

The Marine Biological Laboratory.

Marine biology is one of the newer sides of the science of life. It is only within the last decade or two that we have been provided with any adequate facilities for its cultivation. The reason why marine life is so attractive to naturalists is this: We trace all life back to forms living in water, and most, if not all, fresh-water forms back to marine ancestors. The ocean is the primeval home of life on this planet. Many of the leading problems of life centre in the inhabitants of the sea. These problems must of course be dealt with at the sea-side, and the great importance now attached to them accounts for the interest in marine laboratories. All have doubtless heard of the celebrated Naples Station, which has become a sort of Mecca for biologists from all parts of the world. Perhaps a little of the history of marine laboratories may be of interest.]

From Liebig's "Welt im Glase" arose the idea of marine aquaria, first developed in London. The step from inland to sea-side aquaria was a simple one, but it cost years of pioneering and missionary labor. First of all, the importance of the study of marine life had to be clearly demonstrated, through the work of such men as Johannes Müller, Carl Vogt, Thomas Huxley, Carl Gegenbaur and many others. Among the earliest and ablest advocates of such laboratories was Carl Vogt of Geneva, the venerable friend and colleague of the late Louis Agassiz. As early as 1844-7, he and Milne-Edwards worked out a plan for the investigation of coral islands, for which purpose a station was to be erected on the islands, and a ship with dredging apparatus supplied. A mere question of etiquette brought the plan to naught. The commander of a ship of the royal marine of France could not be subordinated to the wishes of a naturalist. A few years later Vogt proposed a

station at Villafranca, but met with no support. In 1863 he developed a plan for a "zoological seminary" at Naples, which only failed through the untimely loss of his coadjutors--Matteucci and Filippi. An effort to found a station at Triest in 1871 proved likewise unavailing. At length, after so many attempts had ended in disappointment, the great apostle of marine laboratories, lived to see his plan renewed and finally more than realized in a magnificent international station, planted in the middle of the Villa Reale, the beautiful public park of the city of Naples. That station stands today as a great cosmopolitan centre of research,- the most important biological institute that the world has yet seen. (The buildings including outfit, have cost about \$100,000, and its annual expenses for salaries, publications, etc. amount to but little more than the income of a half million dollars.) Since the opening of this station in 1874, and that of Roscoff in 1872, under the direction of Prof. Lacaze-Duthiers, many new stations have arisen in Europe, and they have extended even to Africa, Asia, Australia, and Japan, rapidly verifying the prediction of Dohrn that the earth would soon be encircled by a net-work of biological stations.

Such institutions are no longer regarded as doubtful experiments. The leading governments of Europe, although staggering under the dead weight of standing armies, support them by liberal subventions. The annual deficit of \$10,000 in the budget of the Naples Station is generously met by the German government, notwithstanding the fact that the station does not stand on German ground. Germans may well be proud of a "Fatherland" that, in matters of science, forgets geographical and ethnographical boundary lines.

On this side of the Atlantic something has been done towards completing the great circle of biological stations; but it must be confessed that, notwithstanding notable efforts, we have thus far failed to secure

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the large endowment necessary to such foundations as those maintained by Germany, France, Austria, and England. The history of our sea-side laboratories began under the inspiring leadership of the late Louis Agassiz. The "Anderson School of Natural History", started in 1873, passed the brief existence of two summers. Its isolated location on the island of Penikese, in Buzzard's Bay, 10 or 15 miles from the mainland, and the death of its master, Dec. 14, 1873, led to its abandonment at the close of the second session in 1874. Mr. Alexander Agassiz, to whom the directorship of the school fell after the death of his father, endeavored to interest educational institutions of the country in its support, but all in vain, and hence his plan of removing the laboratory to Wood's Hall, was given up. The laboratory stood as an empty monument to the enterprising genius of Agassiz for nearly 20 years, its plain pine walls adorned only with some mottos which were the treasured words from his inspired tongue during that memorable summer. These mottos were taken to the Marine Biological Laboratory at Wood's Hall in the summer of 1891, and they with a few other relics are all that remain, for shortly afterwards, an unexplained fire completely demolished the building. As Mrs. Agassiz has truly said in her "Life and Correspondence of Louis Agassiz", "Though the Penikese school may be said to have died with its master, it lives anew in many a sea-side laboratory organized on the same plan, in summer schools of Botany and field classes of Geology. The impetus it gave was not, and cannot be, lost, since it refreshed and vitalized methods of teaching.

