lead one to suppose that the size Mr. McConnell suggests is ample, not to say generous. I had hitherto supposed that a scientific writer does not necessarily treat of a fresh subject each time he writes.

Might I add that an index is not a pedigree or diagram, any more than a gazetteer is the same thing as a map? I fear that to mix up such distinct things would merely introduce an altogether needless difficulty. A CATALOGUER.

The Period of the Long Sea-Waves of Krakatão.

IN connection with the great explosion at Krakatão at 10 a.m. on August 27, 1883, a great wave was generated, which at Batavia, 100 miles distant, reached a height of 7½ feet above the ordinary sea-level. It was followed by a fairly regular series of fourteen waves, at intervals of about two hours, gradually diminishing in height. Captain Wharton, who writes this part of the Royal Society Report, is much puzzled by the long period. He says:—"If the wave was caused by any sudden displacement of the water, as by the falling of large masses of ejected matter and huge fragments of the missing portion of Krakatão, or by the violent rush of steam from a submarine vent through the water, it is hardly to be conceived that two hours would elapse before the following wave, the second of the series, started after it. . . . If, however, upheaval of the bottom of the sea, more or less gradual, and lasting for about an hour, took place, we should have a steady long wave flowing away from the upheaved area, which as it approached the shore would be piled up considerably above its normal height. Thus these waves of long period would be set up. . . . The water would flow back on the motion ceasing."

I do not understand how the series of waves would be produced by the sea-bottom being upheaved in the manner described. When the upheaval ceased, the water would probably flow back, and, after the centre of disturbance was reached, a second wave would be generated. But there would be no reason for the water flowing back a second time, and no more waves would be generated. Further, in another part of the Report, we find Prof. Judd expressing the opinion that no upheaval has taken place (p. 25).

Another explanation has occurred to me, which seems satisfactory. Let us assume, with Prof. Judd, that the first wave was due to a great quantity of fragments falling into the sea. This wave would be reflected by the shores of the Straits several times backwards and forwards, each time giving rise to a fresh disturbance, travelling out towards Batavia through the narrow opening to the east. Opposite Krakatão both on the northern and on the southern shore of the Straits is a great bay. The time a wave would take to travel from Krakatão to the head of the bay on the north is given by Captain Wharton at sixty-one minutes, and the distance to the head of the other bay is much the same. This agrees very well with the two-hour period. Moreover the first disturbance at Batavia would be a rise of the water, which was the case.

In a similar way some of the short periods observed at distant stations may have been due to peculiarities of the channels in which the tide gauges were placed.

Hotel Buol, Davos. JAMES C. M. MCCONNEL.

The Distances of the Stars.

YOUR note of Prof. Eastman's address to the Philosophical Society of Washington in your columns of February 13 (p. 351) raises some questions of interest on which I think the Professor is mistaken.

As regards the nearness of particular stars, there are several indications which astronomers have sought to verify by observation and computation. One of these is brightness; a second is large proper motion, and a third is a binary system easily separated by the telescope (especially if the period is comparatively short). Some persons have also supposed that red stars, variable stars, &c., are nearer than most of their neighbours. Stars possessing one or more of these characteristics have been selected for parallax measurements.

One of these characteristics being brightness, almost every bright star in the northern hemisphere and a good many of those in the southern have been at one time or another measured for parallax. But no one has attempted to measure the parallax of *all* stars of the third, fourth, fifth, or sixth magnitudes. Astronomers have selected from among these stars those which afford some striking indication of nearness, such as the great proper motion of 61 Cygni. If, therefore, we take the parallaxes arrived at in this manner for comparison, we are comparing the results attained for *all* stars of the first magnitude with those attained for a small number of exceptional stars of the fifth or sixth.

How far Prof. Eastman's data are otherwise trustworthy I need not consider. I may refer your readers to a very full list of paraxalles hitherto determined, published by Mr. Herbert Sadler in the February number of *Knowledge*, by which it will appear how discordant and untrustworthy these results are. But the exceptional character of Prof. Eastman's faint stars is sufficiently evident from the table itself. His first group, with mean magnitude 5·57, has a mean proper motion of 4″·93; the second group, with a mean magnitude 5·59, has a mean proper motion 2″·33. Surely Prof. Eastman does not mean that the average proper motion of stars of the magnitude 5·58 is 3″·63. There is not one star in a hundred of this degree of faintness which possesses such a proper motion as this. W. H. S. MONCK.

Dublin, February 15.

P.S.—It is possible that a sphere enclosing the thirty nearest stars to us would include more faint stars than bright ones; but I think it certain that it would not include as large a percentage of fifth magnitude stars as of first magnitude stars. The first magnitude stars do not exceed twenty, and a few of them seem to be very distant. The fifth magnitude stars are reckoned by hundreds, and a few of them are comparatively near.

The Longevity of Textural Elements, particularly in Dentine and Bone.

WHATEVER views we may take of the theories of Weismann, which at present occupy the attention of biologists, they may be hailed as giving new directions to research, and one of the subjects about which his allusions will probably lead to further inquiry is the length of time during which textural elements continue individually. I have used the word longevity at the top of this letter; but, perfectly admitting the justice of Weismann's criticism—that division into two, each of which is a unity like the first, is not death—I feel driven to the dire necessity of inventing a new word, *permanunity*, to denote permanence without division; and it is of such permanence or longevity of the undivided unit that I wish to note a circumstance which has recently presented itself to my mind.

Every anatomist is aware that the living elements of dentine are nucleated corpuscles with elongated branches, which are embedded in the matrix, and lengthen as the dentine increases in thickness, while the corpuscles themselves retire inwards, remaining at the boundary of the lessening pulp-cavity. The continuity of the tubes containing these fibres furnishes, as soon as one thinks of it, convincing proof that they are the same branches and the same dentine-corpuscles which are found when the dentine begins to be deposited and when it is completed. But the dentine begins in childhood, and may go on increasing in thickness in old age, with its tubes still continuous, though losing their regularity of position. Therefore, dentine-corpuscles continue alive and without division through the greater part of the life of the organism.

The interest of this is exceedingly great, if the relation of dentine to bone be considered. Bone has a matrix similar to dentine, and has branched corpuscles; but the bone-corpuscles differ from the dentine-corpuscles in becoming completely embedded in the mineralized matrix, without any attempt to retire from it, and thus come to have branches on every side. Under the microscope one can see in compact bony tissue that there is a continual reabsorption and redeposition of bone going on; and these alternating processes are brought about in a way which is easy to understand, though very generally misapprehended. In consequence, probably, of the very pressure exercised by the bony deposit on the corpuscles, the corpuscles are excited to absorb it; and one sees absorption spaces commencing sometimes in the centres of haversian systems, and sometimes in individual lacunæ. The activity thus aroused in the corpuscles causes them to enlarge and to attempt proliferation; which being in the first instance modified by their close surroundings leads to their being converted into large multinucleated masses, the so-called giant-cells or osteoclasts. But when a greater amount of room has been obtained, these masses separate up into corpuscles with one nucleus each, bone-corpuscles or osteoblasts, which, arraying themselves around the cavity, initiate the formation of new