

house but for more than two months could not be seen, although its presence was known by the tracks left on the sand and by the continuous disappearance of chickens.

Smith's friends throughout the world were saddened by his sudden death on September 29, 1941, from an attack of coronary thrombosis. The appraisal of Smith as a scientist and man given after his death in 1941 by L. Stejneger, Chief Curator of the National Museum, is shared by many zoologists who were privileged to know him personally. "As U. S. Commissioner of Fisheries", writes Stejneger (1941) "Dr. Smith was Baird's worthiest successor In my heart two pictures stand side by side, Spencer Fullerton Baird and Hugh McCormick Smith; higher tribute I cannot conceive!"

Extensive repairs to the buildings and renovation of equipment were necessary by 1915. This need is reported in the following excerpt from the annual Report of the Commissioner (Smith, 1917, p. 34) which states: "The Woods Hole Laboratory is the oldest station of the Bureau. Its history and its public service are closely linked with that of the Bureau and the earlier Fish Commission for which it once served as temporary quarters. After more than 30 years of usefulness the laboratory building and equipment are not in a commendable state of repair. It is desirable that suitable provision be made for its renovation."

In 1916, R. E. Coker was appointed "Assistant in charge of inquiry respecting food fishes", and later on served as temporary summer Director of the Laboratory. The effects of World War I and the impending participation of the United States in the conflict began to exert their influence on scientific activities. Various investigations at the Woods Hole Laboratory that were in progress in June 1917, were continued only during part of the year. Before the end of the fiscal year a new policy was adopted with regard to the operation of the Bureau's laboratories because "of the necessity of concentrating all efforts, as far as possible, upon the immediate increase of aquatic food supply." In the following two years, 1918 and 1919, the Laboratory was not opened for general investigations, but concentrated its effort on improvement of methods of preserving fish and on a study of nematode infestation, a question which had a direct bearing on the marketing of fish.

The laboratory was largely occupied by the Navy in 1917-18, and the investigations normally conducted at the station were discontinued or transferred to other points. In 1919, the Navy Department withdrew from the Woods Hole Laboratory and it was reopened under the directorship of P. H. Mitchell. Research activities of this year were concerned primarily with the physiology of oysters, reddening of salt fish caused by bacterial contamination. Edwin Linton was engaged in the studies of fish parasites, and F. E. Chidester carried on laboratory experiments on the behavior of fishes and their migrations.

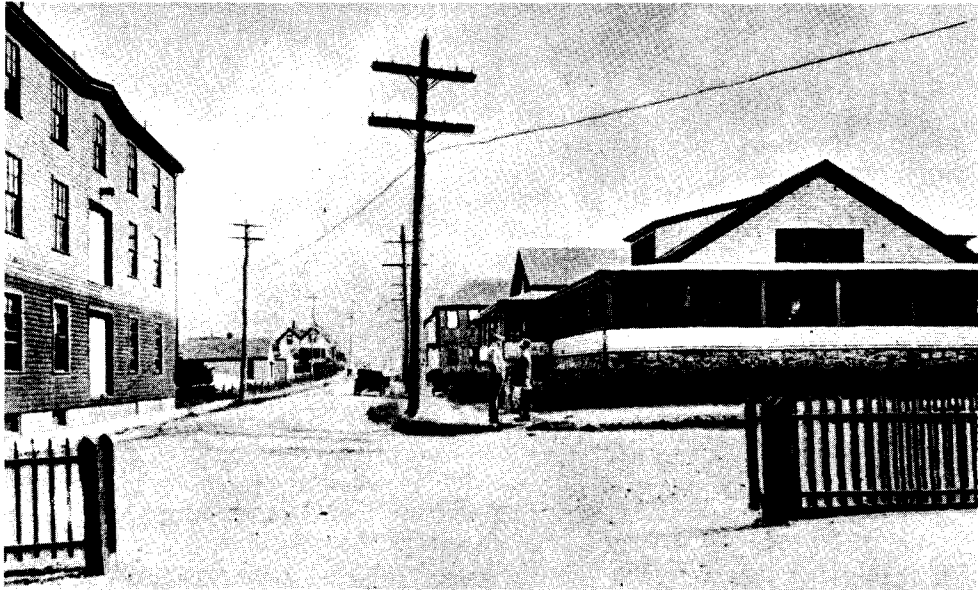


Figure 31.--Corner of Water and Albatross Streets before the fire of 1920. Old machine shop of the Bureau of Fisheries on the left, MBL mess at right corner.

