declination, the change in the earth's magnetic field is in the direction that would be produced by the change in the earth-current intensity and in the electric potential of the earth, hence the current can not be caused by the variation in the magnetic intensity.

Both the earth-currents and the diurnal magnetic variations are in the direction which they would take if they were caused by the electrostatic induction of the sun's negative charge, while the permanent magnetic field of the earth is such as would be caused by the rotation of its own permanent negative charge.

Figure 3 shows the relation between the observed mean diurnal variation of the earth-current in a line about two miles long at Palo Alto and the diurnal variation of the earth's potential for the same three days, as shown by the photographic record. On account of the disturbances in the earth due to trolley lines and other causes, and to possible disturbances in the line, which has been kindly put at my disposal by the Pacific Telephone and Telegraph Company, it is impossible to record the earth-currents photographically with any instrument at my command, and I have been compelled to make all the observations visually. As I have no assistance, I am compelled to make the continuous twenty-four hour runs myself, and for this reason I have at the present time but three such complete records, *viz.*, for June 2, July 18 and August 10, of the present year. The mean

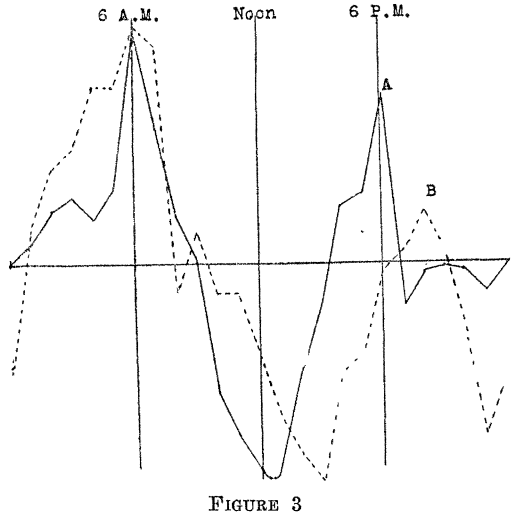

FIGURE 3

diurnal variation for these three days is shown in Curve A in Figure 3, while the mean diurnal variation in earth potential for the same three days is shown by the dotted curve, B. In this curve the signs of the potential are inverted to show better the agreement of the two curves. Both curves show many irregularities which would probably disappear in the mean of a large number of observations, but their similarity in general outline is such as to make it hard to doubt that they are physically related. Their time relation seems to indicate that the positive charge on the day side of the earth is due to the movement of electrons away from the sun.

FERNANDO SANFORD
STANFORD UNIVERSITY

RESEARCH AT THE TORTUGAS LABORATORY

THE untimely death of Alfred Goldsborough Mayor and the consequent interruption of the plans of the Tortugas Laboratory of the Carnegie Institution of Washington naturally arouses renewed interest in the work of the laboratory and especially in the investigations now being carried on there. It may therefore be desirable to bring to general notice a brief résumé of the activities of the laboratory and also to point out the purposes of some of the researches now in progress.

The laboratory has been in existence for eighteen years and during that time it has published seventeen large volumes of "Papers from the Tortugas Laboratory," with one or two volumes more in preparation. In addition, a large number of papers, based in whole or in part on work done at the laboratory, were published elsewhere, one of the most important of these being Mayor's own work of three volumes on the Medusæ. (Further discussion of Mayor's researches is found in Davenport's interesting paper in SCIENCE, August 4, 1922). Among the contributors of these papers are many of America's most productive biologists. In estimating the productive activity of the laboratory it is necessary to remember that the laboratory has been open only from eight to fourteen weeks each year and that the greater part of the work has been

done by university and college men who were busy with professional duties during the rest of the year.

An examination of these papers shows that they may be placed, for convenience, into three groups, as follows: 1, *Systematics and Distribution.* The works of Mayor on the Medusæ, Vaughan on the Corals, H. L. Clark on the Echinoderms, Treadwell on the Annelids, Cushman on the Foraminifera and others show that, contrary to general belief, the tropics still offer extraordinarily rich fields for this fundamental and important branch of biology. Work of this character, which necessarily precedes all other biological work on the organisms involved, has been carried on continuously since the establishment of the Department of Marine Biology by the Carnegie Institution. 2, *Embryology.* In the earlier years of the existence of the laboratory numerous papers were published on embryological subjects, but latterly this phase of biology has received relatively little attention, although there has been no abatement of facility or opportunity for this kind of work. The explanation of this is near at hand. It will be recalled that the laboratory was established at the time when the chief interest of biologists generally was in embryology, but that soon thereafter more and more attention was given to genetics, almost wholly at the expense of embryology. At the present time a relatively small number of descriptive embryological researches are being prosecuted. 3, *Crucial Physiological Experiments and Observations.* It frequently happens that some general conclusion based on a considerable amount of experimental or observational work already completed by one or more investigators, depends for its validity upon some crucial experiment or observation. It seems that because of the organisms, the climate or other conditions peculiar to the tropics, a large number of experimental or descriptive papers depended for their crucial data on work done at the Tortugas laboratory, or on expeditions from that laboratory to other points in the tropics.

