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HENRY VAN PETERS WILSON

1863—1939

A Biographical Memoir by

DONALD PAUL COSTELLO

Biographical Memoir

Woodrow Wilson

HENRY VAN PETERS WILSON

February 16, 1863–January 4, 1939

BY DONALD PAUL COSTELLO[1]

PART I[2]

HENRY VAN PETERS WILSON was born in Baltimore, Maryland, February 16, 1863, the second child of Samuel Augustus and Sophia Ann (Stansbury) Wilson. Samuel Augustus Wilson, his father, had been born at Boonsboro, Washington County, Maryland, September 9, 1826, the second child of Thomas and Henrietta (van Peters) Wilson.[3] Thomas Wilson, his paternal grandfather, had been born in 1786 in Scotland, and came to America in 1805 with his parents, as their only child. Thomas Wilson was a farmer, farming in the Lake Erie region of Pennsylvania until he moved to Boonsboro. He died in early manhood. His paternal grandmother, Henrietta van Peters (for whom Henry Van Peters Wilson was named) was of Dutch parentage but born in Westphalia, Germany, in 1788. She died at Boonsboro, Maryland, in 1860.

[1] The long delay in the preparation of this memoir after Dr. Wilson's death is due to the fact that it was to have been prepared by Dr. Ross Granville Harrison. The press of other duties, and later his prolonged ill health, prevented him from attempting it.

[2] Wilson was a remarkable man. In order "to make things easier for his biographer," he wrote an autobiographical account, and deposited it, along with a list of his publications through 1931, with the Home Secretary of the National Academy of Sciences. In transmitting this material Dr. Wilson wrote, "I have perhaps made the sketch fuller than was necessary but I had in mind to lighten the labor of whomever shall be drawn to write my obituary." Part I of the present account is essentially this but modifying Wilson's concise, almost telegraphic style, and making minor additions from other sources. Where Wilson's own words are so characteristic of the man as to be worthy of special note, I have placed them in quotation marks, in the third person, exactly as he wrote them.

[3] The lower case "v" in the "van Peters" is correct here. Dr. Wilson later capitalized it in the spelling of his name.

H. V. Wilson's mother, Sophia Ann Stansbury (born October 16, 1838, married 1859, deceased April, 1927, all in Baltimore) was the first child of William Hammond and Elenora (Gafford) Stansbury. She had one brother, Daniel, who died in 1852 at the age of twelve. Her father, William Hammond Stansbury, was born on his father's plantation in Baltimore County in 1810, and died in Baltimore in 1866. The Stansburys had come from England in the seventeenth century to settle in Baltimore County, and William Hammond's line had remained there as planters. The Stansbury family home, Adventure, which remained in the family for several generations, was purchased in 1768, according to records attributed by H. V. W. to an earlier Daniel Stansbury, who had been born in Baltimore County in 1727. Sophia's mother, Elenora Gafford, was born in Baltimore in 1817, and died there in 1905. She came of Harford County (Maryland) stock, originally from England, and her parents had moved into Baltimore before her birth. Elenora's father, Joseph Gafford, was a gunsmith, "whose guns were in the way of making him a rich man when he died at the age of 38."

H. V. Wilson's father became, at an early age, a clergyman in the Methodist Episcopal Church, serving first as a "circuit rider" in Maryland, Virginia, and Pennsylvania, and after that in churches of Baltimore and Washington, D. C. He developed voice trouble and retired from active service about 1873, returning at that time from Washington, where he had been in charge of the Foundry Church, to Baltimore. He was then for some time a United States postal inspector, traveling widely over the country. After some years he gave up this work and thereafter lived at home, attending to his affairs and preaching at intervals to oblige some one of his fellow clergymen of the Baltimore Conference (see a memoir of the Minutes of the Baltimore Annual Conference of the M. E. Church, 1904: 66–69). According to his son Henry, "He had an active interest in ideas and events and read constantly, especially in history and literature; extemporized effectively in sermons and prayers; made and kept many warm friends."