In March 1920, a wooden building (fig. 31) containing the steam boiler, engineroom, and machine shop burned down. The fire spread across the street and destroyed the dining hall of the Marine Biological Laboratory. Plans for a new brick building were made, and the contract for the construction of a fireproof structure to house the boiler, machine shop, and sea-water pump --at the cost of \$51,000--was signed on January 6, 1921. The building, with equipment, was completed during the fiscal year of 1921. Because of the lack of funds for research activities, however, the laboratory was not opened.

In that year Henry O'Malley became the new Commissioner of Fisheries and appointed R. E. Coker Director of the Laboratory for the summer of 1922. Administrative responsibility of the Washington office necessitated Coker's presence at the headquarters, and he spent only the month of July at Woods Hole. The

laboratory record for the summer 1922 contains the names of 19 guest investigators working on a great variety of biological problems. Subjects of their inquiry ranged from the studies of diatoms, regeneration of sponges, fish histology, physiology of vision in lobster, parasites of fishes, and haematology of fishes, to the study of the anatomy and genetics of the fruit fly. The Bureau biologists were engaged in two research projects: hydrographic and biological survey of Long Island Sound conducted by P. S. Galtsoff (recently appointed Naturalist of the Albatross) and seasonal variations in the composition of plankton of Woods Hole waters by Charles J. Fish (instructor in embryology at Brown University and aquatic biologist of the Bureau). The Woods Hole station was used as a base for the operation of the U. S. S. Fish Hawk in Long Island Sound.

One of the guest investigators, Miss Marie Dennis Poland, began a study of the methods of identifying fish eggs and larvae. In 1923 she continued the work as field assistant of the Bureau. And in 1924, while still working with Charles J. Fish on the identification of larval fishes found in plankton, joined him in matrimony. The team of Charles and Marie Fish became well known to the biological community of Woods Hole as a couple deeply devoted to marine research. The paper describing the seasonal distribution of plankton of Woods Hole region (Fish, 1925), summarizes the observations made from samples collected throughout the years by the simple device of suspending a large plankton net from the corner of the wharf where the tides kept it in a horizontal position for several hours.

R. E. Coker resigned his Bureau position in 1923 to become Professor of Zoology in the University of North Carolina at Chapel Hill. He continued, however, as a summer Director of the Laboratory from June 22 to September 8. Among the temporary appointees of the Bureau were Charles B. Wilson, working on the collection of copepods of Chesapeake Bay; Paul Visscher of Johns Hopkins University, studying the nature and extent of ship's fouling with special reference to biological aspects (Visscher, 1928); James I. Penney, working on the biology of the wood destroying crustacean Limnoria. The scope of research, as in previous years, covered a very wide range of problems; from the diatom flora of Woods Hole, by Paul S. Conger of the Carnegie Institution in Washington, to structural development of oral glands of snakes by Albert M. Reese, Professor of Zoology of West Virginia University. A considerable part of the Laboratory space on the second floor was occupied by N. A. Cobb, nematologist of the Department of Agriculture in Washington, and his assistants.

The laboratory and living accommodations of the Woods Hole Station were used to their full capacity in 1923. Every working table and every room in the residence were occupied. It was a policy of the Bureau of Fisheries to encourage biological research

at the Laboratory, not only by offering laboratory tables free of charge, but also in providing living accommodations for guest investigators that were not needed by the government employees. Because of the increasing scarcity of housing facilities in the village, the privilege of having a room in the residence was highly attractive and the number of summer applicants always exceeded the space available in the laboratory and in the residence. It was a difficult duty for the Director to assign the residence rooms. Some of them being large and facing the sea were eagerly sought for, while others--small and facing the street were much less desirable. Somehow the Director was able to distribute the guest investigators in accordance with their scientific status and age. Dissatisfaction and hard feeling were avoided, since the task was performed skillfully and with great tact. As I remember, there was a remarkable spirit of cooperation and friendship among the biologists gathered for a summer session. A great deal of that attitude originated from the summer Director of the Laboratory who, with his family, usually occupied an apartment on the second floor of the residence and used the three large living rooms on the first floor for social gatherings, scientific meetings, and card or chess games enjoyed by the staff and their guests. Meals were taken at the MBL dining hall across the street, where the Fisheries investigators enjoyed the same privileges as those the MBL offered to its research scientists and students. Relationships between the two institutions were friendly, and the spirit of cooperation prevailed in the entire scientific community.

