SCIENCE

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REMINISCENCES OF THE WOODS HOLE LABORATORY OF THE BUREAU OF FISHERIES, 1882–89[1]

ON February 9, 1871, a law was passed by Congress which directed the President to appoint a man of approved scientific and practical knowledge of fish and fisheries, to be chosen from among the civil officers of the government, who was to serve as U. S. Commissioner of Fish and Fisheries without additional salary.

This act virtually defined Spencer F. Baird, secretary of the Smithsonian Institution, who thereupon was appointed commissioner by the President. The commissioner was clothed with unusual powers; for the act instructed the heads of the various executive departments to render the commissioner such assistance as might lie in their power. Frequent acknowledgments of the cooperation of the departments of the treasury, war, interior and navy are found in the earlier reports of the Fish Commission.

The immediate problem before the commissioner was: An inquiry into the decrease of food fishes. It is interesting to note that Professor Baird chose Woods Hole as the place for beginning research on this problem. That was in the summer of 1871. Those associated with him were Professors A. E. Verrill, Theodore N. Gill and Sydney I. Smith.

The headquarters in 1872 were at Eastport, Maine; in 1873 at Portland, Maine; in 1874 at Noank, Connecticut; in 1875 again at Woods Hole. During the year

[1] A lecture delivered before the Marine Biological Laboratory, Woods Hole, Mass., August 7, 1914.

1876 no active field operations were carried on by Professor Baird on account of duties connected with the superintendency of the government exhibit at Philadelphia. In the report for 1876, however, the following statement is made:

> The laboratory at Woods Hole was opened . . . for investigators, to whom every facility and assistance was furnished by Vinal N. Edwards in charge of the station.

The first part of the summer of 1877 was spent at Salem, Mass. In August the party proceeded to Halifax, N. S., where a second station for the summer was formed. Among the assistants of Professor Verrill that year was E. B. Wilson. (It is needless to inform this audience that E. B. Wilson has since been promoted.) In 1878 the laboratory was on Fort Hill at the mouth of Gloucester Harbor; in 1879 at Provincetown, Mass., and in 1880 at Newport, R. I. In 1881 Woods Hole was again chosen as the center of scientific operations. In the report for that year Professor Baird speaks of the advantages of the place as a permanent sea-coast station of the U. S. Fish Commission. In the report for 1882 the reasons for choosing Woods Hole as a permanent station are given. After speaking of the experience at Gloucester the report continues:

> A totally different condition of things was found at Woods Hole where the water is exceptionally pure and free from sediment, and where a strong tide rushing through the Woods Hole passage keeps the water in a state of healthy oxygenation specially favorable for biological research of every kind and description. The entire absence of sewage owing to the remoteness of large towns, as well as the absence of large rivers tending to reduce the salinity of the water, constituted a strong argument in its favor, and this station was finally fixed upon for the purpose in question.

In the report for 1875, published in 1878, one finds the spelling of the name of the station changed from Woods Hole to Woods Holl. This change was made in conformity with a similar change made by the Post Office Department. An ingenious argument for this unusual way of spelling hole will be found in a small pamphlet written by the late Joseph Fay. It should be stated, in justice to the author of the pamphlet, that his contention was that the word in question was really the Norwegian word *holl,* meaning a hill, but pronounced hole.

In this connection it is proper to mention the fact that this same Joseph Fay gave to the U. S. government the waterfront extending from what is now the property of the Marine Biological Laboratory to what is now called Penzance, but then was without a name, if one will except the obvious epithets which were liberally applied to the locality by the residents of Great Harbor whenever the wind was from the northwest, for there was situated a large fertilizer establishment, known locally as the "Guano Works." Among material collected at Woods Hole in 1882, I still have a considerable number of goose-barnacles which I scraped from an Italian bark, 90 days out from the Mediterranean, then tied up at the wharf of the "Guano Works" and unlading her cargo of sulphur.

Prior to 1877 the tug *Blue Light* was detailed by the Navy for the use of the Fish Commission. A larger tug, the *Speedwell,* was detailed in 1877. In the year 1880 the *Fish Hawk,* which had just been built, was used in exploring the Gulf Stream and its fauna, especially in connection with the distribution of the tile-fish. In 1883 the *Albatross,* a ship especially designed for deep-sea work, was completed and placed in commission.

Professor Baird early inaugurated the policy of naming a vessel that was propelled by its own power for some bird. A sailing-vessel was given the name of a water mammal, while rowboats were given the names

of fish. With the installation of auxiliary motors in such craft as the *Grampus* and *Dolphin* the taxonomy of the Fish Commission's flotilla is not without its difficulties.

When Professor Baird was laying his plans for a permanent laboratory he was in much doubt as to his ability to induce Congress to make an appropriation for such purpose. Assured of a location for the laboratory, through the public spirit of Joseph Fay, he conceived the idea of having universities and colleges cooperate in the building of a laboratory. To this end he prepared articles of agreement whereby an institution by contributing the sum of one thousand dollars would have the right in perpetuity to the use of a table in the laboratory. This offer was open for but a short time, as Congress, having had experimental proof of the administrative ability and probity of Professor Baird, made the necessary appropriation for the construction of the laboratory. Before the offer was withdrawn, Professor Alexander Agassiz had subscribed for a number of tables, four, I think, for the use of Harvard University. My recollection is that one table was subscribed for by Princeton, one by Williams, and one by some other institution. It is largely owing to this plan that a succession of graduate students has occupied tables in the laboratory of the Fish Commission since 1885. These students brought with them new ideas and methods and inspiration that have been important factors in the usefulness of the laboratory.

