should have written occasionally with looseness and inaccuracy; for example, at p. 52 we find "Vertical iron at the same place will produce the same deviation in whatever direction the ship's head may be, because a vertical line makes always the same angle at the same place with the line of force." There is confusion of cause and effect here—the deviation is not the same in whatever direction the ship's head may be, although the force remains constant or nearly so—and these are important features for the student to realise.

Notwithstanding, however, these shortcomings, Dr. Merrifield's "small manual" may in the main be received as an orthodox production, and will tend to divert the attention of his students from some singular statements and conceptions relating to the deviation of the compass on board ship and its compensation, to be found at pp. 20-23 of his *Navigation and Nautical Astronomy* published conjointly with H. Evers in 1868.

We hope to see manuals of this smaller class emanating from seamen, who, possessed of the knowledge of the exact requirements in the practice of their calling, can extract from original sources, and simplify the main points in the various divisions of the subject.

LETTERS TO THE EDITOR

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

Solar Spectroscopic Observations

I HAVE just seen Herschel's letter to you in *NATURE* of October 3, and am induced to address you, lest his remarks on Indian Climate should make difficulties in respect to the British Association's proposal for a physical observatory for solar observation.

I do not think Captain Herschel has been in England since the Eclipse of 1868, and consequently he cannot speak from experience of the English climate. It is beyond all doubt that from some cause (commonly believed to be haze) there are really very few days when the protuberances can be studied in England. Herschel's letter contains evidence that that cause, whatever it be, is absent in India. We need not go further; we have the two facts (1) that it is impossible in England, with great telescopic power and great dispersion, to see the prominence lines regularly; (2) that it is possible to do so in India, even in the plains at a bad season. The result seems to be that solar investigations should be pursued in India systematically.

I may add that the facility of seeing these things, and the probability that spectroscopic inquiries into the celestial bodies would have been more successful in the earlier stages had there then been any observers in India, are to my mind a strong argument for now establishing in India, and on a permanent footing, an observatory, whose speciality shall be "Researches on the Physics of the Sun and Planets," whether by the spectroscope, or vision, or photography. When the proposal of the British Association is made formally to the Government by the Council, it will, I trust, take this form. There is no such institution now in the British dominions, and when one is established, it should be in the Tropics somewhere, and as systematically devoted to physical researches as Greenwich has been to the moon.

The Director might, probably would, as at Greenwich, in time attach other investigations; but these researches should be his primal object; and, if they were made so, there is no reason why work as standard and as useful should not result.

October 4

J. F. TENNANT

Consciousness and Volition

THE question raised by Mr. Bennett in last week's *NATURE* is of great importance, and of no small difficulty. During a visit to the late Sir William Hamilton in 1855, this subject came up for discussion. Sir William was then engaged on his edition of the works of Dugald Stewart. I called his special attention to Stewart's doctrine regarding the operation of Will in acts which are usually ascribed to Habit. Stewart asserts that all habitual actions are really voluntary. As he had no acquaintance with the modern doctrine of "latent mental modifications," he

would naturally take for granted that there can be neither a volition nor any other act of mind without accompanying consciousness. He accounted for the non-remembrance of that consciousness by the extreme rapidity of the volitional action. (Collected Works, vol. ii. chap. ii.) To this Sir William objected. He went on to show that in many cases an act, or even a long series of acts, originally voluntary, have ceased to be so. The habit or habitude, which is a mental tendency, though not a power, generated by custom, supplies the place of volition. In illustration, he referred particularly to the well-known fact that in India soldiers will march long distances when they are asleep. Now, it seems to me that this decides Mr. Bennett's question. Here we have regulated action, determined, not by volition, but by habit. Sir William, however, failed to meet all my difficulties, because, as I afterwards saw, of his unsatisfactory theory of causation. He so frequently confounded conditions with causes. With him a cause denoted anything without which an effect could not be; hence his doctrine of con-causes, a plurality of causes for each effect. Thus, when I will to move my hand, and the movement follows, Sir William would call the volition *one* cause of the movement, whereas it is merely a condition. It is remarkable that he should fall into this error since he rejected Biran's doctrine regarding the efficiency of volition. In a subsequent conversation we discussed the points of similarity and the points of difference between Habits and Instincts. It would, however, be trespassing on your space to give the details.

