

bright lines were also found in the spot spectrum, and between C and D some very peculiar shadings terminated sharply at the less refrangible limit by a hard dark line, but fading out gradually in the other direction at a distance of three or four of Kirchhoff's scale divisions. The interpretation of such markings is not quite clear, but would rather seem to point to such a reduction of temperature over the spot-nucleus as permits the formation of gaseous compounds by elements elsewhere dissociated, since these shaded spectra are quite probably characteristic of non-elementary substances, a view fortified by Schuster's recent beautiful investigations upon the spectrum of nitrogen.

Many more or less remarkable solar eruptions were observed, though none on quite so magnificent a scale as some before recorded. On several occasions velocities of from 150 to 200 miles per second in the ejected matter were observed by means of the displacement and distortion of the hydrogen lines, and on one occasion a velocity of nearly 250 miles was attained. One of the finest eruptions was visible on the surface of the sun itself in the immediate neighbourhood of a large spot.

A careful comparison of some of these observations with the corresponding magnetic records at Greenwich and Stonyhurst, for copies of which records I am indebted to the courtesy of Sir G. B. Airy and Rev. S. J. Perry, goes far to show that, although probably the greatest magnetic disturbances are due to terrestrial causes, or at least are only indirectly results of solar or cosmical influences, yet, on the other hand, every solar paroxysm does have a distinct, direct, and immediate effect upon the magnetic elements. Thus on August 3 such solar paroxysms were noted at 8.45, 10.30, and 11.55, also on August 5 from 6.20 to 7.30 A.M. (Sherman time), and the last was the only outburst during the day.

Now the annexed figure (Fig. 1), from a photographic copy of the vertical force curve for these days at Greenwich, shows marked and characteristic disturbances at the points indicated, which, allowing for the longitude, correspond to the very instants when the solar disturbances were noted. Further comparisons of such phenomena will be necessary to establish the conclusion with absolute certainty; but in the meantime it seems altogether probable that every solar disturbance receives an immediate response from the earth, and that the magnetic impulse travels with, sensibly, the velocity of light.

I must not close without alluding to certain observations that enable us to distinguish, to some extent, between the substances ejected from the sun, and those constituting the atmosphere into which the irruption takes place. Certain lines during these outbursts were distorted and displaced, while others near them, equally conspicuous, were wholly unaffected.

Thus on August 3 and 5, the former class included the lines of hydrogen, D₃, the lines of sodium, magnesium, and many of those of iron; in the latter were K534, 1474, 1505, 1515, 1528, 1867, 2007 (1870 and 200 were intensely disturbed), 2581, and probably the two Hs; I say probably, because the observation of these lines was too difficult to permit absolute certainty, still I feel very confident that they were unaffected. The barium lines also seldom seemed to participate in any disturbance.

The obvious moral of our summer's work seems to me this, that no time ought to be lost in occupying points of such advantage with the most powerful instruments: the great telescopes now building should be put in a position to profit by such atmospheric conditions as will secure their utmost efficiency, for while it is of little consequence to science whether ordinary glasses are placed where their power will be increased by 25 per cent., it may make a difference of years and decades in her advance if the new artillery opens its attack upon the heavens from the mountain-tops instead of from the plains.