Upon the death of Professor Baird, in 1887, G. Brown Goode was made commissioner pro tempore. He, indeed, was the logical successor of Professor Baird, but preferred to remain at the head of the National Museum. In the meantime the law had been changed, so far as to make the office of commissioner a salaried office. Colonel Marshall McDonald was appointed commissioner in 1888. He served until his death in 1895. Captain J. J. Brice of the Navy was made commissioner in 1896, Mr. Herbert A. Gill being acting commissioner in the interval. Captain Brice served until 1898, when he was succeeded by George M. Bowers, who served for nearly as long a term as that of Professor Baird's. During Mr. Bowers's term of office the commission ceased to be independent. It became a bureau, first in the Department of Commerce and Labor, then in the Department of Commerce. In 1913 Dr. Hugh M. Smith, long associated with the commission, and for some years deputy commissioner, succeeded Commissioner Bowers, and is the present commissioner.

In all the time from 1871 to the present, with the exception of the brief administration of Captain Brice, every encouragement has been given to scientific investigation at the Woods Hole Laboratory of the Fish Commission. Of the laboratory during the administration of Captain Brice I have no personal knowledge. I have been informed, however, that then, for a time, at least, scientific work was virtually suspended, and would have ceased entirely but for the vigorous insistence of Professor Alexander Agassiz on the right of Harvard University to occupy tables in the laboratory. Thanks, therefore, to these compacts, which, I think, Professor Baird somewhat regretted had been entered into, the work of scientific investigation at the Woods Hole Laboratory of the Fish Commission has not been seriously interrupted from its inception under Professor Baird to the present time.

Prior to 1885 the laboratory was on the lighthouse wharf on Little Harbor in the two-story building which had been refitted, the second story added, with outside stairs on the north side. Professor Baird lived in the house which stands just east of the one occupied by Miss Sarah Fay. As I re-

member the house then it had a good-sized porch in front. The offices of the clerical force of the commission were in a house known as the Gardiner house, which stood about where the entrance to the rose garden now is. This house has since been removed. The house occupied by Professor Baird also accommodated the mess, which was made up of the scientific workers and the clerical force. The various members of the party roomed at private houses in the village. For example, in the summers of 1882, 1883 and a part of 1884, four of us younger men had rooms on the third floor of what was then, and still is, the rectory. From the windows of these rooms are to be had some of the most charming views of these beautiful shores.

The residence building was first occupied early in August, 1884. It then accommodated Professor Baird's family, the scientific staff and the office force. The dining-room easily accommodated the entire company, about 30, which constituted a real family, of which Professor Baird was the head. He and his wife and daughter, and some of the older members of the scientific corps, with their wives, occupied one table, the other scientific workers filled another table, and the clerical force a third. The parlor of the residence made a general meeting-place where all the members of the family were accustomed to assemble in the evenings. Although the habit of working in the laboratory at night still continued, members of the laboratory force were in frequent attendance at these family gatherings. In the summer of 1886 we rented a piano and installed it in the parlor, where some pleasant hours were spent in singing, and, on a few occasions, others were invited in and there was a little dancing.

Work on the new laboratory building was in progress during the summer of 1884. A picture which hangs on the south wall of the porch room of the residence gives a view of the locality where the Fish Commission buildings now stand, as it appeared in 1882. During the dredging operations that preceded the construction of the sea wall that encloses the basins we were frequently detailed to make collections of the mud-inhabiting forms that were brought up by the dredge.

The laboratory in 1882 was, as has been stated, on the lighthouse wharf on Little Harbor. Ordinarily the day's work began before 9 o'clock and continued until 10 or 11 o'clock at night. As Professor Verrill's assistant my work in 1882 and 1883 was especially directed to the group of Annelids. Later I was promoted to investigate the ancient and, to some minds, dishonorable, order of Cestodes and their kindred.

In those years there was not much systematic collecting done along shore and in shallow water, except for certain groups and localities. A good deal of time was taken up in the collection and study of surface material, but the chief interest centered about the trips of the *Fish Hawk* to the Gulf Stream. There were other shorter trips for the purpose of exploring some shallow-water localities that were very full of interest to a beginner. The first trip which I made was one to the northward where the dredging operations began off Chatham and continued to Provincetown. It was on this trip that I saw for the first time, in a living state, some particularly large sea-anemones, and the many-armed serpent-star *Astrophyton*. At Provincetown there was at that time an establishment on the point where whale oil was tried out, the whales being taken offshore and brought in to the try-works. There was a vast accumulation of vertebræ, ribs and baleen there, and the younger members of the party took advantage of the opportunity to make private collections, which Captain

Tanner very kindly allowed us to bring back on the ship. The odor thus transferred to the hold of the *Fish Hawk,* while in itself not small, we could assure the captain would not be missed on the point, where it was massive, corporeal and all-pervading.

Almost daily collections were made of surface material. Trips for this purpose were made in the Fish Commission launch, *Cygnet,* D. H. Cleveland, captain, and W. H. Lynch, engineer. Now and then when trips were in the daytime we contrived to have a race with the Forbes launch, *Coryell,* at which times, if the energy with which Lynch shoveled coal could have been transferred directly to the machinery that actuated our propeller, we should have easily won. As it was, unless my memory is at fault, the *Coryell* usually got the better of us.

Two or three times a week collections were made in the evening, beginning just after dark. A favorite place for making these evening collections was in the "hole," where the launch would be made fast to the nun buoy, and for an hour or more towing-nets were used. The material thus collected was then taken back to the laboratory, where it was immediately examined. In this way much information was obtained of the nature, times, seasons, stages of development and habits of the life at and near the surface. I do not remember hearing in those years the word plankton used. Possibly a more tolerant interest might be awakened in a modern audience in these old-time investigations if this paragraph had been headed with the cabalistic legend: Plankton studies.

