trary, I will merely remark that if you, or any of your numerous readers who may feel interested in this subject, will favour me with a visit to my establishment, I shall be happy to give the fullest explanation as well as show the great difference existing between the two, will point out the cause of failure in their arrangement, and also the reason of the complete success of my own thermometer.

Though perhaps it is unfortunate for your correspondents that their reference to Dr. Miller was not made during his lifetime, yet, admitting that he said he was not aware of their arrangement, I must ask in all seriousness, What had their thermometer accomplished to make any one acquainted with it?

Facts speak for themselves. Their arrangement still remains without result, whilst my thermometer, which has solved the great problem of the true temperature of the sea even at its greatest depths, has been adopted not only by our own Government, but also by all the principal Governments and scientific authorities throughout the world. LOUIS P. CASELLA

147 Holborn Bars, Nov. 3

Squalus spinosus

ON the 9th inst. the fishermen of Durgan, in Helford Harbour, sent for me to look at a fish new to them, which had been caught (with a ½*d.* hook) on the preceding night near its entrance. Congers had been numerous, but suddenly ceased to bite. The fish (a spinous shark) had been hooked in the corner of its mouth, out of the reach of its sharp teeth, had wound the line many times round its body, which was 7 ft. in length, and 30 in. in girth, being longer and more slender than one of which I sent a notice to the Royal Cornwall Institution 38 years ago. The back, sprinkled over with spines, was of a dark grey colour, the belly nearly white. It was a male fish. The lobes of the liver were 4 ft. in length. In the stomach was a partially digested dogfish, 2 ft. long. The upper lobe of the tail was muscular and long, perhaps to aid its ground feeding, the lower lobe more marked than in Dr. A. Smith's drawing, as given by Yarrel, and entirely unlike that of the Filey Bay specimen. Twelve hours or more after its capture, when all external signs of life had disappeared, I was surprised to observe the regular pulsations of the heart.

Prof. Huxley has not observed a correspondence between the mass and large convolutions of the brain of a porpoise and its intellectual power.

Several years ago a herd of porpoises was scattered by a net, which I had got made, to enclose some of them. It was strong enough to catch tigers if set in the straits of Singapore, across which they sometimes swim. The whole "sculle" was much alarmed, two were secured. I conclude that their companions retained a vivid remembrance of the sea-fight, as these cetacea, although frequent visitants in this harbour previously, and often watched for, were not seen in it again for two years or more.

Trebah, Falmouth, Oct. 27 C. FOX

Zodiacal Light

IT is a matter for regret that with the magnificent opportunities of investigating the character of the Zodiacal Light afforded to Maxwell Hall by his elevated position in Jamaica, he does not seem to have brought the powers of either the spectroscope or polariscope to bear on it.

I think the full importance of the inquiry is hardly appreciated by many. Taking the generally accepted theory of the light—that of a lens-shaped disc of luminous matter, with the sun for its centre and a diameter exceeding that of the earth's orbit—its matter, lying as it does in the plane of the elliptic, actually connects us with the sun, and may be the medium through which the solar magnetic forces act upon our own.

The intimate connection between solar outbursts, auroras, and terrestrial magnetism is an established fact.

To the aurora, the zodiacal light is by many conceived to be nearly allied, and I do not think the evidence hitherto adduced against this theory is at all conclusive. The remarkable wave of light seen by Maxwell Hall is strongly in favour of it; and though spectroscopic observations seem to point the other way, they are as yet so scanty in number that it would be as unfair to argue from them the want of connection between the two phenomena, as it would be to assert that the planets have no volcanic fires of their own because they only give us a reflected solar spectrum.

Assume the zodiacal light to consist of solid particles of matter—planet dust—shining by reflected light, and it is not difficult to imagine the aurora playing amongst these tiny worlds, each of which might have its own small magnetic system, swayed like our own by the master magnet, the sun.

So far as my own experience goes I can see no objections to this assumption. Though I have seen the light very brilliant in both its branches, I have never yet found it to have a decided outline. Nor have I been able to trace it either east or west to 180° from the sun. Granting that this can be done, however, the apparent vanishing point of the earth's shadow lies comparatively near us, and far within this again is the point at which the shadow would subtend only a degree or two of arc, and at which it would be very hard to discern mid the feeble light of this portion of the zodiacal light; so that a slight extension of the diameter of the disc would remove any objection that might be raised under this head.