Dartmouth College, Nov. 25

C. A. YOUNG

THE TRANSIT OF VENUS

AT the meeting of the Astronomical Society on November 8, a sketch was given of Lord Lindsay's preparations for the forthcoming transit of Venus. Lord Lindsay has selected the island of Mauritius as his station, on account of its highly favourable meteorological conditions. He intends, if possible, to combine the following methods of observation:—1. Observations of the internal contacts to be worked out on the plans of Halley and Delisle. 2. Observations of the first external contact at the chromosphere, to be made with the spectroscope. 3. Photographic pictures. 4. Heliometric measures. For the longitude it is at present intended to use the transits of the moon with an altazimuth made by Simms. As it is expected that the Germans will also have a station on the Mauritius, Lord Lindsay will connect his station with theirs by triangulation. The transit instrument is by Cooke, and has four inches aperture. The chronograph, which can be kept in motion for four hours, has four barrels, each of which can be worked separately, thus avoiding all confusion. The photographic method to be used is that of Prof. Winlock, who suggests a telescope of 40 feet focal length, placed horizontally, and a heliostat to reflect the sun's image along it. The lens is to be an achromatic one. It is intended to have two planes to the heliostat, one mounted on a polar axis, and another to send the rays down the tube. Lord Lindsay has ordered a Foucault siderostat with 16-inch mirrors, and has obtained a 13-inch unsilvered mirror to fit the telescope to be taken out. He intends to use a heliometer, though it is not much in favour in this country, Messrs. Respald, of Hamburg, having undertaken to make one for him with all the improvements used in the Oxford instrument, as well as in some others. The Germans intend to send one to Kerguelen Land, and the Russians will use it at Lake Baikal and the mouth of the Amoor. Lord Lindsay's will include the motion of the halves of the object-glass in curved slides, so that the images will remain in focus; unlimited rotation of the tube in the cradle; the measurement of the position angle at the eye end, and measures of the micrometer read there also. Some new points are;—the graduation of the slides of the object-glass side by side, so as to be read by the same microscope; an arrangement to shut off light from half the object-glass, so as to equalise the light of the images; and the introduction of a thermometer at the end of the tube. Lord Lindsay proposes to eliminate errors of division as affected by temperature, by placing the instrument on one of the collimating piles of his transit circle at home, and heating the room by gas to different temperatures. It is hoped that, by taking a large number of measures, and by taking the most careful precautions, the original error of observation may be reduced to less than $0^{\prime\prime}.5$, and thus make the result one of extreme accuracy.

Lord Lindsay will be glad to receive the advice and assistance of astronomers accustomed to use the heliometer. Mr. D. Gill will accompany Lord Lindsay, the two dividing the work of observing between them.

THE "CHALLENGER"

ON Friday last, Dec. 6, several members of the council and "the Circumnavigating Committee" of the Royal Society, by invitation of the Lords of the Admiralty, inspected at Sheerness H.M. ship *Challenger*, which sailed on Saturday on her three or four years' scientific circumnavigating expedition. The Government have all along consulted the Royal Society as to the fitting out of this expedition, and have liberally carried out every suggestion made by the Circumnavigation Committee. The visitors to Sheerness on Friday included many distinguished men of science, among them being Sir William

Thomson, Sir Charles Wheatstone, Prof. Huxley, Dr. Carpenter, Sir Henry Holland, Prof. Stokes, Prof. Allman, Dr. Hooker, Mr. Siemens, and others. Under the guidance of Captain Nares, the commander of the *Challenger*, Prof. Wyville Thomson, the scientific leader of the expedition, and other members of the staff, the visitors inspected with keen interest all the fittings and appliances with which the handsome ship has been furnished for carrying out the purposes of the expedition. Everything appeared complete, and the perfection and abundance of the preparations excited the universal admiration of the visitors. Government, in this instance, have acted with the most praiseworthy liberality. The ship itself has a greater tonnage than the three ships together which formed the expedition of Cook in 1772. After the visitors had completed their inspection, they were entertained to an ample luncheon in the ward-room, under the presidency of Captain Nares. A few toasts were drunk and a few very brief speeches made, in which some well-deserved compliments were paid to those most intimately connected with the expedition. Dr. Carpenter felt sure that under Prof. Thomson's superintendence "no fact would be let go, and that every fact would find its place and its value when results came to be worked out;" while Prof. Thomson said that if the vessel were not thoroughly equipped, it was the fault of the scientific staff; they had met with every encouragement from Government to ask for what is necessary.

We are sorry to hear that the *Challenger* has already met with a little rough treatment from some of the elements she is bound to explore. In the fierce gales which prevailed on Sunday, she lost her cutter, and was compelled to put into Deal. We believe no serious delay will result from this accident, which, we hope, may be the only one of the kind the party may meet with. According to present arrangements she leaves Portsmouth on Monday next.

We cannot, however, but express our regret that the party were allowed to set off on an absence from England which may be prolonged for four years, animated, in their voluntary exile, by no motive but a desire to promote the interests of science, without some more official and more extended acknowledgment from their scientific brethren throughout the country than a few after-lunch speeches on board the corvette. Our contemporary *Punch* has, however, given his accolade to the expedition in some spirited lines:—

"Broadside guns have made room to ship batteries magnetic,
Apparatus turns out ammunition,
From main-deck to ground-tier I'm a peripatetic
Polytechnic marine exhibition."