The MBL meals were inexpensive, \$7.00 a week in the 1920's, and adequate. They were served three times a day, according to a timetable which was strictly observed. It was a serious matter to be late for breakfast, since the village had no restaurants or lunch counters. The doors were promptly closed, and late comers were not admitted. The arrangement was necessary because many of the waiters and waitresses were students of the MBL courses and could not be late for their classes. Meals were served in a family style, each person occupying his assigned place at a table set for 12. Seating arrangements were the responsibility of Miss Isobelle Downing, affectionately known to everybody as Miss Belle, who for several decades supervised the messhall, directed the serving, and maintained strict discipline. The allocation to different tables required tact and a remarkable memory which helped Miss Belle to arrange her customers in congenial groups. The MBL messhall was an important social factor in the life of Woods Hole, since there was no other place where the people could meet and chat. By 7:00 p.m., when the doors were closed and only a few persons remained inside finishing their dinner, several groups were formed on the porch to spend about an hour in conversation and relaxation.

The working day at the Fisheries Laboratory usually started with a collecting trip to fish traps, or for dredging or taking plankton samples. The small coal-burning steamer Phalarope (fig. 27), under the command of Capt. R. N. Veeder, was used for this purpose. Fisheries biologists and MBL investigators interested in making a trip were welcome. A group desiring to get aboard usually gathered by 9:00 a. m. at the Fisheries dock. Many persons wanted to watch the dredging or seining and were not concerned with obtaining the material. Robert A. Goffin, collector for the Fisheries Laboratory, and two fish culturists formed the collecting crew.

With the exception of long trips, which sometimes lasted the whole day, the Phalarope would return about noontime; early enough for the participants to change and be ready for their luncheon, which was served by the MBL messhall sharply at 1:30 p. m. The collecting trip became so popular, especially when the weather was good, that the number of passengers on board had to be restricted to conform to safety regulations enforced by the Coast Guard. If something exciting happened during the trip, for instance the catch of a big shark or large moonfish, everybody would dash to one side of the vessel and cause a dangerous list. In later years, Capt. Veeder refused to take more than 20 persons aboard.

In addition to the material needed for research at the Fisheries and collected by the scientists themselves or under their supervision, the Phalarope brought live fishes for the aquarium, which was open to the public every day of the week. The aquarium was operated by the Superintendent of the Station with the assistance of R. A. Goffin.

Among the most spectacular persons occupying laboratory space during this period was Nathan Augustus Cobb (fig. 32), acting Assistant Chief of the Bureau of Plant Nutrition of the Department of Agriculture and later principal nematologist of the Bureau. His outstanding contributions to the taxonomy, anatomy, and microscopic structure of nematodes made him known to a wide circle of scientists in the world. From 1924 to the last year of his life in 1932, he worked every summer at Woods Hole, spending long hours at the microscope and often quitting only late at night. He is remembered by his friends and acquaintances as a tall, slender man with thick moustaches, always clad in a khaki laboratory coat. His scientific interests centered around the nematodes, a group of animals which he probably knew better than any other nematologist of his time. To those in the Laboratory who were interested in his work, he revealed his ideas of the tremendous importance of this group of worms. The highly specialized nature of his work did not narrow his point of view as a scientist but permitted him to use nematodes for attacking major biological problems such as heredity, phylogeny, adaptation,

