretty clear, and in half an hour they had passed away.

At 3.15 the sky was clear, and vivid yellowish rays extended nearly to the polar star. The rays had a gradual motion to the eastward. This was well observed by the rays passing in front of the stars of the tail of the Great Bear, which were at that time nearly parallel to the rays. I ceased observing about 3.30.

The Aurora observed at 8.30 P.M. appeared to me very faint in comparison to that at 3.20 A.M. I would hardly have noticed it if a friend had not pointed it out to me.

This same person had observed the Aurora of the 24th, and it was from his observation that I inferred that the Aurora of the morning of the 25th was also much brighter than that of the evening of the 24th.

N. A. STAPLES

Louvain, Sept. 30

Fuel of the Sun

I AM not mathematician enough to form any opinion on the merits of the controversy as to the "fuel of the sun;" that is to say, I am not able to decide whether it is consistent with the conditions of the equilibrium of the solar system that the sun's heat should have been kept up through the ages of geological time by the falling in of meteors. But I wish to state some evidence which proves that meteors are constantly falling in, though it does not touch the question whether this source is sufficient to account for the whole or any large part of the total supply of heat radiated away by the sun.

In the first place, the meteors have been seen. On Sept. 1, 1859, Mr. Carrington and another observer simultaneously observed two meteor-like bodies, of such brightness as to be bright against the sun's disc, suddenly appear, move rapidly across the sun from west to east, and disappear.

The fact that their motion was from west to east is important. If the supply of meteors to the sun is constant and tolerably regular, it is scarcely possible to doubt that the meteors, like the entire solar system, move round the sun from west to east, and occupy a space of the form of a very oblate spheroid, having its equator nearly coincident with the sun's equator.

If this is the case, the meteors ought to fall in greater numbers near the sun's equator than near his poles, making the equator hotter than the poles. Such is the fact. Secchi, without having any theory to support, has ascertained that the sun's equator is sensibly hotter than his poles. The instrument used was an electric thermo-multiplier, and the indications show, not the ratio, but the difference of the heat from the two sources compared.

It can scarcely be doubted that the meteors must enter the sun's atmosphere with a velocity not much less than that of a planet, revolving at the distance at which they enter. We know that the sun's rotatory motion is incomparably less than this, and consequently the meteors, revolving from west to east, ought to make the sun's atmosphere move round his body in the same direction, and with greater velocity in the equatorial regions, where most meteors fall in. This is what is observed. Mr. Carrington, also without any theory to support, has shown that the motion of the solar spots from west to east is most rapid in the latitudes nearest the equator. We cannot compare the motion of the spots with that of the sun's body, as we do not see his body. But the fact that the motion from west to east is most rapid in the equatorial latitudes proves that these motions are not due to any cause like that which produces trade-winds and "counter-trades" of our planet; for, supposing the sun or any planet to rotate from west to east, in any circulation that could be produced in its atmosphere by unequal heating at different latitudes, the relative motions of the atmospheric currents in high and low latitudes would be similar to that of the trade-winds and "counter-trades," and opposite to that which the motions of the spots indicate in the atmosphere of the sun. This will be true at all depths in the atmosphere.

JOSEPH JOHN MURPHY

Suggestions for the Improvement of Meteorological Investigation

THE position of Great Britain at the head of a vast empire encircling the globe, and soon to be at the centre of a network of telegraphs that will feel all the pulses of the world, imposes upon British naturalists and the British Government the duty of leading the way in the important work of meteorological investigation. In the hope of aiding the progress of this work, I venture, through your columns, to call public attention to the following suggestions:—

First:—The increase of the number of meteorological stations on and near the equator is very desirable. For instance, an increase of weather reports from the West Indies and the Atlantic States of North America, especially about latitudes 30° to 32°, would be highly valuable to the people of Great Britain and other portions of Western Europe.

Second:—In meteorological reports, we should recognise both the unity of the atmosphere and its division into areas corresponding with the great divisions of the earth's surface into land and water. As storms are generally confined within these areas, they may be called storm areas, or sections of the atmosphere in which disturbances are very closely connected. For instance, the area within which the greater storms that visit Great Britain begin and end, or circulate with destructive force, is bounded by the equator on the south, and the Rocky Mountains on the west. The northern and eastern boundaries are not yet determined. On September 7, 1869, the first "Northerners" of the season visited New Orleans; on September 8th, storms passed over the Northern States; and between September 9th and 23rd, storms passed over Great Britain and Western Europe. Again, on October 1st, 1869, the barometer at Havana indicated the approach of bad weather; on October 2nd, 3rd, and 4th, there were heavy gales and rains at New York; on the night of October 4th, occurred one of the most destructive storms that has ever visited Maine and New Brunswick; on October 6th, there was a heavy gale in England. The destructive gale in England, on October 16th, was preceded by a hurricane in New England on October 11th. These two last-mentioned storms appear to have been closely connected not only with each other, but also with the extraordinary heat which prevailed in England on October 8th, 9th, and 10th, and in France on October 11th. All the storms mentioned, however, are only specimens of the many annual disturbances of the same kind whose connection with the Atlantic Ocean as a centre has been, or may easily be traced. They are referred to here, merely to show that about an eighth of the whole atmosphere constitutes, and may be named, the Atlantic storm area. To make a weather report of much practical value in Great Britain and Western Europe, it should cover the whole of this area. The number of places, however, from which reports are published, need not be so large as at present.

Third:—The records of the atmospheric conditions and changes should be arranged with reference to the latitude and longitude of each station. At present there is no system in tabulating