LETTERS TO THE EDITOR.

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Pearl and Pearl-shell Fisheries.

IN connection with Sir West Ridgeway's anxiety, as Governor of Ceylon, to revive the pearl fishery off the north-west coast of the island, and the appointment by the Secretary of State for the Colonies of so able a zoologist as Prof. Herdman to report on the subject—so classic to zoologists since Dr. Kelaart's paper and the display of fine examples of the pearl shells by the Indian Government in the London Fisheries' Exhibition of 1883—it may be interesting to mention the activity of the Queensland Government in this and allied subjects. Besides the work of Mr. Saville Kent and the recent (private) investigations of Mr. Lyster Jameson, the Queensland Government early last year appointed an able young zoologist, Mr. James R. Tosh, to make investigations on the life-history of the species which produces the pearl-shells of commerce, the formation and growth of pearls, and other questions bearing on the pearl fishery. He is now busy on Thursday Island. Moreover, Mr. Tosh informs me that the Queensland Government has just sanctioned a grant of 1500*l*. for the erection of a marine laboratory on a small island about two miles distant (from Thursday Island), and in the centre of the pearl-fishing grounds, though at some distance from the coral area. This laboratory will have, besides the work-room and quarters for Mr. Tosh and his staff, three concrete tanks for experimental work. W. C. McINTOSH.

Barham, Springfield, Fife.

A Possible Method of Attaining the Absolute Zero of Temperature.

IN your issue of July 25 there appeared an interesting article on the liquefaction of gases. It was shown that by rapidly evaporating hydrogen, Prof. Dewar obtained a temperature of 13-15° C. (absolute). By a similar use of the more volatile helium, probably an even lower temperature could be obtained.

But, as the author pointed out, such methods will not enable us to reach the absolute zero itself.

May I be allowed to suggest that thermoelectric phenomena will be of some use in attaining the desired result?

Peltier showed that if a current be passed across an antimony-bismuth junction, in one direction heat is developed and in the reverse heat is absorbed and an appreciable cooling effect obtained.

Similarly, in the case of any two other metals, heat is generated if the current traverses the surface of contact in one direction and is consumed if it passes in the opposite direction—the quantity of reversible heat being in each case proportional to the strength of the current and to a coefficient π, depending on the nature of the metals and their temperature.

So that, in general, if r is the resistance of the part of the circuit containing the junction, the energy converted into frictional heat is C^2rt and the energy converted into reversible heat is $C\pi$.

Hence, if H be the quantity of heat produced in t seconds we have:—

$$J.H = C\pi t + C^2rt.$$

By making a small hole at the junction of a bismuth and antimony bar, in which was placed a drop of water and a small thermometer, the whole being cooled to zero, Lenz found that when a current was passed from bismuth to antimony the water was frozen and the thermometer sank to −3·5° C.

Opposing this fall in the junction's temperature there are, in general, two influences. Firstly, when a current is passed through a conductor a frictional generation of heat occurs, which tends to mask the cooling effect. Secondly, when one part of a circuit is at a much lower temperature than the other parts, heat will flow by conduction from the hotter to the colder parts and thus again oppose further cooling.

When a stationary low temperature has been reached by the junction, we must suppose that as much heat is absorbed by the current in unit time as is imparted to the junction by means of both of those influences I have mentioned working together.

If, therefore, we could diminish or do away with these, a very great cooling effect could be obtained.

The frictional heating effect could be eliminated to a great extent by cooling the whole to the lowest temperature attainable by the use of liquid hydrogen. Recent experiments by Profs. Fleming and Dewar show that an astonishing fall in the specific resistance of most metals takes place at very low temperatures. Thus the specific resistances of copper and iron fall from 1564 and 9115 respectively at 0° C. to 289 and 1220 at −200° C., while at a temperature only 20° C. lower, these numbers become 144 and 660—*i.e.* the specific resistance at −220° C. is actually half that at −200° C. (*vide* Foster and Atkinson's "Electricity and Magnetism," p. 162, 1896 ed.) Such an enormous diminution in the specific resistance leads one to expect that at only 13-14° C. from the absolute zero—the lowest temperature yet attained by Dewar—the resistance would be practically negligeable, so that the term C^2rt in the above expression would become extremely small even when currents are employed considerably more powerful than those which can be used at ordinary temperatures for producing the Peltier effect.

If, then, π remained appreciably large, it is quite possible that matter could by such means be chilled almost to the absolute zero without the masking effect of frictional heat becoming sensible.

The second influence, namely, the flow of heat by conduction from the hotter parts of the bar to the cold junction, could be eliminated by avoiding a sensible temperature difference between the chilled junction and the rest of the circuit. For instance, each small section of the main circuit could be cooled simultaneously with the junction by means of a number of other chilled thermoelectric junctions. By the use of some such contrivance, the temperature of the junction need never become very much lower than that of the rest of the circuit.

The coefficient π would certainly alter with the temperature; unless it completely vanishes for all bodies at very low temperatures, such an effect could be corrected by suitably choosing the metals forming the junctions. GEOFFREY MARTIN.

Bristol, July 26.

Food of the Senegal Galago.

THE following facts may interest some of your readers as pointing out the possibility of a rare tropical animal being able to maintain itself unaided for some weeks in an English country town.

On the evening of June 20 an African galago (*G. senegalensis*) escaped from my laboratory in Eton. For some little time it was not seen or heard, but after that it constantly made its appearance in gardens, on house roofs, &c., until, on the night of July 28, it was caught while rifling a cupboard. Previous to this date it had never been seen inside a house, so that how it managed to obtain food is somewhat of a mystery. Probably it lived on fledglings which it took out of the nest, and later on the decrease in their numbers forced it to forage for less tempting prey. Its strictly nocturnal habits and great agility no doubt preserved it from being destroyed by dogs. M. O. HILL.

Pseudoscopic Vision without a Pseudoscope.

THE curious optical illusion which has been noticed by Prof. R. W. Wood and described by him in NATURE for August 8 under the heading of "A New Optical Illusion" has been known for many years.

It is mentioned in Helmholtz's great work on physiological optics in the chapter on the stereoscope and pseudoscope. It appears to have been first described by Prof. Joseph Le Conte in 1869 (see Silliman's *American Journal of Science* for January 1869 and *Phil. Mag.* February 1869).

Both these authorities mention a further similar illusion not described by Prof. Wood, which I think is a more striking illusion. If one looks at a pattern of which the distance between the centres of contiguous figures is somewhat less than the distance between the two eyes, and if we gaze at it in such a manner as if we were looking at a distant object beyond it, we then get the illusion of a much increased pattern at a considerably greater distance from the eye. A. S. DAVIS.

Roundhay, Leeds, August 9.