Imagine one of Saturn's moons revolving in an orbit within his belts, and fairly embedded in the matter, which, for the sake of the argument, we must assume to be illuminated by the planet. To inhabitants of that satellite each night would bring a phenomenon closely resembling our zodiacal light, only far more brilliant. At midnight two cones of light would taper upwards east and west, and meet overhead. The brightest portion of each cone would be that along the axis and nearest the horizon. Towards the summit and on the borders, where the line of sight would lie through less depths of matter, the light would gradually fade away, but from the satellite being embedded in the belt, the entire sky would be more or less luminous.

Has it not been noticed on our earth that when the zodiacal light has been seen unusually bright, a "phosphorescence" of the sky was everywhere visible? May this not arise from our solar belt in a somewhat similar manner?

From my personal observations I see no reason to give a lenticular form to the disc. Parallel faces would afford a perspective such as the zodiacal light appears to me.

I would urge observers who may be fortunately situated, not to neglect opportunities. So far as I am able I shall do my best to aid the work of inquiry, and with the powerful instruments that Browning is forwarding me, placed at an elevation of more than 6,000 ft., under the clear skies of our Indian winter, I trust I shall be able to add something to our knowledge of the zodiacal light.

I should feel much indebted to any of your readers who would inform me which is the best adapted polariscope for such researches, and whose (amongst makers) speciality such instruments are. E. H. PRINGLE

Camp Udapi, South Canara, Oct. 3

Cold Treatment of Gases

ALLOW me to submit to your readers the following sketch o an apparatus for producing extreme cold, by which it might perhaps be practicable to liquefy or even solidify the elementary gases which have hitherto resisted the efforts of chemists.

The gas to be operated on is compressed to any required degree by means of one cylinder, is cooled to the lowest convenient degree in the ordinary way, passes into an expansion cylinder with a properly arranged cut-off, where in expansion its temperature is still further lowered. From the expansion cylinder it returns back to the compression cylinder, extracting the heat from the counter current proceeding from the compression cylinder, so that the latter will be always arriving at the expansion cylinder with a continually decreasing temperature.

As out here I have no possible means of trying whether there is anything in this idea, I offer it to any of your readers who may feel disposed to try it.

Graaff Reinet College, Cape Colony, July 19. T. GUTHRIE

The Relation of Man to the Ice-sheet

MR. TIDDEMAN has shown for Yorkshire what I proved six years ago for the South of England in a paper in the *Geological Magazine* (vol. iv. p. 193), that glacial conditions have obtained in this country since its occupation by Palæolithic man. Unfortunately an attempt which I made to explain this coincidence between his result and mine in a letter to the same periodical in February last was rendered abortive by a clerical (or perhaps printer's) error. I would press upon geologists to consider

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whether the point proved is not that a glacial period has intervened since the times of Palæolithic man and the present, rather than that man existed in this country before the glacial epoch, I think Mr. Tiddeman thinks as I do; but I take the liberty of stating this view more distinctly. O. FISHER

Wave Motion

IN NATURE, vol. viii. p. 506, Mr. Woodward has suggested a simple and ingenious illustration of wave motion. Could he, or any other correspondent, supply, or refer to, a popular explanation of the action of the particles upon each other, to which the propagation of the wave is due?

In the case of sound waves, the propagation is comparatively simple, and is fully and clearly explained in Dr. Tyndall's "Lectures on Sound," and elsewhere. Helmholtz, in his "Popular Lectures," has figured the motion of the individual particles of which a water wave is composed. And in Sir John Herschel's "Familiar Lectures," there is an elaborate and beautiful demonstration of the motion of the particles of ether in plane and circularly polarised light; but neither of these expositions appears to deal with the mode of propagation of the motion by which the wave is formed.

On the other hand, Sir Charles Wheatstone's ingenious model beautifully exemplifies the interaction of *waves* and their results. But here the waves are produced by the wooden wave forms introduced into the machine, the beads representing the particles remaining fixed in relation to each other. Neither, therefore, can this explain the manner and direction of the actual impact of each particle upon the adjacent one (beginning with those in contact with the source of motion itself), to which, combined with the tendency to yield in the direction of least resistance, the water wave must owe its form, and upon which the still more complicated conception of the light wave must ultimately depend.

Could a reference be given to any practical explanation of this point, it would confer a benefit on many who are not competent to follow the subject into the higher mathematics. M. F. E.

Sussex, Nov.