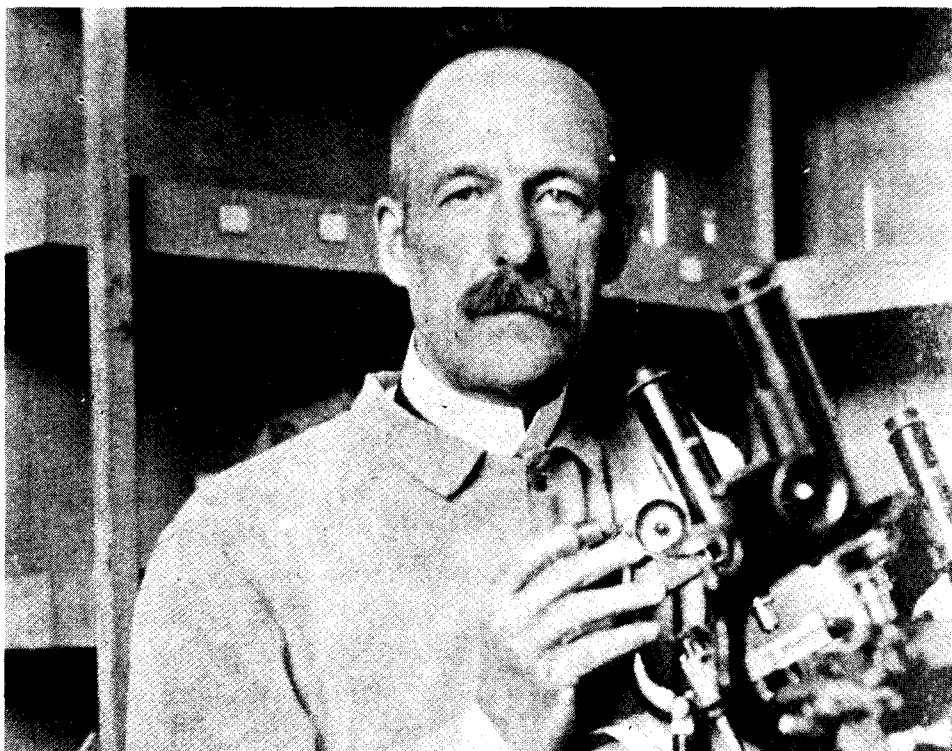


Figure 32.--N. A. Cobb, nematologist of the U.S. Department of Agriculture and summer investigator at Woods Hole Laboratory.

and parasitism. A scientific discussion with Cobb revealed his broad philosophical approach to science. Nemas to him were not the goal but only the means and tools for seeking solutions to broad scientific problems.

Every summer toward the end of June the arrival of Cobb at Woods Hole was preceded by the appearance of two men from the Department of Agriculture, one of them a carpenter, the other a mechanic. Their duty was to set up equipment consisting of specially constructed rotating tables divided into several sectors for microscopes with lamps, and open compartments for notebooks and pencils. An elaborate system of black curtains having certain parts that opened and closed by pulling a rope, placed within easy reach of the microscopist, was set in a corner of the room. This section of the room was reinforced with paired steel girders driven through the first floor and foundation of the laboratory and into the ground. Vibrations of the building caused

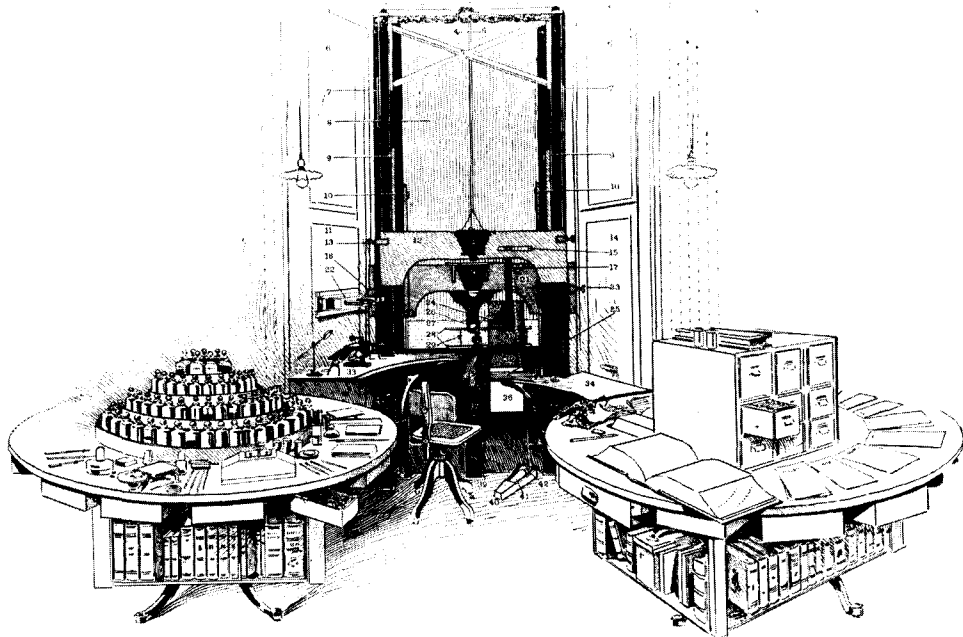


Figure 33.--Sketch of Cobb's equipment for microscopic work on nematodes at Woods Hole.