In 1882 dredging on the outer continental slope was still being vigorously carried on, most of it in depths ranging from 100 to 400 fathoms. Trips to this locality were usually called Gulf Stream trips. The great abundance of living things brought up by the trawl from this under-sea edge of the continent was still yielding many new and interesting forms, and, since it was important that the material be cared for promptly, three or four of the younger men were always detailed for this work. Professor Verrill himself did not go on these trips, the motion of the ship quickly incapacitating him for work. Indeed, any one who can endure the motion of the *Fish Hawk* for 24 hours without experiencing unpleasant sensations can qualify as an able seaman, at least as far as immunity from sea-sickness goes. Our trips to the Gulf Stream were carried out in this wise: The precise time of departure was not set until a short time before starting. This was because the *Fish Hawk,* having been designed as a kind of wandering fish hatchery whose field of operation was to be limited largely to such bodies of water as Chesapeake Bay, was not then and is not now regarded as a vessel that could safely weather a severe storm. It was Professor Baird's custom, therefore, before sending the *Fish Hawk* on an outside trip, to get a special bulletin from the weather bureau saying that no atmospheric disturbances were indicated for the North Atlantic coast for the next forty-eight hours. Favorable conditions prevailing, we were then notified, sometimes but an hour or two, or even less, before starting, that we were expected to make a trip to the Gulf Stream. The usual time for starting was 5 P.M. We steamed out all night, and upon the following morning, having now arrived at the outer slope, began dredging. As a rule the trawl was overboard by 5 o'clock; the first haul was consequently made before breakfast. My recollection of these days are of hours of not altogether unalloyed pleasure. To this day the smell of material brought fresh from the bottom of the sea awakes memories that

I would fain let slumber. The material which but a short time before had been on the bottom at a temperature but little above the freezing point was unpleasantly cold to handle. Then there was the ever-present discomfort caused by the rolling of the vessel, accentuated to a stomach-racking degree by the motion communicated to the vessel when the dredging was in operation. Under such conditions it should not be a matter of wonder if from time to time the most zealous of naturalists turned away from the large seive, into which the material from the trawl was emptied, with feelings akin to those experienced by the fishes just before they lost consciousness as they were being hurried from the bottom. These fishes came to the surface with either swim-bladder or stomach protruding from their mouths, and their eyes starting from their sockets. Such phenomena are due to the enormous release of pressure experienced in being in a few minutes transferred from the bottom to the surface, a difference approximating 50 pounds for each one hundred feet, or 300 pounds per square inch for a depth of one hundred fathoms.

The forms brought from the bottom on the borders of the Gulf Stream, were so varied and so different from those found along shore or at moderate depths that, until they had been seen repeatedly, they caused the disturbing motions of the *Fish Hawk* for the time to be forgotten. For example, an annelid which lives in a tube constructed from its own bodily secretions early attracted my attention. The tube had the appearance of quill; when burned it gave the same odor as burning quill, and, when cut into the shape of a pen, could be used for writing the worm's name. Another was an interesting case of symbiosis, or life-partnership, that had been made familiar to those of us who had listened to Professor Verrill's lectures. Here it was seen in the living condition, a hermit crab having its home in a living house, that grew as the crab grew, and consisting of a colony of sea-anemones. Close examination would usually show that the sea-anemones had originally established themselves on the shell of a mollusk in which the hermit crab was living. The cœnosarc common to the anemone colony not only grew entirely over the shell, but continued the lip of the shell with enlarged gap so that the crab did not need to seek a new and larger shell in subsequent molts. Furthermore, the advantage of this partnership is mutual. On the one hand the crab is provided with a house which adjusts itself to its needs and, with its frieze of tentacles, armed with nettle-like defensive organs, gives him a measure of protection from his enemies. On the other hand, the anemone is carried about by its active partner and is thus afforded a much more varied experience than it would have if growing on a non-motile object. Moreover, the crab, being a greedy feeder, very unlike Chaucer's nun, who, we are told, "let no morsels from her lippes fall," allows many fragments of his meals to float off in the surrounding water, is thus, while eating, doubtless often encompassed by a cloud of crumbs which are as manna to the colony of polyps which thus become literally commensals or true table companions. Such matters are, of course, familiar to students and teachers of zoology, but may not be so familiar to those whose biological training has proceeded along different lines. An interesting feature about this case of commensalism is that, while several hundred specimens were collected in the expeditions of the *Fish Hawk* to the Gulf Stream, these two species were always found associated as commensals. In other words, this particular species of hermit crab was not found except as a commensal of this particular species of sea-

anemone, and this particular sea-anemone was not seen except as a commensal of this particular species of hermit crab. Other cases of commensalism between sea-anemones and crabs were encountered, but none in which the commensals were so faithful to each other as in this.

The material of a haul having been cared for, some of it assorted, labeled and placed in proper preserving fluid, some of it kept in sea-water to be brought alive to the laboratory, we quickly relapsed into that condition of indifference to all things, past, present and to come, which characterizes alike the sea-sick and the aspirants to Nirvana. From this apathetic state we aroused less and less completely as the day wore on. On one or two trying occasions when a heavy swell rocked the *Fish Hawk* in its glassy cradle, much of the material in the last haul, in spite of its great value from the point of view of those who desired an accurate knowledge of the life on the ocean floor, was huddled together and brought back to the laboratory in much the same condition in which it was scraped from the bottom by the trawl.

Before the trawl was put overboard a sounding was made. This was done by means of an ingenious machine invented by Captain Sigsbee of the navy. Instead of the hempen cord of the older machines fine piano wire was employed. A thermometer was also sent down with the sounding lead, the case in which it was enclosed being fastened securely at the lower end, while the upper end was held to the wire by a detachable clamp which was loosed by a lead traveler sent down the wire. This tripped the thermometer, which, in turning over, broke the column of mercury in a bend of the tube, so that the mercury in the filiform portion of the tube remained and could be read in the reversed instrument when it reached the surface. Specimens of the bottom were also obtained. Thus each sounding yielded data of depth, temperature and character of the bottom. Now and then temperatures at different depths in the same locality were taken. The bottom was largely a soft foraminiferal ooze into which the trawl sank, the net sometimes bringing up a large mass of mud, in spite of its having traversed a hundred fathoms or more of clean sea-water on its way to the surface. Occasionally a boulder of fair size was captured, and on more than one occasion the load was too heavy for the net. What came to the surface then was a broken net with, at most, a few small starfishes and serpent-stars clinging to its sides. At such times the comments of Captain Tanner resembled some of the more lurid passages in the novels of Captain Maryatt.