Owing to the brief season during which the laboratory has been open each year, problems in the science of genetics, which at present occupies so large a place in biology, can not be carried on with entire satisfaction because of the fact that such work as a rule requires continuous attention for long periods.

Of the researches now in progress at Tortugas may be mentioned, first, that of Professor Longley, of Goucher College, on the coloration of reef fishes, an investigation which he has been carrying on for a number of years by means of a specially designed diving hood which enables him to study the habits of fishes in their natural environment. In addition to making important contributions to the general subject of animal coloration, he has collected what is perhaps the largest body of data in existence on feeding and other fundamental reactions of coral reef fishes. Doctor Bartsch, of the National Museum, has been engaged in breeding experiments on *Cerion,* a genus of land snails inhabiting the Florida Keys and the Bahamas, with a view to determining their specific relationships and their evolutionary history. Professor Lipman, of the University of California, has begun a comprehensive study of the activities of marine bacteria. The indications are that bacteria play as large a part in the life of the sea as they have been found to play in the life on land. It is consequently difficult to overestimate either the importance or the magnitude of this investigation. Captain Potts, of Cambridge, England, is continuing his studies, begun elsewhere, on factors influencing growth rates among various species of invertebrates. Dr. Morgulis, of the University of Nebraska Medical School, has begun a biochemical study of the blood of certain crustaceans, and finally, I may mention my own work on marine amebas, of which a monograph is now ready for the press.

A number of researches which were inaugurated at Tortugas require traveling to distant points for the successful prosecution of these researches. Among such investigations which are in progress at present may be mentioned those on marine Annelids by Professor Treadwell, who has visited a number of the West Indian Islands, Hawaii and several of the South Sea groups; Professor Harvey, who has visited various parts of the world in search of luminous organisms for his studies in bio-

luminescence; Professor Setchell, who has spent several seasons in the South Pacific in floristic studies. And in this connection must be mentioned also the unfinished researches of Doctor Mayor himself, who visited the Samoan Islands for the purpose of making observations on the rate and the conditions of the growth of corals, and who was laying plans, up to within a few days of his death, for another expedition to the South Pacific for the purpose of continuing his own and other investigations.

The life of the tropical sea presents unlimited opportunities for fruitful scientific investigation and it is the stated purpose of the laboratory to provide facilities for such investigations from a broad point of view. The published results clearly indicate that this purpose is being achieved in full measure. Students of marine biology confidently hope that the Carnegie Institution of Washington will continue to support the Department of Marine Biology so that the study of life in the sea may be continued with undiminished energy and with unrestricted scope.

A. A. SCHAEFFER
UNIVERSITY OF TENNESSEE, KNOXVILLE

THE MOUNT EVEREST EXPEDITION

IN an account of the expedition *The Geographical Journal* says that the early climbing season of 1922 was very brief. The expedition reached its base camp below the Rongbuk glacier at the end of April, when winter still held in the valley: and in the first days of June the monsoon broke and the season was over—at any rate until September. In the few weeks available there were two highly successful climbs, and a third which ended badly in the avalanche. Within six weeks most of the best climbers were out of action by frostbite, and the whole party so exhausted by the prolonged exertion above 16,000 feet that there could be no thought of renewing the attack in the autumn.

The final conquest of the mountain must wait, then, for a third year's campaign, organized in the light of this year's experience and this year's great though not complete success. Closer acquaintance with the mountain has shown that the physical difficulties are more formidable, the physiological difficulties decidedly less, than had been supposed: the organization and equipment were on the right lines and in most respects perfect. But the weather introduces each year an incalculable factor, against which the best schemes may be laid in vain.

In October those members of the expedition who went out from England will reassemble on the platform of the Central Hall to recount their adventures and to receive the hearty congratulations they have earned so well. The meeting will regret that they can not welcome and congratulate with them the four officers of the Indian service whose duty will keep them in India.

By the last reports we are glad to learn that Major Morshead is doing well, and that he will lose no more than the tips of three fingers of the frost-bitten hand. The other members of the party who suffered less are already quite recovered: several are already home and others well on their way. General Bruce with headquarters arrived in Darjeeling on August 2, and the only member of the expedition left in Tibet is Captain Noel, who has established a photographic dark-room at Gyantse, and is hard at work developing many thousands of feet of cinematograph film and a great quantity of plates and panoram films. His leisure he spends in "filming" Tibetan life and customs; and he is not due in England until the middle of October. It will therefore not be possible to show any of the film at the joint meeting of the society and the Alpine Club at the Central Hall on Monday, October 16, when General Bruce and several members of the party will give the first account of their work. A second joint meeting will be held on November 21 for the first show of the film, which will be awaited with great interest. Captain Noel did extraordinarily well in getting his cinematograph camera, fitted with an enormous telephoto lens, to 23,000 feet on the Chang La, and photographing the climbing to about 26,000 feet. He writes that the Sinclair camera and the big lens by Taylor, Taylor & Hobson have been a great success. The latter was a heavy addition to the outfit, but it saved his life in the diaster which befell the third climb-