

The Marine Biological Laboratory

The Marine Biological Laboratory (MBL) was founded in 1888 in Woods Hole, Massachusetts. Woods Hole was already the site for the government's US Fish Commission Laboratory directed by Spencer Fullerton Baird, and it seemed like the obvious place to add an independent research laboratory that would draw individual scientific investigators along with students and instructors for courses. From the beginning, the lab had the dual mission of teaching and research, and from the beginning leading biologists have found their way to this small village on the "heel" tip of Cape Cod.

Supported by trustees who were largely in the Boston area, the lab opened its doors that first year with one small wooden building and great enthusiasm. Advertising was largely word of mouth since the building was still being constructed and the supplies had not yet arrived up to the last minute. Nonetheless, eight students and seven investigators made up the pioneer group in a six week session with a budget of just over \$10,000 to build and equip the new laboratory building. With a focus on marine life, Balfour H. Van Vleck served as first instructor for a general zoology course.

The second year brought considerable expansion to six instructors and the addition of botany. After that, the lab was on its way to becoming an international presence in marine biology and eventually in certain defined areas of biology generally. From the beginning, embryology was one of the primary focus areas of the lab, and it has remained so throughout the MBL's 120-plus years. The leadership of the laboratory had a strong embryological interest from the beginning, as did the individual investigators and trustees. Especially when the work was experimental, the emphasis was sometimes labeled "physiology" instead of "experimental embryology" to get at fundamental processes of development.

Charles Otis Whitman served as first director of the lab. He had directed the small private Allis Lake Laboratory near Milwaukee, Wisconsin, then directed the biology program at Clark University, and then the biology program at the University of Chicago. Whitman was an able administrator who inspired people intellectually, and he somehow managed to make things work even when money was short. This is probably due in large part to the talents of Frank Rattray Lillie, who followed Whitman at Chicago and at the MBL where he became Assistant Director and then second Director. Where Whitman left financial matters to hope, saying things like "well, what is money for?," Lillie was an astute manager with support from his wealthy father-in-law Charles Crane and other individuals and foundations. Whitman and Lillie made a fine team, and they attracted a board of trustees that included top research biologists and also loyal donors. This has remained true, as the MBL has developed a Corporation of research scientists who pay a membership to be part of the group, plus installed a governing Board of Trustees to oversee operations. Despite some challenging times and some tempting take-over offers, the lab has always remained independent; research and instruction both have increasingly come to rely on federal grants and private foundations but the lab has resisted various attempts to make it an arm of a university, the government, or other organizations.

In 1890 the lab started a series of evening lectures that became known as the Friday Evening Lectures. The goals of offering these lectures and advertising them widely to the public were twofold: first to take science to the larger public and increase interest in science, and second to bring specialists together to learn from each other. Lecturers were instructed to make their talks accessible to beginners as well as of value to senior researchers. These were not intended to be courses, but rather to supplement the systematic organized instruction of the courses. For the years 1890-1899,

the lectures were published as the Biological Lectures Delivered at the Marine Biological Laboratory in Woods Holl.

Courses included zoology, of course, and botany starting in the second year. In addition, Jacques Loeb added physiology as a focus. By 1893 the lab announced instruction in zoology, botany, embryology, physiology, and microscopical technique. In particular, Whitman was directing a course of lectures in embryology, working with Lillie. The Embryology Course has remained a core part of the MBL instructional offerings since 1893, with additional specialized training programs at different times with different emphases.

From the beginning, individuals or institutions could rent lab space and carry out investigations. Since embryological research drew heavily on comparative studies of marine development, it made sense for universities to send their embryologists to the seashore to do work. As Philip Pauly noted, the combination of doing one's research while summering at the seashore was a tremendously attractive option. The MBL has always been a place for the world's top embryologists to gather in the labs, in lectures, on sailing picnics, and with their families at the beaches. Annual Reports show the range of work done at the MBL, and since 1897 the publication of the Biological Bulletin has added an outlet for research carried out by MBL researchers and others.

For the early decades of the lab, embryological work centered on descriptive and comparative studies, especially cell lineage work that reported the details of each cell division for as long as it could be followed in each organism. Different researchers took up different organisms and compared their results, developing concepts of determinative and regulatory development depending on how much the cell divisions could respond to changing environmental conditions. Edmund Beecher Wilson placed cells at the center of developmental research, with his masterful *The Cell in Development and Inheritance* (1896; second edition 1900; much revised third edition 1925). Then the early twentieth-century brought experimental embryology, and by the 1950s and 1960s embryology embraced genetics and became known as developmental biology. Leaders such as James Ebert and Eric Davidson led the lab and also the Embryology Course in the direction of studying differentiation through processes like organogenesis or genetic regulation of development, for example.

While other places often gave up the embryos, the MBL has retained an interest not just in the cells and molecules but also in the developing organisms, which exist in specific environments and depend on complex systems of interacting cell signals and environmental cues. The Embryology Course and the investigation carried out in labs has changed over the 120-plus years at the MBL, but the MBL has played an important role in securing the central place of embryos and the value of comparative study of developmental processes. Perhaps being near the organisms and being able to have them delivered directly from the collectors in the Supply Department makes them more real and the interactions of the parts more salient.

Complex systems, modeling, molecules, and physiological systems all join together in the study of marine and related material at the Marine Biological Laboratory. Researchers have gone out to collect their specimens and have kept them alive in the on-demand seawater running through designated pipes. They have studied normal development, pathologies, and experimental conditions. Generation, regeneration, and new generation are on the research agenda. As the Annual Reports show starting with the very first years, the MBL has been a place for leading investigation and instruction in several areas including embryology, neurobiology, and physiology. Over the years, this has placed the MBL in a solid position to develop such diverse promising areas of research as molecular genetics, neuroembryology, and regenerative medicine.

View a timeline of the MBL here.

Sources

1. Lillie, Frank R. *The Woods Hole Marine Biological Laboratory*. Chicago: the University of Chicago Press, 1944. Reprinted as a Supplement to *The Biological Bulletin* Vol. 174 (1988) available at <http://www.biodiversitylibrary.org/item/17426>.

2. Maienschein, Jane. 100 Years Exploring Life, 1888-1988. Boston: Jones and Bartlett Publishers, 1989.
3. Marine Biological Laboratory Annual Reports: available in the MBL Biological Bulletin Vols. 17 and 21-105 at <http://www.archive.org/details/biologicalbullet01mari> and beginning with 2004 at http://www.mbl.edu/governance/gov_annual_report.html.
4. Marine Biological Laboratory. Symposium Supplement to The Biological Bulletin Vol. 168 (1985): 1-204.
5. Pauly, Philip. "Summer Resort and Scientific Discipline: Woods Hole and the Structure of American Biology, 1882-1925." In *The American Development of Biology*, eds. Ronald Rainger, Keith R. Benson, and Jane Maienschein, 121-150., Philadelphia: University of Pennsylvania Press, 1988.