Most of the dredging work of the *Fish Hawk* on the Gulf Stream was done with a beam trawl. The lower end of the net was kept on the bottom by means of leaden weights, while the net itself was buoyed up with hollow balls of thick glass. Sometimes these balls, which were empty when they were started down, came to the surface with water inside. This appears to be due to the extreme pressure which forced water through minute openings in the glass.

In addition to the bottom work some attention was given to the collecting of surface material by means of towing nets and dip nets. Specimens of the Portuguese man-of-war and other Siphonophora were frequently taken as well as *Hippocampus* and various other forms found in the floating gulf-weed. Sharks also were sometimes taken, and, on one trip I remember, three or four porpoises were harpooned. This latter, however, was rather by way of diversion and did not enter into the more serious work of the trips.

About sundown the dredging was discontinued; the ship's course was laid for

Gay Head light, and the thump, thump of the engines began, to keep up all night. On the following morning, soon after sunrise, we would sight Nomansland or Gay Head, and about 9 o'clock were tied up at the wharf in Great Harbor, which, as I remember, was just west of the Luscomb wharf.

Sometimes the fair-weather forecast did not hold good for the whole trip. That meant an uneasy time for Captain Tanner, who, it was said by other officers and by the crew, never slept from the time the *Fish Hawk* put out to sea until she was safe in harbor. Of one of these return trips I have a vivid recollection. With little provocation the *Fish Hawk,* not then provided with a bilge keel, could get up a 45° roll. On this occasion soon after we turned in we had an exhibition of rolling and pitching and various combinations of these severally trying motions that far outdid any former exhibitions of similar nature. Now and then the twin screws, prophetic of the air craft of the present day, were whirling in air, while on board there was a constant rattling and banging, creaking and slamming, with an occasional crash of breaking glass that kept us awake but, so far as I remember, did not cause us any alarm. We did not know much about the sea-going qualifications of the *Fish Hawk,* while we had an extravagant confidence in the ability and caution of the captain.

When we reached port on this trip Captain Tanner put in circulation a new story. In order to understand the point of the story it is necessary first to explain that, just as now the title of a scientific worker in Woods Hole is doctor—so much so indeed that one readily understands why a little girl a few years ago brought word upstairs to her mother that Dr. Boles, the carpenter, was below—so, in the 80's, the title of professor was similarly employed. "The Professor" always, and to all persons, meant Professor Baird. Otherwise the title of professor was bestowed with great liberality and impartiality. Indeed we young assistants were called professors by the crew of the *Fish Hawk* as cheerfully and naturally as the same persons would have given the title to an instructor in the art of self-defense. It so happened on this trip that there were some worthies on board who occupied the spare staterooms, and mattresses were spread in the ward room for the assistants. Captain Tanner said that when it came on to blow he sent his servant, George, below to see if everything had been made secure. When he returned the captain asked: "Well, George, is everything clewed up tight?" "Yas, sah." "You're sure that all's been made snug?" "Yas, sah." "Nothing loose?" "No, sah, 'scusin of a few professors adrift on de ward-room flo'."

On a number of the trips made to the Gulf Stream in 1882 trawl lines and bait were taken along for the purpose of fishing for the tile-fish, whose destruction in enormous numbers had been reported by incoming vessels in the spring of that year. These vessels reported that they had seen countless millions of fish in a dead or dying condition covering thousands of square miles of the sea. The tile-fish (*Lophilatilus chamæleonticeps*) was first taken in 1879. It is a bottom fish with habits much like the cod, and it occurred in vast numbers in the waters bordering the Gulf Stream between Hatteras and Nantucket previous to the season of 1882.[2]

Professor Baird had hoped that profitable fisheries for this species might be opened up, and was very anxious to have specimens secured to prove that the species was still extant. I remember a remark that Captain Chester made as he came alongside

[2] U. S. Fish Com. Report for 1882, pp. 237–94.

the ship on our first trip to the tile-fish grounds, after underrunning the line that had been set for several hours. There were a considerable number of fish of various kinds in the bottom of his boat which he had taken from the line. Some one sung out from the ship asking him if he had taken any tile-fish. His reply was: "Not a lophilatilus, not a chamæleonticeps!" In fact no tile-fish were taken until July, 1899. They were taken again in July, 1900. The hoped-for fisheries for the tile-fish have not yet been realized.

The *Albatross* started on her first trip from Woods Hole July 16, 1883. The trip lasted, as I remembered it, five days. It was my good fortune to be one of the number assigned to this trip. In attempting to review the events of this trip I find that my ability to recall details is limited to a not large number of incidents which rise in my memory like pictures. Life on ship board is somewhat monotonous at best, and when one experienced an undertone of discomfort, there follows the natural tendency to dismiss all recollection of it from the mind.