PROCEEDINGS OF ZOOLOGICAL COLLECTORS

MR. T. K. SALMON has lately transmitted to his agent, Mr. E. Gerrard, jun., of Camden Town, a fine collection of birds from the province of Antioquia, United States of Columbia. Amongst them are specimens of a new Humming Bird, which Mr. Gould has described as *Adelomyia cervina*. Mr. Salmon has now pushed forward into the upper valley of the Cauca, where he will enter upon untrodden ground.

Mr. Henry M. Whitely has also been very active lately in the district he is now exploring, in the Andes of Carabaya, east of Cuzco, Peru. His last collection contains some very fine species of Tanagers, previously only known from d'Orbigny's specimens in the Paris Museum. There are also several remarkable humming birds in Mr. Whitely's collection, one of which, being new to science, Mr. Gould has named *Iolama Whitelyana*, after its discoverer.

Letters have been received from Mr. Charles R.

Thatcher, who is *en route* for the Philippines, announcing his arrival at Yokohama, *via* San Francisco, and immediate departure for his destination. Mr. Thatcher will attend principally to the land-shells and birds of the Philippine Archipelago. P. L. S.

NOTES

THE Italian Government has ordered a massive gold medal, with a suitable inscription, to be prepared for presentation to Dr. Livingstone. The medal was to be ready by the 3rd inst. and was to be consigned—with an official letter addressed in the king's name to the great traveller—to Sir Bartle Frere, in the hope that he may either present it in person, or forward it to him by some safe hand. The Commendatore Negri Cristoforo, President of the Italian Geographical Society, has been the prime mover in bringing about the gratifying recognition of Livingstone's labours in behalf of Science and humanity; and the Italians generally appear to be delighted with the idea of being the first to tender him this national proof of the high estimation in which they hold him. On one side the medal bears the bust of the king, with the legend "Vittorio Emanuele II. Rè d'Italia," and on the obverse "A Davide Livingstone, Vittorio Emanuele II. 1872."

AT a meeting of the Geographical Society on Monday night, Mr. Francis Galton, who occupied the chair, stated that he believed Sir Bartle Frere would probably be in Alexandria that night, and that Lieut. Grandy, leader of the "Livingstone Congo Expedition," would land in Sierra Leone about the 15th of this month. Mr. Galton also announced that a long list of astronomical observations had been received from Livingstone by Sir Thomas Maclear, at the Cape, who says they will take three or four months to reduce.

WE greatly regret to have to record the death, on Monday last, of John Keast Lord, the manager of the Brighton Aquarium. We learn from the *Brighton Daily News* that Mr. Lord was laid up with a severe attack of paralysis some months since, but though it was known that he was not in the enjoyment of robust health, it was far from being generally thought that his indisposition would so soon be brought to a fatal termination. Originally a captain in the Royal Artillery, in which capacity he served in the Crimean war, and took part in the battle of Balaclava, Mr. Lord seems to have always entertained an intense love for the study of natural history; and at the close of the Russian campaign he quitted the army for a field in every way more congenial to his tastes. He now devoted himself to the study of nature in good earnest, and spent some time in Vancouver Island, which he appears to have thoroughly investigated. The results of his labours were afterwards given to the world in "The Naturalist in Vancouver Island." Mr. Lord afterwards served on the North American Boundary Commission, and later on was engaged by the Viceroy of Egypt to report upon certain characteristics of that country. It was from Egypt, we believe, that he was called by the directors of the Aquarium to take the appointment for which he was so peculiarly fitted.

THE University of Cambridge has passed a resolution by which in future successful candidates in Moral Science can present themselves for the next Natural Science Tripos, and *vice versa*.

AN examination for minor scholarships for students intending to commence residence at Cambridge next October will be held at Clare College on Wednesday, March 25, 1873. One of these of the value of 50*l.* tenable for 3½ years, will be awarded for Natural Sciences. The subjects are Chemistry, Chemical Physics (including Light, Heat, and Electricity), Comparative Anatomy and Physiology, and Geology. Excellence in any two