I will only add that an "unconscious volition" in the sense intended by Mr. Bennett is not possible. Dr. Carpenter's expression "unconscious cerebration" I regard as unfortunate, since it appears to rest on the assumption of the essential identity of mental, vital, and physical powers. Mr. Bennett will find many valuable observations on the nature and conditions of habitual acts in Hamilton's lectures on "Metaphysics," Morell's "Outlines of Mental Philosophy" (published in 1862), and Sir Henry Holland's "Mental Physiology."

JOHN MOORE

Stamford House, Sale, near Manchester, Oct. 14

The Solar Spectrum

UPON reading the communication from Capt. Herschel in your number for October 3, upon the solar spectrum, I seem to remember a letter from a correspondent being published some year or more ago in your pages, in which it was stated the writer had seen the bright lines near the sun's limb with one of Browning's direct vision prism spectroscopes, the instrument being placed on the back of a swing looking-glass as a stand. The dispersion of this instrument would be probably rather more than that of one angular prism. I am bound to say that I have been unable myself, up to the present time, to do more than see a bright line near D, superposed on the solar spectrum, with such an instrument as, however, for other purposes, is a most convenient and sufficiently powerful one.

To my own I have added three small wedge-shaped pointers cut out of thin brass, and fixed in the eye-piece, while the slit-plate, and consequently the spectrum itself, is drawn across the field by a micrometer screw having a range of about 600 divisions between its starting point near A and G at the other end of the spectrum. In this way a bright line (say the auroral one) may be brought upon one of the pointers, and its distance from D, in a salted spirit-lamp flame, at once accurately measured and mapped down; and if the pointer is again brought on the line after the observation, it may be verified by the position of the pointer next day upon the solar spectrum itself.

It occurred to me the other evening to try the effect of a V-shaped slit, and it seems to me to have some advantages. The lower ends of bright lines being brought to a fine point, are more easily positioned on a scale or pointer, while the tapering of faint or nebulous lines or bands enables their relative intensity to be more easily compared. My experiment was a rough one, and with a home-made slit; but for working purposes, by a sliding plate a slit might be contrived of a V shape, whose width and length would be altered at pleasure; and it would, I think, for some observations give good results.

Guildford, Oct. 7

J. RAND CAPRON

A Day Aurora

A CONTROVERSY was carried on in your columns about a year ago as to the possibility of an aurora being seen during the day time. A recent communication from Padre Secchi to the French

Academy of Sciences will be found of interest as bearing on this question. Writing from Rome on the 27th of August, he says (*Comptes Rendus*, p. 613):—"On the 15th of this month we had an Aurora Borealis by day, at ten o'clock in the morning up to midday. The magnetometers were greatly disturbed, and in the heavens at half-past ten appeared an arch of light cirrus clouds, stretching from N.N.W. to N.E., and crowned along the whole of its contour by numerous and fantastic rays (*jets filamenteux*). The forms of these rays so perfectly resembled those of the solar protuberances that some of the drawings of them might easily be mistaken for drawings of solar protuberances even by people well accustomed to these observations."

Merton College, Oxford

J. P. EARWAKER

Meteor

LAST night, Oct. 9-10, about midnight, G.M.T. a meteor was seen by my wife in the S., considered by her to rival the brightness of Venus, and describing a path which was so carefully sketched by her immediately afterwards as to form a possible basis of comparison; and which therefore may be thought worthy of insertion in NATURE. It seems to have become visible near ζ Ceti, probably rather *near* that star (which, however, was not noticed by her through a dewed window-pane), and to have passed with a slow motion and a yellowish light, in a path somewhat convex towards the zenith, in the direction of β Ceti, before reaching which it vanished. For about three-fifths of its course it preserved the same aspect, as of a ball of light with sparklings round it, and some appearance of a train; but in its further progress it seemed to waste away to extinction.

T. W. WEBB

Hardwick Vicarage, Herefordshire; according to Ordnance Map, long. W. 3h. 4m. 23s., lat. N. 52° 5' 20".

Fossil Oyster

I HAVE recently noticed a fossil oyster, in what Sir C. Lyell calls the Lower Miocene, or Hampstead beds. Can you, or any of your readers inform me if it has been noticed before. I can find no mention of it, in any work within my reach. I have been a subscriber, from your first number; and have observed the kind notice you have extended to other inquirers, and have thus been emboldened to trouble you.