Sophia Ann Stansbury had a strong will and sense of duty combined with a gentle, unobtrusive manner. She held herself somewhat aloof from people. The children of the family (there were two sons in addition to Henry and three daughters, one of whom died in infancy) were encouraged to read and were given excellent opportunities to develop an interest in general literature and history. In the summer the family frequently spent a month or two boarding in some Maryland farm house. The children thus learned a little about farm animals, crops, and the interesting aspects of farm life. The boys early developed the habit of boating on the river and of making long rowing trips with attendant fishing, crabbing, and swimming.

H. V. Wilson attended public schools in Washington and Baltimore. In the excellent secondary school for boys in Baltimore, Baltimore "City College," he found a number of admirable teachers, especially Professor Chapman Maupin in Latin, Professor Wight in English, Professor Raddatz in German and Professor Norris (who was at that time beginning his career as tutor in history and other subjects). The school numbered about five hundred boys and occupied "what seemed at the time a large and handsome building on Howard Street." It offered sound instruction in languages and literature, history and mathematics. Wilson, like many others, felt in after life a great indebtedness to this school and retained very pleasant memories of it.

In 1880 he entered "the remarkable college which President Gilman and his associates in the faculty had established as part of The Johns Hopkins University." By the end of his freshman year he had decided to prepare himself for the study of medicine and thus came before graduation under the influence of such scholars and teachers as Ira Remsen[4] (1846–1927) in chemistry, H. N. Martin[5] (1848–1896) and Wm. T. Sedgwick (1855–1921) in general biology, and W. K. Brooks[6] (1848–1908) in comparative anatomy. The spirit and

[4] Later to follow Gilman as president of the University.

[5] A brilliant student of T. H. Huxley and Michael Foster; at twenty-eight the first man in America to hold the title of Professor of Biology.

[6] Student of Louis Agassiz.

to some degree the methods of research reached well down into the undergraduate work of the Johns Hopkins, but it was not until he was a member of the general biology class under Sedgwick "that the idea of investigation presented itself to him with any personal significance." He received his A.B. in 1883 and during the summer of that year spent a month at Professor W. K. Brooks' station for the study of marine biology at Hampton, Virginia, near the mouth of Chesapeake Bay. The next year was passed by him at the Johns Hopkins, as a graduate student and laboratory assistant, in completing the full curriculum of undergraduate biological work into which he had entered only in his last year of college.

A little tired of university work and shaken in his desire to study medicine (a few weeks after he had enrolled in the Medical School of the University of Maryland), Wilson withdrew from medicine, deciding that his interests were in teaching and research. He gladly accepted a position as private tutor in biology to Mr. E. P. Allis, Jr.[7] (1851–1947) of Milwaukee, a manufacturer who had decided, rather late in life, to become a zoologist. He conducted Mr. Allis through most of the practical work of the Johns Hopkins undergraduate courses and during the year discovered that he himself wished to go on in the study of zoology as a profession. It may be added that Mr. Allis soon afterward established in Milwaukee the Lake Laboratory of Biology of which C. O. Whitman was placed in charge; Howard Ayers followed him, and the staff included, for a time, William Patten. It was with the financial help of Mr. Allis that the *Journal of Morphology* was founded by Whitman.

At the end of the year Wilson returned to Johns Hopkins to begin work under W. K. Brooks, as a candidate for the Ph.D. degree. The winter months were largely spent in studying the anatomy and histology of certain medusae. In March he and a fellow student, G. B. Haldeman, transferred their work to Beaufort, N. C., a small coastal town where the Johns Hopkins was maintaining at the time a station

[7] For a most interesting account of this, see the article on the Milwaukee Lake Laboratory by E. J. Dornfeld.

for the study of marine zoology. They remained there during the spring and summer. He returned to Baltimore with some minor discoveries on the development of medusae which were later incorporated in a little paper, *The Structure of Cunoctantha, etc.*, 1887, and he continued to concentrate his reading and anatomical work on the morphology of the coelenterates. In March, 1887, Professor Brooks transferred the work of his school to Nassau, New Providence. Here the party spent the spring months. In Nassau Wilson found a coral that was breeding and soon settled down to a study of its embryology. This work was continued during the following year and was written up as his dissertation (*On the Development of Manicina areolata*) for the degree of Doctor of Philosophy, which was awarded in June, 1888.