One experience, however, was so unique, and, fortunately, not associated with feelings of discomfort, that I have often lived it over in my memory. That was when the first haul was made from the deep sea. A depth, as I remember it, of 1,400 fathoms, or nearly 1.6 miles, was shown by the sounding that was made just before the trawl was put overboard. As the dredging operations of the *Fish Hawk* had been limited to localities where the maximum depth was less than half this depth, this was the first experience of any one on board with really deep-sea dredging. Of this event the picture which I carry in my memory is a moving one of perhaps a little more than a quarter of an hour's duration, beginning a few minutes before the trawl appeared and ending after we had spent a few minutes in overhauling the material. The trawl had been over several hours. I have not verified my impressions, but I think it was possibly as much as six hours. When the indicator showed that the trawl was within a few fathoms of the surface every one began to peer down into the transparent water to catch sight of the messenger that had been on such a strange voyage of discovery. It was long past sunset and quite dark, but the scene was brilliantly lighted by electricity. A strong arc-light suspended over the water made sufficient illumination to reveal a school of flying squid pumping themselves about in the water. The light penetrated to sufficient depth to enable one to trace the wire cable far down until it was lost in the darkness below. For some reason, I do not know why, I glanced around. What I saw and remember would, I think, make a worthy theme for a great painting. In the foreground were the naval officers in their trim uniforms; near them the little band of investigators in their nondescript but not unpicturesque attire. Grouped on the forecastle was almost the entire ship's crew, the white trappings of the sailors standing out bravely under the rays of the powerful electric light. Above, below and around about, darkness. The picture was given the needed motif by the approaching trawl upon which all eyes, but my own for a brief interval, were centered. I find myself still as a somewhat detached spectator recalling this scene, and think of this little hemisphere of light in the general gloom that shrouded the great expanse as symbolic of the light of science in the world, which is shining not only to reveal the things that may be seen, but striving to illumine the depths and thus bring to the surface a knowledge of things that lie deeply hidden. This scene lasted but a short time. Pres-

ently we could discern, far down in the transparent waters, a formless thing that quickly took shape, and then the trawl was hauled above the surface, the boom swung in, the net emptied into the great sieve, and we had our first view of living examples of the abyssal fauna. Those forms that lay in the sieve had, only an hour or two before, been resting on the ocean floor where their ancestors had lain undisturbed through the ages of the past with no traditions to affright them by visions of some mysterious being reaching down to snatch the dwellers of the abyss to the unknown regions above.

We had become familiar with the rich and varied fauna of the continental slope, and some of the party had had much experience in dredging in depths of as much as 500 fathoms, but among this material, not large in the mass, were forms that at first no one could assign even to a probable phylum. For example there were a half dozen or more curious-looking objects, not unlike in shape and size to an ordinary five-cent loaf of bread, perhaps a little flatter, and in color and consistency resembling the compound ascidian known as sea-pork. When these objects were brought to the attention of the mollusk specialist he would have nothing to do with them, saying that they were ascidians, or, possibly, worms. The annelid specialist passed them by. It was really not until some of these puzzling creatures had been lying for some time in a tub of sea-water that they were seen to be holothurians, sea-cucumbers of unusual appearance plucked from the abyss. Details of this deep-sea fauna may be obtained from the published reports of the Fish Commission. A strange world was opened up to the imagination by these creatures from the depths: Fish with eyes living in those regions whither the light of day can not penetrate! Whence comes the light which the presence of organs of sight implies? Gorgonia corals, slender and fragile and as delicate as the finest grasses of autumn, shining in shadow with a brilliant phosphorescent light, suggest that if we could see this ocean floor, we would see it dimly illuminated by the phosphorescence of its living denizens, among them groves of gorgonians, motionless in the currentless water and shining with a light literally not seen on sea or land.

I propose now to record brief memory sketches of some of those who were associated with the Fish Commission at the Woods Hole laboratory in 1882 and the years immediately succeeding.

SPENCER FULLERTON BAIRD

Information regarding the life and works of this great American can be had from the published accounts. My purpose here is simply to record a few personal recollections.

I first met Professor Baird in the summer of 1882 when I came to Woods Hole as an assistant of Professor Verrill. About the first thing he said to me was to ask what particular field of zoology I was interested in. By this question I can see now two striking characteristics of Professor Baird's mind: First, his interest in young men who were inclined to the study of nature, and, second, his conviction that such study was best begun by becoming familiar with some particular group of animals. He was then about 60 years of age but looked older than his years. He was a large man, probably fully six feet in height, and possessed of a powerful frame. He stooped slightly, his movements were rather slow and his manner deliberate. His hair and beard were becoming gray. He had a kindly smile, a genial but quiet manner, and a bearing which might not improperly be called patriarchal. He had a wholesome sense of humor,

and was not unacquainted with some of the lighter literature of the day. He read with zest, as many of us did, Rider Haggard's "King Solomon's Mines," and was so much interested in Mrs. Burnett's "Little Lord Fauntleroy," which came out in serial form in *St. Nicholas,* to which he was a subscriber, that he asked the author's husband whether the story had been completed, or whether Mrs. Burnett was supplying copy to the magazine month by month. He was much relieved when told that the manuscript for the entire story had been given to the publishers, since he could now go on with the reading without fearing that some calamity might happen to the author that would prevent her finishing the story. He gave the impression of being one who had succeeded in establishing entire control over himself. I never saw him roused out of his habitual serenity but once. That was when a collecting expedition for a special purpose was being delayed in its starting because the commander of the *Lookout* wanted to finish a game of tennis he was playing on the grounds near the Dexter House. (The *Lookout* was a steam-yacht used by Major Ferguson, the assistant commissioner.) When it was reported to Professor Baird that the expedition was being delayed he left his office and walked at a very rapid pace down toward the laboratory on Little Harbor. The commander of the *Lookout,* sighting Professor Baird bearing down upon him under full steam, abruptly suspended his game and a few minutes later the *Lookout* was under way.

Professor Baird's knowledge of living things, especially of fishes and birds, was extensive, exact and detailed. He belonged to the older school of naturalists whose view of nature was bounded by no narrow horizon. Unfortunately for him and for science his later years were encumbered by administrative details which, although he attended to them apparently without worry, were often perplexing, always time-consuming, and grew in volume with the years. As secretary of the Smithsonian Institution and as commissioner of fish and fisheries his administrative burdens were very great. His nature was such that he could not easily shift burdens to other shoulders. As a consequence of all this he suffered the penalties that follow long hours at his desk substituted for a life that had been formerly in good part spent in the open.

In the interval between the summers of 1886 and 1887 his health failed, and in August, 1887, he died in the residence building into which he and his immediate family and the greater family making up the commission force had moved but three years before.