INQUIRER

N.B.—I have no pretensions to science, or any scientific acquaintance, being merely a solitary observer.

AN ELECTRICAL BAROGRAPH

I HAVE recently designed a barograph, a brief account of which may be interesting to your readers. The advantages claimed are:—

That the record may be seen as it is going on.

That it is quite as, if not more sensitive than, the photographic barograph, and the scale is larger.

That no time is lost preparing the paper, printed forms answering the purpose.

That the first cost and cost of working are both much less than in the photo-barograph.

A photograph has been taken which shows the instrument in working order, with part of a day's record shown on the cylinder.*

The cylinder is ten inches long, and eight inches in diameter, allowing for one inch per hour of paper.

The clock, or governor, is connected by a bar to a movable inclined plane, this is again connected by a bar to the long wire parallelogram which carries the pen, and the clock, by means of an eccentric, causes the inclined plane, and with it of course the pen frame, to move backwards and forwards once every minute. The wire frame is guided by four brass friction wheels, attached to a brass frame having motion up and down only; under it are the coils of an electro-magnet, the armature of which is attached to the brass frame. So long as no electricity passes through the coils the brass frame is thrown up by a small spring high enough to lift the pen off the paper.

* A photograph and section were obligingly forwarded by the author with his description.

The barometer tube is an ordinary glass one 0.58 in diameter, and is fixed firmly to the case. Its cistern is a small glass one, one inch in diameter, and cemented to a brass arm hinged to the left side of the case, and which allows it perfectly free motion up and down, but not sideways. From this cistern projects a very light arm, also hinged, and bent at the end so as to extend over the inclined plane. One wire of the battery is attached to the cistern arm, and the other, after passing round the magnet, to the inclined plane. As soon, then, as these two parts touch, the electro-magnet brings down the brass frame, and with it the pen, on to the papers which at once begins to mark, and continues to do so until the motion of the clock draws the inclined plane from the cistern arm, and so breaks the contact; the pen remains off the paper until, by the motion of the clock, the inclined plane is brought to touch the projecting cistern arm, when the pen at once begins to write. As the barometer, when the pressure increases, must draw the mercury for its increased height from the floating cistern, the cistern becomes lighter, and rises with it, and the smallest motion may be made sensible by altering the inclination of the moving inclined plane. The accuracy of the motion of this plane is secured by making it work on two fine steel points—the same motion, in fact, as that given to the cutter of a dividing engine. The cistern floats in a reservoir of mercury.

The pen is a syphon pen, supplied with *thin* ordinary writing ink.

H. C. RUSSELL

Sydney Observatory, Aug. 10

BEAUFORT'S WIND SCALE AND THE BOARD OF TRADE*

THE Board of Trade have recently issued instructions to Receivers of Wreck and Officers of Coastguard, with reference to Beaufort's Wind Scale, so that one uniform construction should, as far as possible, be placed upon the wind scale by them. In the Circular the following passage occurs:—

"The Board of Trade are led to think that different constructions are placed by different persons upon the scale known as Beaufort's scale. In illustration, it may be remarked that the higher forces, 11 and 12, are, as the Board learn from the Meteorological Committee, scarcely, if ever, reached in the British Isles. Force 12, which is intended to represent a West India hurricane, the velocity of which is 80 miles per hour and upwards, has been reached only twice in four years on the coasts of the United Kingdom; notwithstanding high winds prevailing at the time of a wreck are frequently described by the ships' officers as storms or hurricanes."

It is here taken for granted that the positions of the anemometers of the Meteorological Committee are such as to record observations of wind fairly comparable with those felt at sea; and also that the anemometers are constructed to record those velocities of the wind which are applicable to the case in hand.

It is not stated how the two instances of velocity of 80 per hour and upwards were ascertained. Since, however, the space traversed or recorded by the anemometers at the observatories of the Meteorological Committee can scarcely be measured for a shorter period of time than 15 minutes, it may be assumed that on two occasions, and only on two occasions during four years, have the anemometers been noted to record a velocity of 20 miles or upwards in 15 minutes—that is, a velocity at the rate of 80 miles an hour or upwards. If the tracings of the Hemispherical Cup Anemometer could be read off for so short a period as five minutes, many instances of 80 miles an hour, and even several velocities of 100 miles an hour and upwards, could be taken from the records of these four

* See Circular, No. 558.