

Annual Report of the President of the  
University on behalf of the Regents to  
His Excellency the Governor of the State  
of California.

1913-1914

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SCRIPPS INSTITUTION FOR OCEANOGRAPHICAL RESEARCH

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La Jolla, July 1, 1914.

To the President of the University,

Sir: My report for the year July 1, 1913, to  
June 30, 1914, is respectfully presented herewith.

The preparation for publication of the field  
records collected by the explorations at sea during  
the whole existence of the Institution has been in  
progress for many months. These records have now  
been turned over to the printer for publication.

The positions occupied by the boats have been  
located or relocated on the coast and geodetic sur-  
vey charts; the temperatures and densities of the  
water have been recalculated; and all the data,  
biologic and hydrographic, have been made as com-  
plete and accurate as possible. Five hundred and  
twenty-seven "sections," i.e., squares of sea sur-  
face five miles on a side, were occupied during  
the explorations, these extending from Cedros  
Island 300 miles down the coast of Lower California,  
to Puget Sound. By far the greater number of posi-  
tions were, naturally, on the coast of Southern  
California.

Approximately 3000 temperatures and 2000 den-  
sities are entered, each density being reduced to  
three temperatures: namely, that of the observation,  
0° C., and 17° 5' C.; this to correspond with the  
usages in different countries where oceanographic  
research is prosecuted. About 3450 biological net  
hauls are recorded, 3200 of these pertaining to  
pelagic organisms, and 250 to bottom dwelling

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organisms. Four thousand three hundred and thirty-six water samples are included, 376 soundings, and 50 gas analyses.

Much labor, practically all of which has fallen on Messrs. Michael and McEwen, has been devoted to the preparation of these records, and their publication will be somewhat expensive; but they will be of great use not only as a basis for future biological and hydrographical investigations of various sorts, but as giving an opportunity to other investigators for testing results reached by us.

Search after the laws governing the movements of pelagic animals has been extended by Dr. Esterly during the year to two groups of animals hitherto studied very little from this standpoint, the Ctenophora and the Schyzopoda. The large significance of discoveries attainable in this domain by the methods used is emphasized by Dr. Esterly's two short papers: but the complexity and diversity of the phenomena are equally emphasized, and so the necessity for more data collected with more definite reference to particular questions is made more manifest than ever.

An elaborate plan was laid out in the summer of 1913 by Professor Kofoid and Mr. Barrows for collecting material upon which to study the vertical distribution of the microscopic plants, the Peridinidae. The entire work of the Alexander Agassiz was devoted for three weeks to carrying out this plan only to find after the collections had been shipped to Berkeley and a preliminary examination of the hydrographic data had been made, that owing to imperfection in the apparatus somewhere the water bottle used for taking the biological samples had not closed regularly at the level at which it was intended it should close, and consequently that the data had been badly vitiated or made wholly worthless for the particular problem aimed at.

This costly experience brings home with great force the necessity of forethought in preparing for

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such work and of vigilance in executing it. The fact that the most vital part of the apparatus operates beneath the surface of the sea where it can not be watched, seems to indicate that certainty of success in a long series of operations may be impossible without frequent laboratory examinations of the samples taken. As these collections are in Mr. Barrera's hands, for study; and as he resigned in March of this year to accept the secretaryship of the Pacific Division of the American Association for the Advancement of Science, not much has yet been learned of their character. That they will be useful in taxonomic studies and to some extent also for distributional studies is certain, so this field work will not be a total loss.

Although the preparation of the field records for publication was Mr. Michael's chief occupation during the year, he has made good progress with his study of the distribution of Salpa democratica in San Diego area, and also with his report on the chaetognatha of the Pacific Ocean belonging to the United States National Museum.

In my own research work I have, with the help of Messrs Wallace and Koltze, added considerably during the year to the observations and statistical data on the growth of organisms and the proportionality of their repetitive parts, which subject has occupied much of my attention for a number of years. Particularly suggestive results were obtained on the problem of the relation between cell size and leaf size in several species of plants. I am looking forward eagerly to the opportunity for pushing these investigations to decisive results.