The funeral services were read by the rector of the Episcopal Church of Woods Hole. To the prescribed church service were added two of the beatitudes which appeared to those who had been associated with him most intimately to reflect the high points of his character. They were the ones which pronounce blessings on the peace-makers, and on those who are pure in heart.

Professors A. E. Verrill and Sydney I. Smith are best known to Woods Hole workers for their voluminous and invaluable report on the "Invertebrate Animals of Vineyard Sound and Adjacent Waters." They were alike in that they were zoologists of unflagging zeal. In all other particulars they were unlike and good-naturedly antipathetic. The one was unemotional, dogged, and, to those who did not know him well, seemingly, at times, crusty. The other was quick, vivacious, open and frank in his manner at all times and to all persons. They invariably took opposite sides of any question that came up for discussion, whether it was scientific, political,

theological or philosophical. The only adverse criticism that I ever heard passed upon their use of time was that they often wasted it in argument over questions which, however they might be settled, if they ever were settled, would not advance human knowledge appreciably, or improve human practise materially. It must be remembered, however, that they were both prodigious workers and that their argumentation was about their only recreation. They did not smoke, and, indeed, were abstemious in all their habits, except in the matter of debate.

Professor Verrill's memory for details was almost uncanny. It was generally believed among us younger men that he could tell correctly at any time the exact number of spines on any parapodium on any species of annelid that he had studied, and he had studied those of the New England coast so effectually that no one has attempted to do much in a systematic way since his time. It was a matter of surprise to those who came to know him well to discover in him a kindly heart and a genial nature. It is a pleasure to record that he is still vigorous and complaining, as usual, because there are not more than twenty-four hours in the day. Professor Sydney Smith, too, is still much alive, and in spite of the great affliction in the loss of his sight, is still unquenchably bright and cheerful.

A peculiarity which Professor Verrill possessed as an arguer may be commended to any who may have to play the part of disputant. No matter what the nature of the interruption might be, or how often the interruptions were made, he never allowed them to divert him from the main course of his argument. I have often heard Mr. Sanderson Smith engaged in a furious debate with Professor Verrill, generally during the progress of dinner, where the fury, however, was all on the one side, and manifesting itself in frequent and energetic interruptions and expostulations, during which Professor Verrill would patiently pause, and, after the breath of his opponent was exhausted, take up his argument where it had been interrupted, and, with even voice, continue as if nothing had been said on the other side. By and by, at the proper place he might reply to the interjected arguments.

Richard Rathbun was working in the laboratory in those days. His special interest then was in parasitic copepods. He was a most industrious worker and smoked an amazing number of cigarettes while at work. His tireless industry in those days was prophetic of his subsequent, indefatigable, vacationless, administrative labors to which the splendid achievements of the National Museum are in no inconsiderable degree due.

George Brown Goode was one of the most well-balanced minds it has been my privilege to know. I remember very well his wonderfully clear and honest eye, his great expanse of forehead, his ready and intelligent interest in what we younger men were working at, his wise and stimulating suggestions. It is much to be regretted that he had not been chosen by one of the great universities, where, in surroundings less permeated with administrative detail, he might have developed the talents which I am sure would have made of him a great teacher, with a longer span of life than was his portion.

John A. Ryder, the most gifted, the most original, the most profound, the most unconventionally human of them all, withal a most likable man, stands out prominently among the workers at the Fish Commission laboratory in the 80's. Often have I sat in wonderment as I listened to his conversa-

tions, which were, indeed, largely monologues, and recall also a remark of Rathbun's, made a few years later. He said that Ryder would awaken lively interest at the meetings of the Biological Society in Washington, and hold their undivided attention throughout the entire meeting, although, often, he confessed, no one was exactly certain what he was actually talking about. He was wonderfully suggestive and always interesting. After having been a member of the faculty of the University of Pennsylvania for but a few years, he died at a comparatively early age. His death, as was that of the talented and beloved Montgomery, who some years later succeeded him to the same chair, was a calamity to the science of biology in this country.

Theodore N. Gill appeared to me to be a rather elderly man in 1882, but he could not have been much above fifty years of age. He was then and, unless his memory has yielded to the weight of years within the past few months, still is an animate ichthyology in himself. How a memory such as his could develop in these days of printed books, with their tabulated lists and bibliographies alphabetically arranged for ready reference, is a marvel. Names of varieties, species, genera, families, orders, synonyms, authorities, morphological details, literature in many tongues, seemed to be always at hand and ready for immediate use. In the variety, extent and accuracy of his knowledge he stands in a class by himself among the men I have known.[3]

Dr. Jerome Kidder, naval surgeon, was another of the interesting and capable men that Professor Baird attracted to himself and the commission. He had charge of such investigations as required a knowledge of chemistry. His personality is still a very real presence in my memory where he stands as a model of good-breeding, good-humor and good-fellowship. He was possessed of intellectual endowments of signal brilliancy. His early death was mourned by a much wider circle than that bound to him by the ties of kindred.

[3] Professor Gill died September 25, 1914, aged seventy-seven.

Tarleton H. Bean was not engaged in field work much of the time in the years of which I am speaking, although he had been much in the field in the earlier days of the commission. As I remember him he was always animated and cheery, abounding in interesting and amusing anecdote, with an extensive and accurate knowledge of fishes and their ways.

Captain Z. L. Tanner, in 1882, was in command of the *Fish Hawk* whose construction he had superintended. Before that time he had been in command of the *Speedwell*. When in 1883 the *Albatross* was placed in commission he became her commander. While a naval officer with the rank of captain, he was not a graduate of the Naval Academy, but had been promoted for distinguished services in the Civil War. He had a florid complexion, a somewhat harsh voice, and a bluff and hearty manner, such as one naturally associates with the typical ship's captain. He was a strict disciplinarian, but just and impartial, and highly respected by all who served under him, or were in any way associated with him.