About 10 years after the abandonment of Penikese, a second attempt was made to interest the colleges and universities in a marine laboratory. It was the late Prof. Baird, who undertook this task, backed by all the resources of the U. S. Fish Commission. Baird succeeded in planting

at Wood's Hall the most extensive Fish and Fisheries station in the world, and in attracting a few naturalists to its laboratories. The station had a fleet of vessels at its service and laboratory facilities beyond anything before offered in this country. But for various reasons, the station did not develop into a strong centre of biological research. After Prof. Baird's death, his office fell to Colonel Marshall Mc Donald, who reorganized the station, and endeavored to revive the plan of making it a scientific centre. The station has been eminently successful so far as fulfilling the functions of a great fish commission; but it is now apparent to all that its organization and aims are incompatible with those of a research centre. It is now conceded on all hands that a station, in order to meet the needs of our science, must have an organization entirely independent of government control, and be dependent, not on annual appropriations that may be as uncertain and variable as the fortunes of political parties, but on an adequate endowment furnished by private initiative. This point we accept as a fact, settled by history as well as by the general verdict of scientific men.

The latest effort to establish a biological observatory at Wood's Hall is now in the fifth year of its development. This effort has been carried on with small means, but with high aims. At the outset the times were not ripe for the immediate realization of our hopes. The entire situation was beset with difficulties which time and faithful work alone could overcome. Educational institutions, with but few exceptions, took no interest in the project; rival schemes were set up all around us; men of high scientific respectability and influence held aloof; and the cause itself had to be vindicated at every point. In short, the conditions and forces with which we had to deal required a period of creative incubation and nursing before they would lend themselves to the

hoped-for development. We have not yet discovered a second Anderson, but we have prepared the ground; we have demonstrated the feasibility of the plan; we have secured the active ²cooperation of most of the leading biologists of the country; we have a rapidly growing constituency among the colleges and universities; and we have a thoroughly representative, non-sectional organization. The next benefactor of our science will therefore find us fully equipped and ready on the instant to realize a full-fledged, ideal plan, the length and breadth of which will not fall short of the largest measure of munificence. Not only have we secured all those elements essential to a safe and permanent foundation, but we have already thoroughly tested the resources of the fauna and flora, so that we can now say with absolute confidence, that Wood's Hall, all things considered, is precisely the location which combines the larger number of natural advantages, such as, accessibility, healthy climate, quiet surroundings, extensive and easy collecting grounds, water free from contaminating inflows, either from rivers or city sewers, wealth and variety of shore life and pelagic forms. Close by are small, easily isolated bodies of brackish water, and besides a considerable number of perfectly isolated fresh-water basins and lakes, affording opportunities of the rarest kind for studying the effects of long isolation, and most favorable conditions for the control of experimental work. The U.S. Fish Com. plant, furnishing extraordinary facilities for collecting, and always ready to cooperate, adds ~~immensely~~ ^{greatly} to the advantages of the location. These practical features are set ~~in~~ ^{in an} environment that certainly does not lack scenic attractions. Sloping hills covered with forests of evergreens, or groves of sturdy oak and maple, form the back ground; in front lie the beautiful islands of Naushon and Nonamesset, the two nearer links in the long chain of the eight Elizabeth Islands, the Indian names of which are familiar to ~~the~~ members of the Laboratory through the fol-

lowing rhyme:

"Naushon, Nashuena,
Nonamesset, Uncatena,
Weepecket, Pasquenese,
Cuttyhunk and Benikese."

