sufficient, still the method is only available on a comparatively clear night; and though the same sights may possibly be also used for the determination of longitude, it will more commonly happen that the complete position may be satisfactorily determined by Sumner's method applied to two stars having a considerable difference in azimuth.

The pages in which Mr. Rosser treats of Sumner's method are of themselves sufficient to establish what has been already said as to the practical nature of the book. In an admirable monograph published two years ago, under the title of "Stellar Navigation," Mr. Rosser has shown himself alive to the very great value of this method of determining a ship's position, and to the necessity of shortening the calculation by the use of Sir William Thomson's special tables, or by Burdwood's and Davis's azimuth tables. But no remark in the "Self-Instructor" calls attention to this, and the problem is left, in its native clumsiness, in the form suitable to the questions of the examination room. The same might indeed be said of almost all other problems, which are given without any hint of the little artifices which, in practice on ship-board, render the computation quicker and easier. In saying this, however, we attach no blame to Mr. Rosser, unless it is for calling his book "practical," or "adapted for use at sea." The book is meant to meet the demands of the examinations; and for this, at least, it appears sufficiently well adapted. J. K. L.

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. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

On the Cause of the Dissimilarity between the Faunas of the Mediterranean and Red Seas

THE republication by Mr. A. H. Cooke of the list of Testaceous Mollusca obtained by the late Mr. Robert MacAndrew during a dredging excursion (in 1869) in the Gulf of Suez,[1] affords data for comparison with that of the Mediterranean over its eastern part, and of which the late Mr. J. Gwyn Jeffreys has, amongst other writers, given an account.[2] The extreme dissimilarity in reference to the species will, upon such a comparison, impress the mind.[3] I propose briefly to sketch out the process by which this dissimilarity may be supposed to have been brought about.

Going back to the Eocene period, we know that the whole of the region bordering the Levant, and including large portions of the three continents, formed the bed of the ocean, and we may presume that a community of genera and species existed over the whole tract represented by those of the Nummulite limestone of the Middle Eocene period.

During the Upper Eocene period there was a shallowing of the sea-bed in many places, and corresponding deepening in others, and thus the first division of the submerged area into deep and shallow basins would have been brought about with a certain influence on the animal and plant life; but the general result may not have been considerable.

It was during the succeeding Miocene period that the differentiation of the fauna and flora of the two seas really began. Recent observations on the geology of Northern Africa, Arabia, and Palestine by Zittel, Lartet, and others, leave little doubt that the Miocene period was one during which the main lines of the future lands and seas were marked out; and the absence of deposits belonging to this epoch (except a few scattered tracts formed of shallow-water and littoral beds) over the region referred to, leads to the conclusion that land-conditions prevailed very much where we now find them, and that the submerged areas of the Mediterranean and Red Seas were dissevered by the Isthmus of Suez. It was during this period of elevation that the differentiation proceeded; the original forms of the Eocene period developing in each basin independently of one another, and becoming more divergent as time went on. The process seems to have been continued well into the Pliocene epoch, but at a time which may be indicated perhaps as "Newer Pliocene" there occurred a re-submergence of the land to the extent of 220 to 250 feet below the present level of the sea, marked by the occurrence of raised sea-beds containing shells, &c., of species still living in the adjoining waters, and of old coast-cliffs perforated by Pholas borings, like that discovered by Oscar Fraas in the cliffs of Jebel Mokattam, near Cairo, at an elevation of 220 feet above the surface of the Mediterranean, and recently described by Dr. Schweinfurth (*Zeitsch. d. deutschen geolog. Gesellschaft*, 1883). During this depression Africa became an island, and the waters of the two seas were united.

With this union of the Mediterranean and Red Seas there must have been brought about a certain commingling of the forms inhabiting their waters respectively, and hence it is somewhat surprising that there should at the present day be found such an almost entire dissimilarity as that already stated. The explanation, it seems to me, is to be found in the fact that the strait was, in its shallower portion, very shallow; and that consequently, except for the purely littoral and shallow forms of marine life, a commingling really did not take place to any great extent. To the north of Lake Timsah there occurs a ridge of ground called *El Guisr*, which rises 70 feet above the present sea-level, and another called *Tunum*, which rises 25 feet. These ridges would have caused a shallowing of the strait to the extent of their elevation, so that over the former ridge the depth of the strait would only have amounted to 180 feet or less during the greatest submergence. It is impossible to say whether these ridges are higher, or the contrary, than they were at that period; but it is a remarkable fact that the sub-fossil shells in the gravels to the south of Tunum are those of the Red Sea, and to the north those of the Mediterranean; other ridges, like that of Tel-el-Kebir, produced similar shallows. As a general result it is clear that the submersion of the isthmus during the later Pliocene period did not produce a general commingling of the forms of the two seas; and when ultimately the seas were again separated by the re-elevation of their beds, and the present isthmus established, those forms which may have passed across from sea to sea would succumb to the altered conditions of their environment. It can scarcely be doubted that the temperature of the water of the Red Sea differs considerably from that of the Mediterranean by several degrees, and the forms which belong to the former would perish in the latter, and *vice versâ*. It would be interesting to ascertain which of the two faunas more closely resembles that of the original Eocene stock.

Here, then, we have the remarkable zoological phenomenon of two perfectly distinct sets of marine forms originating in one stock only as far back as the Middle Eocene period, independently developing to such an extent that, at the present day, there are scarcely more than eighteen species (according to Prof. Issel) common to both. Now, if the beds of these two seas (the Levant and Red Sea) were to be elevated into land and their fossil contents studied by a geologist of the future, he would probably assert on the palæontological evidence that they belonged to two distinct periods of geological time! This is subject matter for reflection, at least for geologists of the present day. I may add that I have been induced to try and solve to my own satisfaction the problem here presented while engaged on a work containing the scientific observations and conclusions made during the recent expedition to Arabia Petrea in connection with the "Palestine Exploration Fund."

EDWARD HULL

[1] *Annals and Magazine of Natural History*, vol. xv. p. 322 (fifth series).
[2] *Ibid.*, vol. vi. p. 65 (fourth series).
[3] This fact has been recognised by Prof. Haeckel in his "Visit to Ceylon" and his "Arabische Korallen," &c.

Hybridization among Salmonidæ

I PERCEIVE in NATURE (vol. xxxi. p. 563) that the "National Fish Culture Association" propose cross-breeding land-locked salmon and trout as proposed by Prof. Brown Goode in "Forest and Stream," August 7, 1884. Before doing so I would venture to direct their attention to a few points.