by passing automobiles were completely eliminated by this arrangement. The columns supported a heavy board for the microscope and camera lucida. One of the unique features of the equipment was a specially designed head rest, molded individually to support the head in a fixed position while making camera lucida drawings. Cobb's equipment, assembled every summer in the Fisheries Laboratory, looked exactly like that shown in the drawing that accompanied the publication (fig. 33) describing this technique (Cobb, 1916). By the time the complex installation was finished, Cobb appeared, accompanied by his assistants (junior nematologists) Edna M. Buhner, Charlotte E. Sprennel, Josephine F. Danforth and others. Since no living accommodations were available for girls in the government quarters, the charming ladies rented rooms in the village but participated in the social gatherings which were held about once a week at the residence.

Cobb's laboratory work was extraordinarily well organized, and various operations were divided among his assistants. He developed special techniques for examining live or unstained material, and for making whole mounts of worms made transparent by glycerin or other media. One of the assistants was busy in making such preparations and placing them on stages of the microscopes set on the round table. When this was done, Cobb began examining them one after another and pushing the table around. The notes referring to each slide were placed in a compartment under each microscope. They were immediately collected by one of the girls, typed, and placed in the same order on another round table. Cobb developed great skill in the use of camera lucida for illustrating the minute details of structure, which are usually destroyed by ordinary reagents. The artist assisting him worked on drawings which later appeared in his papers. One of these illustrations attracted attention of all the members of the Laboratory. It was an anatomical drawing of a free-living marine nematode, Metoncholaimus pristiurus, common in the muddy bottom of Woods Hole harbor a little below low tide level. This nema is particularly suitable for use in laboratory courses in zoology because it can be examined alive or in temporary mounts in lactophenol and five percent potassium hydrate. The original drawing consisted of a number of sheets, each about two feet long. By the end of the summer they were all pasted together making a composite more than 12 feet long in which structural details of highly complex systems of organs were depicted in various colors. The black and white reproduction of this illustration can be found in the Journal of the Washington Academy of Sciences (Cobb, 1932). It is hoped that the original masterpiece has not been lost. The anatomical description of this nema, accompanied by drawings, is used at the summer course of Invertebrate zoology given by the MBL, and several bound copies of this paper are kept in the library as an aid to the students.

Daily contact with this remarkable man showed other facets of his personality--unshaken dignity, frankness combined with courtesy, and a keen sense of humor. He frequently composed delightful verses which, to the extreme joy of his audience, he read at the end of his scientific addresses.

In 1924 and 1925, Willis H. Rich, in charge of the Division of Inquiry, was the summer Director. He remained at Woods Hole for the entire summer season, from June 22 to September 12. Among the new persons who availed themselves of the use of the Fisheries Laboratory were F. G. Hall of Milton College, Wisc., who, with his collaborators Samuel Lepkofsky and I. E. Gray, started a long-continued program of studies of fish respiration. Gray's work was primarily concerned with the chemical composition of fish blood. Baldwin Lucke, Professor of Pathology, School of Medicine of the University of

Pennsylvania, an outstanding student of fish tumours, worked on the mechanism of vital staining and cellular degeneration.

Investigations for the Bureau of Fisheries were carried on by P. S. Galtsoff, who studied the effect of external factors on survival of oyster larvae and continued to work with the assistance of Eugenia Galtsoff on regeneration and dedifferentiation in sponges. The work on oyster larvae was the result of observations made during the survey of Long Island, which showed that industrial pollution may be a factor in the failure of setting of oysters in the waters along the northwestern shores of the Sound. Dr. and Mrs. Charles J. Fish remained in residence the year around and continued their studies of seasonal distribution of plankton and the identification of young fishes. During the month of July (1925), O. E. Sette, Assistant in charge of Fishery Industries of the Bureau of Fisheries, carried on laboratory and field investigations of mackerel. Francis Staff, Director of Fisheries in Warsaw, Poland, visited the Laboratory and spent 10 days acquainting himself with American fishes and methods of fishing.