Elementary Biology

I, ALONG with many others, who are desirous of obtaining an insight into Nature, would esteem it a great favour, and it would be of the greatest benefit to us, if any of your scientific readers would undertake to give through your columns a short account of the various low forms of life included under the elementary stage of biology of the Science and Art Department. They might give instruction as to where the various objects could be seen, how inspected, names of the best text-books for the students' guidance, &c.

By so doing, they would secure the praise of many who at present cannot find out the modes of studying such subjects.

Hull, Nov. 8 BIOLOGY

Black Rain and Dew Ponds

CAN any of your readers explain the cause of this phenomenon? On Thursday, the 4th Sept., about 5 P.M., in the village of Marlsford, in the valley of the Thames, near Wallingford, a heavy storm of rain occurred: and the water which fell in several parts of the village was found to be nearly black. It is described as being of such a colour as would be produced by mixing ink with water. Another of these black water showers fell during the night of the following Friday.

Would any reader of NATURE also kindly set forth the theory upon which the utility of the dew ponds, found in many of the highest points of the Berkshire Downs, rests. They are circular ponds made with considerable care, and are supposed to receive so much dew as to supply all the water needed for the sheep in their neighbourhood through the driest summer.

Tiverton E. HIGHTON

ALBANY HANCOCK

THE brief announcement by which some of our readers may have first learnt of the decease of one of our greatest biologists is, in its simplicity, in singular harmony with the life the close of which it commemorates.

The retrospect of so serene a career leaves little to the biographer, for its points seem marked rather by phases of study, as indicated by important scientific memoirs, than by incidents which the world regards as striking or noteworthy.

Albany Hancock was born at Newcastle-on-Tyne on Christmas Eve, 1806. His father, Mr. John Hancock, died some six years later, and of the six little children thus left dependent on their mother, Albany was the third. He received a good education as times then went, and on leaving school was articled to a solicitor of good standing in Newcastle. Uncongenial as was the employment, he served his full term, passed the customary examinations in London, and even took an office in Newcastle with the view of establishing himself in practice. But the occupation was irksome, and he gave it up ere long to join a manufacturing firm, and this in turn circumstances led him soon to abandon. The simple fact probably was that neither occupation permitted him to follow the bent of his inclination, and that the desk and counting-house were alike distasteful to a mind pre-engaged as was his by other currents of thought. His early taste for natural history pursuits was probably in part derived from the collections, chiefly conchological, formed by his father, who was in many ways a man of superior ability, and had been something of a naturalist; and association with the late Mr. Robertson and Mr. Wingate, the one a botanist, the other an ornithologist, of repute; with the well-known Mr. Bewick; and above all with his near neighbour Mr. Alder, confirmed his inclination in this direction. He was, as a boy, clever with his fingers, and that manual dexterity which in later years served him so well when engaged with dissecting needle and pencil, exhibited itself in many of the pursuits of his early life.

The first mention we find of Mr. Hancock's devotion to natural history is in Mr. Alder's "Catalogue of Land and Fresh-water shells," published in 1830, in which the author handsomely acknowledges the obligations he is under to him and to Mr. John Thornhill "for the communication of many habitats observed during their active investigation of this as well as other branches of the natural history of the neighbourhood" of Newcastle. His earliest appearance as an author seems to have been in connection with two short papers in the first volume of "Jardine's Magazine of Zoology and Botany," published in 1836, the one a "Note on the Occurrence of *Raniceps trifurcatus* on the Northumberland Coast," the other a "Note on *Falco rufipes*, *Regulus ignicapillus* and *Larus minutus*." These notices were, comparatively speaking, of trifling significance, but they were the beginning of a long series of contributions to knowledge which only ceased when his last illness deprived him of the power of continuous work. It is unnecessary here to enumerate the successive memoirs that embody the results of his life's labour. A catalogue of the original papers of which he was author, or joint author, would extend to something over seventy titles.

Early association with Mr. Alder in the study of the mollusca led to the production between the years 1845 and 1855 of their magnificent "Monograph of the British Nudibranchiate Mollusca," which may still be taken as a standard of excellence amongst such publications. Many of Mr. Hancock's earlier papers were devoted to the elucidation of the boring apparatus of the mollusca, and these were followed by similar researches respecting the excavating power of a group of sponges (*Cliona* and allied genera) which until that time had been but little known or understood.

As an anatomist—and after all it was his large knowledge of minute anatomy and infinite skill in dissection that gave its especial value to most of his work—he was, perhaps, best known by his elaborate memoir on the Organisation of the Brachiopoda, published in the Philo-

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