Captain J. W. Collins was the designer of the U. S. Fish Commission schooner *Grampus* and her first skipper. The *Grampus* was intended to be a model fishing schooner, and is distinguished as the prototype of the *We're Here* of Kipling's "Captains Courageous." He is remembered by me for his cordial and approachable maner, his profound knowledge of the fishing industry, especially on the Banks,

and for his narratives of his own personal experiences and of those of others. One incident, the truth of which I have no reason to doubt, was that of two of his acquaintances, who loaded two dories from the flesh of a giant squid, which they found floating at the surface, leaving an amount which they estimated would have made another dory load. Other incidents of his narrating were not meant to be taken literally, as, when speaking of his experiences in Copenhagen, when attending an international fisheries meeting, where he said that it rained so much that horses frightened at a person who was not carrying an umbrella. Then there was his story of the commander of a vessel, who, sailing into his home port on the Norway coast when there happened to be no fog, did not recognize the place, and accordingly put out to sea, when, the usual fog setting in, he succeeded in a few hours in making his own familiar harbor.

Captain H. C. Chester had charge of the collecting apparatus and superintended the dredging operations. The trawls and nets were stored in what is now called the Stone Building, then known as the Old Candle Factory. Captain Chester was an ingenious and true son of the Nutmeg state. His inventive genius was highly valued by Professor Baird, as an examination of the Reports will show. He abounded in quaint and original humor. He had had much experience as a sea-faring man. It was well known among us that Captain Chester had taken a prominent part in the *Polaris* expedition, and that it had been due to his unflagging good-spirits in the presence of intense cold and extreme privation that the party that returned by land was brought through safely. We often tried to get him to tell us about that expedition but never succeeded. He preferred to talk about Noank, Connecticut, which he invariably spoke of as "the garden spot of the earth," and a famous variety of apple, which his father developed to grow in an orchard on a steep hill side. These apples, he averred, were flat on one side, which kept them from rolling down hill into his neighbor's field below.

Sanderson Smith I remember as an elderly man, probably Professor Baird's senior. I think that he had been an engineer by profession, but with a strong bent towards natural history. His work for the commission, besides looking after the mollusca, consisted in tabulating results of soundings, dredgings, temperature data, and the like. He was a model of good nature, more ready to do favors for others than to minister to his own comfort. In those days there were many visitors to the laboratory and Sanderson was always ready to drop his work, which the rest of us sometimes did reluctantly, to show visitors over the laboratory. James H. Emerton, Professor Verrill's artist, was very patient under these visitations to his table, but one day, I remember, he complained vigorously because some of the visitors had breathed down the back of his neck as they were watching him make a sketch.

Soon after we moved into the new residence building some of us one morning found Sanderson looking with a much puzzled expression at the new clock, across the face of which was printed a direction for winding, but which he was interpreting as a weather forecast. Pointing to it with an air of indignant agitation he said: "Why, why, why, what, what, what does that mean? 'Wind every Monday morning'!"

Leslie A. Lee was a most cheery and well-beloved member of Professor Baird's larger family in the 80's. He was an enthusiastic collector, capable of the best work, but whose love of collecting and of first-hand

observation overrode his inclination to put his knowledge into printed form. His publications bear no proper relation to his work and knowledge.

H. L. Bruner, one of the assistants in my time, grave and serious as a young man, was assiduous and painstaking in his work, and immune to sea-sickness. J. Henry Blake, who succeeded Emerton as artist, and was in the laboratory for three or four years, is another who has built himself a pleasant habitation in my memory.

Among the young men who worked in the laboratory on Little Harbor in 1882 and 1883 were also B. F. Koons, W. E. Safford, Peter Parker and Ralph S. Tarr. Tarr was so much impressed with the accuracy of Vinal N. Edwards as a weather forecaster that he declared that if Vinal Edwards said it was not going to rain in the afternoon he would still believe him even if his own senses told him that there was a genuine downpour.

A year or two later, Professor W. Libbey for at least a summer, and Professor W. B. Scott, as an occasional visitor, brought new ideas and methods, and Dr. McCloskie, too, brought a breeze of enthusiasm with him that was most refreshing.

Among the numerous visitors to the laboratory who tarried long enough to impress their strong personality on us younger men I recall most vividly and pleasantly Professor Cope and Doctors Osler and S. Weir Mitchell.

It is not my purpose to extend these reminiscences much beyond the days when Professor Baird's presence was the most potent influence in this community. I shall, however, insert a few observations on the season of 1889.

Returning after a year's interval, I found a complete change in the personnel, and but little change in the spirit which pervaded the laboratory. The laboratory was under the efficient directorship of Dr. H. V. Wilson. The laboratory workers still had their mess in the residence building, where I greatly missed the benign presence of Professor Baird.

There was here, however, that summer, a man of quiet and unobtrusive manner, who, as it seems to me, had elements of real greatness in his nature in higher degree than any one whom it has been my fortune to know. That was Professor W. K. Brooks.

It was an interesting lot of young men that I found in the laboratory of the U. S. Fish Commission in 1889. There was E. A. Andrews, then and still of Johns Hopkins University; H. V. Wilson; F. H. Herrick; E. R. Boyer, C. B. Davenport, and W. M. Woodworth, post-graduate students of Harvard; M. C. Greenman, a post-graduate student of the University of Pennsylvania; R. P. Bigelow, C. F. Hodge, T. H. Morgan, and Sho Watase, post-graduates of Johns Hopkins. Of this group, Hodge, who has recently molted the effete east, has written of dynamic biology. I think it can be said with truth that he and the others of this little group, after the quarter of a century that intervenes, are to be reckoned as among the potent dynamic agencies in the biological science of this generation.

The Marine Biological Laboratory had been opened the previous summer. Dr. Whitman had already inaugurated the custom of having evening lectures. They were held in the one laboratory building in the room, I think, in which the invertebrate course is now conducted.