The Local Board decided last summer to recommend Dr. F. B. Summer to the Regents of the University for the new research position to which it had been previously resolved that part of the funds should be devoted, which the State had granted the Institution. The matter was deliberated on with special care because it involved the question of entering an entirely new field of investigation. Would it be justifiable

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to do this even though the funds available for running expenses are somewhat enlarged, in view of the great desirability of increasing the marine investigations? Whether or not the decision reached was wisest can be known with certainty only in the future.

Dr. Sumner's central problem is the much discussed one of the heritability of acquired characters. Many biologists accept the Weismannian hypotheses of a "germ plasm" wholly distinct from a "somato-plasm," and so immune to environmental influences acting upon the latter; and on the basis of this conception coupled with the great amount of positive evidence now in court to the effect that specific, localized bodily modifications produced directly by contact with environment are not heritable, hold the question to be closed with the possibility excluded that external influences of any sort play a direct part in organic evolution.

Dr. Sumner is one of the minority, as it seems, of biologists who do not admit the evidence against transmission to be as conclusive as Weismann and his followers hold it to be; and his doubts are justified by strong evidence obtained by experiments of his own as well as by those of other investigators.

The importance of the problem, not only biological but humanitarian; the desirability of enabling Dr. Sumner to carry farther the experiments he had previously begun; and the strong convictions held by me, not only of the fundamental fallacy of the germ plasm conception but also of its baneful influence on philosophical biology generally, all worked together in favor of entering the new domain in spite of the inadequate support which can be given both it and the marine work under the present financial limitations of the Institution. The hope is that the importance of this problem as well as those of the sea life upon which we are already engaged, and the nature of the results already reached in the latter field and those before long to be reached in the former, will constitute a basis for an effective appeal for more ample funds. But in reality while, seen from one direction,

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Dr. Sumner's work is wholly new to the Institution and different from what we have hitherto been doing, looked at from another direction it is only an extension to land animals of the same kind of study we have been prosecuting on certain groups of marine animals. One formulation covers large aspects of both the main problem of marine biology upon which we are engaged, and the problem of terrestrial biology upon which Dr. Sumner is now entering. What relation of organisms to their environment is revealed by comparing and correlating long series of statistical data pertaining to both the organisms themselves and their environment? In other words, what comes to light when the nature and degree of adaptation of organisms to their environment are investigated quantitatively?

The central motive to this sort of investigation is the perception that many questions concerning adaptation, and so concerning the nature of organisms, cannot be answered in any other than a speculative way until quantitative conceptions are applied to them and quantitative methods are employed in studying them.

In order to meet the objection that positive results on the inheritance of acquired characters reached by studies on lower organisms might not hold for higher animals and man, some groups of mammals, it was agreed, must be used in the investigations. For many reasons mice would be the most favorable. Naturally Dr. Sumner turned to Dr. Grinnell, Curator of the Museum of Vertebrate Zoology of the University of California, for help in deciding what species to begin with. It is a great satisfaction to be able to state that without the extensive knowledge of the mammalian fauna of California possessed by the members of the Museum, and the large and splendidly prepared series of specimens contained in the collection, it would have been impossible for Dr. Sumner to take up his problem as he has taken it up. He began work November 1st, 1913, and has already accumulated a mass of quantitative data and information concerning several sub-species of a genus of field mice, by work on museum collections that would have required many months at best had he been obliged to collect

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and prepare his own specimens. Also through Dr. Grinnell's assistance he has been able to trap and keep alive and under observation a large number of one sub-species from Berkeley and another from Victorville, California, a typical desert locality; so a half year's work has advanced the investigation to a point that could hardly have been reached in double or treble that time but for the help of the Museum.