In the summer of 1926, the position of the Director of the Laboratory was occupied by J. O. Snyder, Professor of the Department of Zoology of Stanford University. Research on mackerel was conducted by Sette; C. J. Fish started a study of the life history of young cod fish. Galtsoff, with the assistance of Henry Federighi and H. Richard Seiwell, initiated experimental studies on the physiology of oyster feeding. They gave special attention to the effect of temperature on the ciliary motion of the gill epithelium (Galtsoff, 1928) and made observations on oyster culture in Wellfleet Harbor, Mass. Laboratory facilities were again made available to Cobb, Wilson and Linton for their respective work. W. C. Schroeder, aquatic biologist of the Bureau, stationed at the Museum of Comparative Zoology in Cambridge, worked on the life histories of the Gadidae and migrations of the cod (Schroeder, 1930).

In 1927-28, the newly appointed Assistant in charge of the Division of Scientific Inquiry, Elmer Higgins, served as Director of the Laboratory. He worked on the material previously collected by him on the life histories of shore fishes of the South Atlantic states. The new fishery project initiated in this period was the study of life histories of Sciaenidae, by John C. Pearson. The mackerel investigation by Sette was conducted with the assistance of Edward W. Bailey, Lee G. Kendall, Samuel L. Leonard, James A. Halstead, and Elizabeth Deichmann of Radcliffe College.

Oyster research under Galtsoff was expanded in 1927 to include observations on the effect of free chlorine on water propulsion, and on sensory stimulation by chemicals. The latter part was conducted by A. E. Hopkins, who continued this work through the winter. Oyster cultural investigation

in the field was carried on by Earle B. Perkins.

Studies of oyster physiology conducted in 1928 were concerned primarily with the metabolism of normal and green colored oysters. Dorothy V. Whipple of Johns Hopkins Medical School and H. B. Pease, student at Harvard University, assisted Galtsoff with the laboratory work.

Numerous repairs and improvements were made during the season. A new laboratory room for biochemistry was equipped on the third floor of the building; an oceanographical laboratory was refinished and the storeroom entirely rebuilt and re-equipped. All these alterations materially increased the usefulness and efficiency of the Laboratory.

The summer season of 1928 was marked by a series of special lectures given in the living room of the residence and attended by a large and appreciative audience of Woods Hole biologists. The lectures were by Galtsoff on "The Chemistry of the Sea"; F. G. Hall on "Respiration of Fishes"; A. G. Huntsman, Director of the Atlantic Biological Station at St. Andrews, New Brunswick, on "Limiting Factors in the Sea"; and H. B. Bigelow on "Oceanography and Fisheries." This very successful season ended with the Annual Convention of the National Association of Fishery Commissioners, held on September 7 and 8. The sessions were attended by 75 persons from various Atlantic states. Hon. Charles W. Gifford, congressman of the Cape Cod district and a good friend of the Laboratory, addressed the opening session. Exhibits arranged for the occasion by the Laboratory comprised 29 different items showing the method of studying the physiology of feeding and reproduction of the oyster; oyster culture; anatomy of the oyster; and depredation caused by oyster drills.

In the years between 1912 and 1928, a great deal of research in oceanic fisheries was conducted for the Bureau of Fisheries by Henry B. Bigelow of Harvard University (fig. 34). Although not employed by the Bureau, he was a frequent visitor to the Fisheries Station and exerted a great deal of influence on the type of research conducted by the Bureau. To the members of the Laboratory he was known as a witty person and devoted scientist, determined to conduct observations in the open ocean in spite of the great personal discomfort of working on small vessels in bad winter storms. He was a pioneer explorer of physical oceanography, plankton, and fishes of the Gulf of Maine. The results of his explorations published by the Bureau (Bigelow, 1926, 1927, 1931) and fundamental work on fishes of the Gulf of Maine made jointly with Schroeder (Bigelow and Schroeder, 1953) remain a source of most valuable information. From 1931 to 1940 he was the first Director of the Woods Hole Oceanographic Institution (WHOI).