In 1889 cross-breezes were ruffling the calm of the biological atmosphere. There were some in the laboratory who stoutly denied that the surroundings did or could have any manner of influence on the germ cells. There was no god in animated nature but heredity and Weismann was his prophet. In those days also the neo-La-

marckians were in the land; sturdy Americans they were, who hardened their hearts at ideas made in Germany. One evening, I remember, we went over to the Marine Biological Laboratory to hear a lecture by Professor E. D. Cope. The lecture was on some mechanical factors in evolution. Professor Cope, the most scintillatingly brilliant American man of science that has yet appeared, told us about the shapes of the carpal bones in a number of extinct artiodactyles which he had been studying. He illustrated his lecture with numerous crayon sketches which he made while he was talking. His conclusion was that these bones owed their shape to the mechanical effects of pressure and stress, and were thus evidence of the inheritance of characters that had become impressed on lines of descent by the surroundings, and hence might be said to prove the inheritance of acquired characters. I recall that one of the young men, upon our return to the Fish Commission laboratory, characterized Professor Cope's lecture as puerile, which I did not think then, nor do I think now, is exactly a word that is needed to describe anything which Professor Cope said or did in 1889.

It has been my fortune once and again to hear more or less patronizing criticism of the way time was spent in the work of collecting and classifying the animal and vegetable forms which inhabit the waters of the Woods Hole region. Doubtless the time could have been better spent, but this remark may be made with equal justice concerning any sort of human endeavor. It may not be amiss to say that whatever the character of the publications of these earlier workers, the conversations to which, as a young man, I listened between such men as Professors Baird, Gill, Verrill, Smith, Goode, Ryder and Cope, contained nothing about priority of names, and little upon taxonomy in general, while they did abound in discussions of such matters as the habits and distribution of animals, adaptation, development, function, behavior and heredity.

Looking back on the laboratory activities of those days and comparing them with the present with its varied application of the sciences of chemistry and physics to the study of the phenomena of life, the work done here in the 80's may seem narrow. It should be remembered, however, that no science has sprung at once into maturity. The immediate problem before the Commission of Fish and Fisheries was that of acquiring all the knowledge obtainable of the fishes of our coast and of their food and environment. It is not conceivable that this knowledge could have been gained in any other way than by a study of the conditions at first hand. Doubtless our knowledge is to be vastly extended by those experimental methods whereby animals are subjected to conditions which do not exist in nature, but such investigations, however valuable they may be in refining and extending our knowledge of life, would have been as much out of place in the days of Baird and Agassiz as the automobile and the locomotive would have been in the forests of this country 200 years ago.

Those of us who breathed the serene atmosphere of the days of Professor Baird, and have continued work somewhat similar to that which we began some three decades ago, have inherited, I trust, some of his kindly spirit that should enable one to listen to criticism with equanimity and to endure patronage without agitation of mind. Thus one may dwell beside the road and be a friend to the passing biological pageant. So he could be a respectful onlooker when, in 1898, he beheld the passing show, brave with many colors; when newborn ideas in biology must first be baptized in corrosive sublimate and then decked in

the royal purple of hematoxylin before they could be exposed to the awed gaze of the beholder. Likewise, in 1899, when the name of vom Rath was a word to conjure by; continuing in 1900, when nerve endings were the end and aim of all that was worth while, he could only wonder and be silent. I remember in 1899 asking an acquaintance that I had made the previous year what he was working at. His reply was: "I have been working for the past two years on the nerve endings of *Arenicola*, but have not got any results yet." But with the introduction of experimental methods the epoch of zoological fads came to an end. Now our dweller beside the road listens with appreciation to illuminating lectures on a variety of subjects, where problems new and old are attacked from various and unusual points of approach and by a multiplicity of methods. He listens with delight to the lecturers who announce the results of their researches, but with a conviction that is sometimes in inverse proportion to his knowledge of the subject under discussion. Often he is inclined to accept these conclusions with enthusiasm, only to have his enthusiasm chilled when he hears what the lecturer's friends have to say about the lecture on the following morning.

When, in more recent years of the Fish Commission, or Bureau of Fisheries, as it is now called, Parker, with no other equipment than a pair of hat-pins, demonstrated the functions of the otoliths of fishes, and, with an apparatus which he constructed with the aid of a saw and hammer, supplemented by a simple surgical operation, discovered the function of the lateral line in fishes, and in equally simple fashion cleared away the fog that enveloped our knowledge of how much or how little fishes hear sounds either above or beneath the water; when Sumner showed by ingenious but easily worked experiments the degree to which flat-fishes adapt themselves to their surroundings; when Field gave proof as convincing as that of the proverbial pudding that *Mytilus edulis* is truly an edible, and that the smooth dog-fish by some other name would be eagerly sought in the markets; when these pieces of original work and others like them, of which many could be named, are considered, we feel that they represent in good degree the kind of investigation which would have won Professor Baird's hearty sympathy and approval. I am inclined to think, however, that he would have viewed with still greater favor the Bulletin of the Bureau of Fisheries for 1911 reporting a Biological Survey of the Waters of Woods Hole and Vicinity.

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THE INTERNATIONAL ENGINEERING CONGRESS

THERE will be held at San Francisco, from September 20 to 25, 1915, an International Engineering Congress, organized and conducted under the auspices of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the Society of Naval Architects and Marine Engineers. General G. W. Goethals has consented to act as honorary president and is expected to preside over its general sessions. The following eminent engineers have consented to serve the congress as honorary vice-presidents: Professor Richard Beck, Sir J. H. Biles, Otto T. Blathy, Commander Christian Blom, Professor André Blondel, Dr. C. E. L. Brown, Dr. Emil A. Budde, Henry Le Chatelier, Professor Hermann Hullmann, Wm. Henry Hunter, Professor Luigi Luiggi, Rear Admiral Yoshihiko Mizutani, W. M. Morday, Sir Charles Parsons, Jean L. de Pulligny, V. E. Timonoff, R. P. J. Tutein-Melthenius, H. H. Vaughn, Sir Wm. Willcocks.