Taken, then, on the whole, this aurora of February 4th was one of the most brilliant, most interesting, and most widely visible which has been witnessed for many years past, and is probably one that will cause renewed attention to be paid to the still unsolved problem of their causes.

J. P. EARWAKER

[We have also received the following from J. W. Spengel of Berlin:—"At Berlin, the sky being covered by clouds, no one could see anything. But a young astronomer of our observatory told me that he had recognised the existence of a mighty aurora by means of the spectroscope. The magnets were also vehemently disturbed, and all the telegraphs failed for several hours. The following appears in the *Leipziger Allgemeine Zeitung* for Feb. 8:—'Freiberg, Feb. 6. The aurora observed by many on the evening of Sunday caused here a complete interruption of communication through the telegraph wires for some time. The intensity between 5·40 and 6·45 overcame the strength of the battery at this station, so that it was not possible to change the oscillations of the magnetic needle caused by the earth-stream. After the northern light had become fully developed the oscillations became stronger, and followed one another at short intervals until the phenomena entirely disappeared about 7 P.M.' At Warmbrunn in the Riesengebirge, the aurora was seen magnificently from 6 to 8·30. Towards 10 it had almost disappeared. The thermometer indicated 0° C., with a violent storm from the south-west. About 11 the storm suddenly subsided; the thermometer fell to − 1·5°, and the aurora appeared for the second time in the same manner and with the same uninterrupted play of colours as at 6. After 11·30 the storm recommenced, and the aurora disappeared soon after 12. The play of the aurora on the snow-covered mountains is described as one of the most magnificent sights that can be conceived."—ED.]

REFERENCE SPECTRUM FOR THE CHIEF AURORA LINE

WHILE Nature herself seems to delight in surrounding some questions with triple difficulties and mysteries almost inscrutable, there are other questions which she has made the easiest of the easy if men will only use the means which she has prepared. And amongst such easy questions, no more signal example can be quoted than the exact spectrum place, within very narrow limits indeed, of Angström's yellow-green aurora line, whenever any aurora at all appears.

This chief aurora line coinciding precisely (as I believe I may say from my own observations, though by means of the roughest of home-made apparatus) with the second line, at W.L. 5579, of the citron band of the blue base of flame, from any and every material used for artificial illumination by man, and having immediately on one side the 1st line, of the same strength with itself, at W.L. 5630, and on the other side the fainter 3rd line, at W.L. 5535, of the same citron band; the smallest variation of spectrum place in the aurora line can be instantly perceived by the eye on this chemical scale, without the aid of any mensuration apparatus.

And yet in your last impression a respectable spectroscopist, after much labour, informs the Academy of Sciences in Paris, on Feb. 5, that Angström's yellow-green aurora line is somewhere close to Fraunhofer's solar line E, *i.e.* W.L. 5269; and in your previous impression a returning Indian observer considers the same Angström line to be somewhere near F, or W.L. 4860. Now, not only are these statements in error to the extent of from 30 to 70 times what they need be, but they cruelly drag us backwards in what should be the always onward course of science, and cause men to flounder once again in that slough of confusion they were immersed in a couple of years ago, when the chief solar corona line, at W.L. 5316, and Angström's grand aurora line, at W.L. 5579, were stated to be one and the same line, in the same place.

Excuse may, indeed, be proffered for these two observers, that they did not know of such a convenient night reference-spectrum as that which I have now alluded to; and then comes the question as to whose fault was that.

A full description of the method (after extensive trial for several months) was sent by me to the Royal Astronomical Society on May 30, 1871, with the particular request that the paper might be read at their June meeting and printed in the June Monthly Notice. This was mainly with the hope of supplying some possibly useful hints to the intending eclipse-corona-observers of December. The paper, however, though taken in, was neither read at the June meeting (if I am rightly informed) nor did it appear in the June Monthly Notice; but was handed over to secret referees, who simply sat upon it during six long months—or until the eclipse was safely past, and then they began to hint about possible objections being likely to be taken against some parts of the paper.

Of course I could not allow so admirable a society to run any risks of which they were afraid on my account; so I withdrew the paper thereupon, and am now engaged in publishing it myself, sustained in so doing by the hope that, although the eclipse for which it was mainly intended is irretrievably gone, its pages may yet be useful to some spectroscopists of aurora; and, in fact, that through their influence certain of both French and English observers will cease to attempt comparing the faint aurora's chief line with a bright solar spectrum, which they can never see in combination therewith (and if they could it has no coincident lines), but with a cheaply-procured chemical spectrum, which only comes well into view under the darkness of night, and is gifted by Nature in the spectroscope with an easily recognisable line in apparently absolute coincidence with the cosmical line of Angström.

C. PIAZZI SMYTH

15, Royal Terrace, Edinburgh, Feb. 16

*AMERICAN DEEP-SEA SOUNDINGS**

UNDER the title at foot a pamphlet of thirty-three pages, accompanied by a large chart, and illustrated by several diagrams and tables, has been issued. The school-ship *Mercury* is a vessel belonging to the commissioners having in charge the hospitals and prisons of New York city, and is employed for the purpose of training boys, committed by the magistrates for vagrancy and slight misdemeanours, to become thorough seamen. Instead of growing up to be a curse to the community, such boys are made into valuable men. The adventurous life has a special charm for them.

An essential feature of the discipline on this ship is to make long cruises, by which the boys are fitted quickly to enter into the service of the navy or mercantile marine. Of 258 boys carried out on this voyage, 100 were on the return of the ship, in the opinion of the captain, capable of discharging the duties of ordinary seamen.

The commissioners, in addition to the above object, desiring to advance the interests of science as far as lay in their power, instructed the captain, P. Giraud, to obtain a series of soundings on the line of or near the equator, from the coast of Africa to the mouth of the Amazon, to observe the set of the surface currents and the temperature of the water at various depths. He was also directed to bring home specimens of water and of the sea bottom.

The ship sailed on December 20, 1870, and arrived at Sierra Leone on February 14. On February 21 she left

* Cruise of the school-ship *Mercury* in the Tropical Atlantic, with a Report to the Commissioners of Public Charities and Correction of the City of New York on the chemical and physical facts collected from the deep-sea researches made during the voyage of the nautical school-ship *Mercury*, undertaken by their order in the Tropical Atlantic and Caribbean Sea, 1870–71. By Henry Draper, M.D., Professor of Analytical Chemistry and Physiology in the University of New York.