The instruments provided for measuring the environment of the animals are for the most part those in common use by meteorologists. They are:

Thermograph (Richard, Paris), model "B.C.M." weekly recording.  
Hydrograph (Richard), D.M.2.  
Barograph (Richard), B.N.3, metric scale.  
Recording Actinomometer (Richard).  
Maximum registering solar radiation thermometer,  
Observatory barometer.  
Maximum and minimum thermometer.  
Whirling psychrometer.  
Robinson Anemometer registering to 5500 miles.  
Rain gauge.

For the present only a few of these are duplicated, but, as the investigation advances the plan is to instal a complete set at each of two or three or more stations in the typical habitats of the different sub-species being investigated.

Dr. McEwen has published a study during the year on the relation between the phenomenon of up-welling water on the Pacific Coast of America, the meteorology of the Pacific, and the climate of Western North America. He has also made progress on the hitherto almost untouched problem of the relation between the absorption of the sun's heat by the ocean and up-welling water. Through the interest taken in the matter by the Commissioner of the Federal Bureau of Fisheries, Dr. H. M. Smith and Mr. W. L. Schmitt, naturalist of the Bureau's steamer Albatross, the vessel while carrying on an investigation of the halibut fishery on the coast of Washington and Oregon during the present spring and summer, is also collecting hydrographic data

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in behalf of the problems upon which Dr. McEwen is occupied.

The preparation of field records for publication being now off Dr. McEwen's hands he is in position to make immediate use of this new Albatross data, and to push on the several problems in hand without interruption.

The year has brought splendid progress in the development of the library. One thousand nine hundred and five new books have been added, 1114 by purchase and 791 by gift. Many of the purchases are in sets of journals most of which are complete to date and are to be continued through subscription. Much binding has been done, and the work of accessioning, cataloging and arranging of the entire library has been nearly finished.

About 2200 pamphlets and reprints were added in one lot by gift from the director, and good progress has been made in sorting, collating and binding the whole collection of pamphlets. The space devoted to the library and reading room has been increased and storage room for exchange reprints and duplicates has been provided.

With the freeing of the entire laboratory building for scientific uses by the removal of the director's household to the new residence erected for that purpose, new and well furnished quarters have been provided for the zoological collections, and these can now be made more complete and attractive.

A section of concrete sea wall 250 feet long and about eight feet high above the surface of the ground has been constructed in front of the laboratory buildings to stay the inroads of the sea upon the cliff. Two lines of concrete drain pipe each 600 feet in length have been laid across the area upon which the buildings stand to carry away the surface water coming down from the adjacent mesa. Six thousand six hundred dollars were expended on these improvements.

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A residence for the director was completed in December. Four thousand dollars were appropriated for the purpose and the work was done practically within the appropriation. The efficiency of Mr. Crandall as business manager is shown by the fact that these improvements were carried out in accordance with the plans and within the limits of the funds set apart for them.

The salt water circulatory system was completed and put into operation in the fall. The pump, having a capacity of 2100 gallons per hour, is driven by electricity. In the absence of a pier upon which the intake pipe might be carried beyond the immediate wash of the shore, it was deemed best to consider the installation as more or less provisional and so not to expend a large sum upon it. Plans and estimates are now being prepared for a pier by the Engineer of the University connected with the Comptroller's office, Mr. H. B. Foster, and as funds for the purpose are or soon will be available, it is anticipated that the near future will see the aquarian plans realized.

Owing to the fact that the hull of the Alexander Agassiz had not been thoroughly examined for several years it was decided last summer to put the boat on the ways, make such repairs as might be necessary to render her entirely seaworthy and, besides, to take the opportunity to remove her center board, never used, and center board box, and give her more of a keel than she had. These repairs and improvements cost \$900; but the operating qualities of the boat were greatly improved and she was put in good condition in every respect.

Mr. C. J. Marvin, curator of the museum, Mr. W. S. Wallace, research assistant, and Mr. Karl KÖltze, collector and aquarium assistant, resigned without completing the year for which they were appointed.

Respectfully submitted,  
Wm. E. Ritter,  
Scientific Director,

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