them out because we know what a stumbling-block even slight mistakes are to such students. Their reverence for printed results is often wonderful. The utility of Mr. Lock's "Higher Trigonometry" is greatly hindered by the number of typographical blunders.

The Physical Geology and Geography of Ireland. By Edward Hull, F.R.S. Second Edition. (London: Edward Stanford, 1891.)

THE first edition of this book was reviewed in NATURE rather more than thirteen years ago (vol. xviii. p. 354). Of the second edition, which will be welcomed by all students of the subjects it deals with, we need only say that Prof. Hull has embodied in it the additions which have lately been made to our knowledge of the geological structure of Ireland. The more important of these additions he sums up under the following heads:—(1) The determination of the occurrence of Archæan rocks in certain districts of the west and north of Ireland. (2) The determination of the peculiar relations subsisting between the Lower Devonian (or Devono-Silurian) strata and the Upper Old Red Sandstone and Carboniferous series of the southern districts. (3) Additional evidence regarding the relative ages of the trachytic and basaltic lavas of Antrim. (4) Evidence of the invasion of Ulster by a great ice-sheet from the Grampian Mountains of Scotland during the earliest stage of the Glacial period.

The Ouse. By A. J. Foster, M.A. (London: Society for Promoting Christian Knowledge, 1891.)

IN this little book the course of the Ouse is traced from its source to the point where it enters the sea, and some account is given of the various elements of interest that are to be met with on the way. The idea is good, and the author has worked it out skilfully. Any boys or girls who may read the volume will find at the close that they have obtained from it much sound geographical knowledge.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

A Difficulty in Weismannism.

IN your number of October 29 (vol. xliv. p. 613), Prof. Hartog depicts a dilemma in which a study of Weismann's theories has placed him.

Prof. Hartog sums up the main points of Weismann's theories in five theses, but, considering the great importance which the latter attaches to the operation of *natural selection*, he might well have added a *sixth* to the list.

There can be no doubt that, of the two hypotheses brought forward in the letter, hypothesis B is the one adopted by Weismann for the explanation of the problems of heredity. We are therefore not concerned with hypothesis A.

"According to hypothesis B," Prof. Hartog states, "the Ahnenplasmas of all Metazoa being similar and Protozoan, if the *numbers are equal* and the shuffling fair, any two parents may beget any offspring whatever; . . . a lioness might be expected to bring forth a lobster or a starfish, &c."

What does Prof. Hartog mean by *fair shuffling?* Surely not such shuffling as is resorted to in the game of whist, but such shuffling as he himself describes in thesis 4. He states here that the "process is comparable to the shuffling of two packs of cards by taking half from each and joining the talons or remainders to form a new pack."

It surely cannot be imagined that Weismann ever intended to assert that with each sexual act there was a rearrangement of the Ahnenplasmas comparable to the shuffling of a pack of cards during the game of whist.

Did he anywhere asert this, we should naturally expect him to believe that a lioness might as well bring forth human beings or lobsters as normal cubs.

With the evolution of sexuality, the excessively numerous Ahnenplasmas of our variable Protozoan ancestors became *arranged* in more and more complex, ever-varying *combinations*. At the very outset, natural selection operated. The variations (due to the combinations) most advantageous to the species were perpetuated. Unfavourable variations involved extinction. It is the *special combination* of the units of ancestral germ-plasm which predetermines the structure of the mature individual. This combination, of course, is very closely related to the two combinations from which it arose, and it is just this closeness of relationship which prevents us from supposing that a lioness can ever produce anything but cubs. Changes in the combinations are only slowly effected. The influence of the mother is due to the fact that one-half of the maternal combination is present in the offspring, and similar statements can of course be made concerning the influences of father, grandfather, great-grandfather, &c.

Do not these two considerations—(1) that the nature of the individual depends upon the *peculiar combination* of units of ancestral Protozoan germ-plasm, a combination very closely related to two previous ones (owing to the fact that, in sexual union, two halves of immediately preceding combinations are united to make one whole); (2) that the operation of natural selection provides for the *extinction* of *useless*, and the *preservation* of *useful* variations—afford to Prof. Hartog the means of escaping from his dilemma? A. H. TROW.

Penarth, Cardiff, November 14.

THE contributions of Mr. Trow and Dr. Poulton to this discussion render necessary an explanation that should, perhaps, have accompanied my first letter. After rough-drafting this, I felt misgivings lest I might have misconceived Weismann's meaning, and set up a man of straw to knock down. Accordingly, I wrote to Prof. Weismann to ask if I rightly understood his meaning, explaining my object in doing so; and he answered my queries with great kindness, courtesy, and fulness. As I wrote back to him, I then thought it better, relieved from my misgivings, to state the point without reference to his letter. But Mr. Trow and Dr. Poulton have both blamed my use of the word shuffling, and appear to think that my hypothesis A is a purely imaginary conception of the straw man order. I hope, therefore, I shall not be accused of having wilfully kept a trump card up my sleeve if I now quote the two essential passages of Prof. Weismann's letter, which were written in definition of the points at issue.

"Ich denke mir dass das Keimplasma eines Individuum's aus einer gewissen Zahl von Einheiten besteht, welche untereinander sehr ähnlich, aber nicht gleich sind. Die Unterschiede zwischen ihnen entsprechen meist den Unterschieden zwischen je zwei Individuen derselben Species. *Jedes derselben würde im Stande sein ein Individuum der Art hervorzubringen falls es sich zu der dazu nöthigen Masse vervielfältigen könnte oder würde.*" The sentence I have italicized corresponds, I think, very fairly to my hypothesis A: "Each Ahnenplasma unit corresponds to an individual of the species itself; and if put under suitable trophic conditions would, singly, reproduce such an individual." Dr. Poulton writes: "I agree with Prof. Hartog in considering it [Hypothesis A] as valueless." I am far from considering any hypothesis as valueless which upsets a wrong theory of which it should be the mainstay.

Prof. Weismann goes on: "Sie können ganz wohl die geschlechtliche Fortpflanzung mit dem Mischen eines Kartenspiels vergleichen, aus dem immer die Hälfte der Karten entfernt wird. Nur ist nicht zu vergessen dass die Karten selbst nicht völlig unveränderlich sind." It is obvious that Prof. Weismann accepts the peculiar mode of shuffling I have described (not the ordinary mode at whist), as a fair illustration of his conception of fertilization and its antecedents. He always speaks of *combinations* in his "Essays," and not *permutations*. The reason is obvious: the figured elements of the living nucleus are constantly changing their relative position; and it is these that are the outward and visible sign of the mysterious ancestral units.