On the south and east lies Vineyard Sound, a favorite course for yacht-races and an important highway for steamers, vessels, and crafts of every order and description. Just beyond rises the famous Martha's Vineyard which, together with Nantucket, constitutes the "foot" of the Mass. "boot!" The "sole" of this "foot" is imagined to be ripped off and turned back in the form of Cape Cod, which, being out of sight, to the observer at Wood's Hall, does not detract, even by way of metaphorical suggestion, from the beauty of the Island. Opposite, on the west, is the broad expanse of Buzzard's Bay, nearly landlocked from the ocean by the chain of the Elizabeth Islands, and thus forming almost a separate sea of about 30 miles in length. Such are the attractive surroundings.

In conclusion, let us glance at the situation as it bears upon the needs and possibilities of future development. The present Marine Biological Laboratory at Wood's Hall represents only the initial stage of our undertaking. It serves ~~to preempt the ground, and~~ as a temporary basis for the concentration of forces and perfecting plans for the future. It is provisional, however, only as a germ or an embryo is provisional, which anticipates, potentially at least, the essential characters and activities of the mature organism. It ~~has~~ already an organization of national breadth, a working equipment far from perfect, but superior to that of any other marine laboratory in America, and a constituency *g*rowing at a pace of great promise. The Laboratory owes its origin to the Woman's Educational Association and some members of the Society of

Natural History, of Boston. Its Board of Trustees, numbering about twenty, represent, Harvard, Yale, Columbia, Princeton, Harvard Medical School, Mass. Institute of Technology, Williams, Bowdoin, Cincinnati, the University of Toronto, the Mo. Botanical Garden, the Philadelphia Academy of Sciences, and the Boston Society of Natural History? Its officers of instruction have been drawn from no less than fourteen leading educational and scientific centres of the U.S. Its membership has already extended to nearly all the more important universities, colleges, and schools. Beginning in 1888 with a membership of 17 representing 13 different institutions, it increased the ~~membership~~ ^{numbers} to 44 in 1889, 47 in 1890, 71 in 1891, and 110 in 1892, representing 52 of our higher institutions of learning. The whole number of colleges, universities, and schools for the five seasons is 110. We now have 30 private laboratories for the use of investigators, and 5 general laboratories for students and beginners in investigation. Every room and every laboratory was filled during the past summer. Of the 110 in attendance, no less than 50 were investigators, of whom 30 occupied private laboratories as independent workers.

In one all-important respect, the Marine Biological Laboratory stands alone among the sea-side laboratories of America. We have private laboratories, and we have university laboratories, but, with the single exception of the Marine Biological Laboratory, we have not one marine laboratory, independent in foundation, ^Ynon-sectional in its organization ~~and control, and maintaining a policy truly national in scope.~~ The Marine Biological Laboratory attaches itself to no single institution, but holds itself rigidly to the impartial function of serving all on the same terms. It depends not upon one faculty for its staff of instructors, but seeks the best men it can find among the higher institutions of the land. The Board of Trustees is a growing body, every year adding to its numbers until

it now comprises a very large proportion of the leading biologists of America. The whole policy is national in spirit and in scope. It exists in the interests of biology at large, and not to nurse the prestige of any ambitious university, or to minister to the pride of individual pretension. It upholds an idea which stands for the higher interests of science and for the economy of energy and expenditure. It is the idea of collective as opposed to isolated endeavor, - of coöperative concentration of varied forces in place of dissipative multiplication of like forces. *The* need of the hour is differentiation rather than wasteful repetition, organic integration rather than disorganic isolation. Differentiation is only one half of the universal law of progress; affiliation is the other half. The two principles are working out the destiny of the world, and the survival of the fittest is the eternal decree which they are appointed to enforce.

As the organization of the Laboratory proves true to these requirements, so ~~it~~ ^{it} will have a mission.