The Temporary Thermo-Current in Iron.

IN the *Philosophical Magazine* for January, Mr. Herbert Tomlinson has proposed an explanation of the remarkable fact that in an iron wire, heated red hot by a burner, an electric current is produced when the flame is shifted along the wire (see Wiedemann's "Galvanismus," ii. 453).

As his explanation is inadequate, perhaps I may be excused again drawing attention to this subject. Briefly his explanation is as follows:—That, as the portion of the wire in the flame rises in temperature, it, thermo-electrically speaking, becomes in fact like a different metal, and that then, on shifting the flame, the junction with the unaltered wire on the side moved towards becomes hotter than before, while the one on the other side falls in temperature, thus presenting the ordinary case of a thermo-couple with junctions at different temperatures. Now this explanation entirely overlooks the fact that, by the first assumption, just as fast as the temperature on one side rises, the wire there changes into the "second state," and correspondingly changes back on the other side as the temperature falls there; so that, as far as this explanation goes, there ought to be no current whatever, for thus both junctions must always be at the same temperature.

When I first noticed this current, which from considerations to follow I have ventured to call the "temporary thermo-current," it appeared to me to be due to the difference in the temperature-slope (or gradient) along the wire in front from that behind the flame, as it heats more rapidly in front than it cools behind, and to the electromotive force being a function of the slope, *i.e.* of $\frac{d\theta}{dx}$. But this hypothesis did not stand the test of experiment, as I have shown in a paper published in the Proceedings of the Royal Dublin Society, July 1886. So that as there *is* a current, we must suppose the "second state" to be not only a function of the temperature, but also of the time, *i.e.* that the wire changes into (or from) the "second state" more slowly than it is possible for it to change in temperature. So that the electromotive force at any point depends on the rate of change of the temperature slope, or equals $\phi\left(\frac{d}{dt}\frac{d\theta}{dx}\right)$. In support of this it will be found that if the flame be steadily moved along very slowly no current is produced—at all events less than would be otherwise expected; and, secondly, that the maximum current is got by moving the flame the fastest consistent with the condition of keeping the wire red hot.

It is with the view of emphasizing this dependence on the time that the term "temporary thermo-current" seems appropriate.

FRED. T. TROUTON.

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Causes influencing the Bathymetrical Range of Deep-Sea Fishes.

YOU refer (p. 219) to the fact that Dr. Günther has adopted the 100-fathom line as the boundary at which with the extinction of sunlight the bathybial fauna commences. This selection of 100 fathoms as the limiting horizon is of much interest in connection with the theory that the shallow-water marine fauna is greatly influenced by wave-currents. In a letter you published in 1885 (NATURE, vol. xxxii. p. 390) I indicated 100 fathoms as the depth to which wave-action of some sort must extend, as evidenced by the character of the deposits at the mouth of the English Channel. Dr. Günther now shows that the deep-sea fishes do not rise above that horizon. But, although the 100-fathom horizon agrees very well with the apparent limit of wave-action, it does not seem to agree with the most recent experiments on the penetration of sunlight in water.

So recently as November last you recorded the fact that during the past year Prof. Forel found that the greatest "depth-limit of absolute darkness" from March to July in the Lake of Geneva was 100 metres (NATURE, vol. xxxvii. p. 88). If experiments in a fresh-water lake may be taken as a guide to light-penetration in the ocean, 50 fathoms will be nearer the limit than 100. In this case the bathymetrical range of the bathybial fauna cannot be much influenced, if at all, by the presence or absence of sunlight. This view is moreover fortified by the fact that, though the deep-sea forms do not usually ascend above the 100-fathom line, the shallow-water forms go far below it; and there is no reason why they should not do so; for, although a form unfitted to withstand wave-currents cannot face them, there is nothing to prevent a flat-fish, fully equipped in this respect, from passing at will from the disturbed to the tranquil horizon, and *vice versâ*.

A. R. HUNT.

Torquay, January 10.

Wind Force at Sea.

IN reference to a letter on the above subject in NATURE (p. 274), I beg to acquaint your readers that Capt. Barker's wish that anemometers should be used more on board ship has been endeavoured to be met by an instrument designed by myself on the sail principle. It has now been in use on some ships at sea for long voyages for five years, and daily observations have been obtained and sent home of the data observed, of pressure, direction, and velocity of the winds met with.

Regarding the further inquiry of ascertaining the rainfall at sea, this has now been carried on for about ten years by means of a rain-gauge designed by myself on the pivot principle, and it has been used by many vessels in all the great seas.

The daily observations have been sent home and are now on hand, and about five years of the returns have already been announced, and a further compilation of the data may be prepared when the materials become sufficient.

It may be added that the late Capt. Symington, of the s.s. *Hankow*, amongst his meteorological observations took the rainfall by rain-gauge on his ship for twenty years or more. The marine anemometer and rain-gauge above mentioned were exhibited at the Liverpool Exhibition in 1886, and at the Meteorological Exhibition of last year.

W. G. BLACK.

Edinburgh, January 21.

Untimely Insect Development.

SOME of your readers may be interested in a case of untimely insect development, caused no doubt by the phenomenal mildness of the weather in this part of the country during the last few days. Last evening a perfect imago of the common tortoise-shell butterfly (*Vanessa urtica*) was found inside my house on the wall of my nursery. It is fully developed in every way, and the only thing in its appearance at all abnormal is that the antennæ are bent back and lie between the wings, which are in the erect position usual in repose. The insect has evidently only just emerged from the pupa, and is in a torpid condition, only just flapping its wings when touched. The nursery is a warm room looking to the south, and has a fire in it all day.

St. Albans, January 10.

JOHN MORISON.

Weasels killing Frogs.

SEEING a note in NATURE (December 29, 1887, p. 208), about weasels killing frogs, I thought that the following fact would be a further confirmation.

I was walking near the village of Clifton Hampden in August last, when I saw a weasel, carrying a good-sized frog in its mouth, come cautiously out of the rank grass by the road-side; directly the weasel perceived me, it dropped its prey on the road and retreated to the cover of the grass. The frog was dead. I kept silence, and the weasel left its hiding-place, and advanced a few steps, but again retreated. Soon, after several advances and retreats, it rushed out, seized the frog with its teeth, and running across the road disappeared in the long grass on the other side.

January 20.

M. S. PEMBREY.

"British and Irish Salmonidæ."

THE author of "British and Irish Salmonidæ" calls in question the justice of three criticisms in my review of that book. In reply to his first objection, I have to point out that my quotation of the sentence referred to was, as Mr. Day has himself noted, made to draw attention to its grammatical errors, and therefore the omission of a few words which affected the sense but not the construction was of no consequence at all. I omitted the words intentionally, to shorten the quotation, and gave no opinion on the statement contained in the sentence: the statement which is implied rather than expressed is perfectly correct.