

very high temperature, and therefore converted the drops of water into the spheroidal state. There they bounded and danced and rolled about like pith balls under an excited electrical receiver. Their constant rotation and well-known rippling motion gave them an opaque appearance which caused them to resemble closely a fine fall of hail. In fact, those to whom I pointed out the phenomenon likened their appearance to a fall of dusty snow at the mouth of a furnace. The sight was very striking and interesting. The workmen had taken these spheroids to be particles of scale and dust swaying about in the currents of air at the mouth of the furnace.

I have seen many times the experimental illustration of "Leidenfrost's phenomenon" at the mouth of a furnace, but I had never before seen its practical, though accidental, development, and in the incident which I have narrated above the interest chiefly attaches to the great antithesis of the fact and its appearance—snow at the mouth of a fiery furnace.

W. H. PREECE

The American Eclipse Expedition

I DEEM it but proper and just that I should correct a mistake that has just met my eye in Dr. Schellen's excellent work on Spectrum Analysis.

On page 332 of the 2nd German edition we find "Die erstere Expedition wählte unter der Anführung von Professor Morton die Stationen im Staate Iowa.

"(1) Burlington mit den Beobachtern Professor Mayer, Kendall, Willard, Phillips, und Mahoney, denen sich der als gewandter Spectroskopist bekannte Dr. C. A. Young, Professor am Dartmouth College (Hanover), und Dr. B. A. Gould für die photographischen Aufnahmen hinzugesellen."

In the English translation, edited by Mr. Huggins, the above reads, "The first expedition, under the guidance of Professor Morton, selected stations in the State of Iowa as follows:—

"(1) Burlington, where its observers were Professor Mayer, and Messrs. Kendall, Willard, Phillips, and Mahoney, together with Dr. C. A. Young, Professor of Dartmouth College (Hanover), well known as an experienced spectroscopist, and Dr. B. A. Gould, to whose charge the photographic department was committed."

Dr. Gould had no connection with the photographic expedition, but placed himself under Professor Coffin's general organisation, so that he could have facilities for making observations on the corona, and in searching for the suspected intermercurial planet.

The Burlington station of the Philadelphia eclipse expedition was placed under the direction of Dr. Mayer, and the photographs pointing page 337 of Dr. Schellen's work are two of the five plates secured by him during totality.

Also the diagram on page 338 is from Dr. Mayer's report on the eclipse (published October 1869), an abstract of which, with accompanying copies on glass of the original negatives, was presented by M. Delaunay to the Institute of France. The Rev. T. W. Webb laid them before the Royal Astronomical Society, when the report and the photographs were discussed at length at the meeting of November 12, 1869.

HENRY MORTON, President

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Mr. Spencer and the Dissipation of Energy

WILL you permit me to inquire, for the instruction of the many who are familiar with Mr. Herbet Spencer's "Doctrine of Evolution," and especially in regard to "First Principles," sec. 58, referred to by Mr. Spencer in his paper in your number for February 1, if the theory of the "Dissipation of Energy" does not upset a very considerable and significant portion of Mr. Spencer's "First Principles"?

WILLIAM SMYTH

Maidstone, February 12

THE AURORA OF FEBRUARY 4

ON Sunday, the 4th inst., was witnessed one of the most magnificent displays of aurora which have been seen in Europe within the past twenty or thirty years. To most observers in this country it appeared equal in magnificence to the two fine auroræ seen on Oct. 24 and 25, 1870, and which were especially grand in

England; but foreign observers could only compare it with those seen in 1831 and 1836. But if we take all the attendant phenomena into consideration, it will appear that, whilst others may have equalled this one in grandeur and beauty, there is not one which can compare with it either as to the wide extent of country over which it was visible, or as to the strangeness of many of the phenomena by which it was accompanied. The numerous letters which have appeared in these columns the last two weeks show how universally it was noticed in England, Scotland, and Ireland; but in addition to these, the letters and telegrams which have appeared in the daily and weekly papers—both English and foreign—show that it excited attention over a still larger area. It is difficult to trace the exact limits of this area; but when we mention Paris, Cologne, Berlin, Malta, Constantinople, Egypt, and India, it will be seen what a large extent of country is embraced. So far we have seen no account of it as having been visible in the extreme north of Europe, as in Iceland, Norway, Sweden, St. Petersburg, &c., where most auroræ boreales are so well displayed; but, on the contrary, many of the cities in which it was noticed are those which are commonly supposed to be too far south for such phenomena to be seen. The importance of this point will appear later on.

To take England first. Mr. Allnatt sends to the *Times* a long description of the appearance of the aurora as seen by him at Frant, which shows that it was first noticed at 6 P.M. in the S.W., and that by 7 o'clock it had reached the zenith. It disappeared at 7.45, but reappeared for a short time at 10.50 in the N.; but "at 7.30 P.M. the whole heavens were pervaded by this abnormal southern aurora, that had now expanded universally and dipped its supplementary bands into the northern horizon." He also writes:—"The earth's electricity was so powerful, that the gold leaves of the electrometer remained diverged for a considerable time!" Other correspondents describe it as seen at Blackburn, in Lancashire, at 7, "embracing the whole southern sky from N.E. round to W.;" from Faversham, in Kent, as visible between 9 and 10 o'clock; "from Cambridge as having its maximum intensity about 10; at Swindon as commencing at 10 minutes past 7 and lasting till 10 o'clock, "and giving as much light as a full moon, every object being clearly visible." But many observers had noticed it at times considerably earlier than those just mentioned: thus, "J.S.H.," writing in *NATURE* last week from Gloucester, "observed it at 5.30, just in the twilight, but it was then confused with the rays of the setting sun; but as the darkness deepened the aurora came out alone, and was then extremely beautiful." But still earlier was it observed at Hartlepool, whence a correspondent writes, at 5 o'clock:—"The whole of the southern sky was tinged with a most beautiful rose colour, which, as darkness set in, extended towards the zenith, where it culminated in a brilliant corona." This very early manifestation of the aurora partakes very much of the nature of a "day aurora," the possibility of which has been so much discussed in these columns (*vide NATURE*, vols. iii. and iv.) To us there does not appear much difficulty in believing that these grand meteorological phenomena, whatever their cause may be, are independent of merely relative time, and that the reason why they are mostly observed at night is because the purely local circumstances are then most favourable to their observation. That an aurora should wait till night-time before it manifests itself hardly seems probable, whilst, on the other hand, that the more brilliant light of the sun should prevent auroral displays being seen in the day-time is not only probable but is borne out by what we know of the light of the stars and planets. No one believes that stars only shine at night-time, why then should there be a belief that auroral displays take place only at night-time, especially when it is remembered that the experiences of polar travellers in their sunless regions are distinctly against it? But this is a digression arising from the fact that in comparative daylight we have distinct and independent evidence of this aurora having been observed. In addition to those already