Wilson had been a "graduate scholar" (1885–1887) and a fellow (1887–1888). On receiving the doctorate he was appointed to the newly established Bruce fellowship, on the stipend of which he was able to make, along with a fellow student, C. L. Edwards, a second visit to the Bahama Islands. This time he and Edwards went direct by schooner from Baltimore to Green Turtle Cay, one of the small outlying islands which a party under Professor Brooks had visited some years before. Here he spent six months, returning to Baltimore in January, 1889. He had become interested at Green Turtle in the development of sponges and continued this investigation until May, when he received an appointment as an assistant in the U. S. Fish Commission (later the U. S. Bureau of Fisheries). Colonel Marshall McDonald was at this time Commissioner of Fisheries and Richard Rathbun, later Assistant Secretary of the Smithsonian Institution, was at the head of the Division of Scientific Inquiry. Wilson was sent to Woods Hole, Mass., where he had charge of the laboratory. He remained in this position for two years. During the first year he was occupied in the study of the embryology of teleost fishes, this work resulting in a report, *The Embryology of the Sea Bass* (1891). During the second year he was permitted to return to his work on sponges which seemed to the Commissioner and Dr. Rathbun to

hold out some promise of discovery concerning methods of breeding commercial sponges. This anticipation, it may be noted, was in a measure justified by later work at Beaufort, N. C. (1907, 1910, 1911), but the practical significance has long since shriveled away under the impact of the chemistry of synthetics, while the theoretical implications may well endure forever. In 1891 Wilson resigned from the Bureau "after a period of investigation and association that meant much to him then and later."

At this time he joined the faculty of the University of North Carolina at Chapel Hill, N. C., as professor of biology, finding there "some able men, a pleasant atmosphere with great freedom, and very slender pecuniary resources." In 1893 he was married to Edith Theresa Stickney (deceased 1900), daughter of John H. and Lucy (Stedman) Stickney of Boston, Mass. The Stickneys and Stedmans were New England families of early colonial times. Three children were born: Edith Stedman (Mrs. Thorndike Saville) b. 1894; Eleanora Stansbury (Mrs. Howell Peacock) b. 1896; Henry Van Peters, Jr., b. 1898, now a surgeon in Dover, Delaware.

What in the educational dialect of later years came to be called the "teaching load" was heavy in 1891 in Chapel Hill and long remained so. Nevertheless the habit of research was there, although as in so many institutions it had to be exercised chiefly during the long summer vacation and other holidays. Wilson completed an extensive paper on the development of sponges in 1894 and was then occupied more or less continuously for ten years in the taxonomic study of a collection of sponges which Alexander Agassiz had made on one of his oceanic (1891, *Albatross*) expeditions and had entrusted to him. The report on this collection was finally published in 1904. Meantime some smaller investigations were carried through, the most important of which were a taxonomic report on the sponges of Puerto Rico (1902) and a critical study on the early development of the frog (1900, 1901), the results of which, it was thought, were incompatible with the "concrescence theory," then widely accepted, of the way in which a vertebrate embryo gastrulates. In this work

he made use of an inverted microscope, one of the few highly specialized pieces of equipment that the department was able to acquire (and still cherishes).

In 1899, under the leadership of Professor J. A. Holmes, who had occupied the chair of geology and natural history in the University of North Carolina but who had resigned in 1891 to become director of the newly organized Geological Survey of the state, an effort was made to induce the U. S. Bureau of Fisheries to establish a station for the study of marine biology on the North Carolina coast at Beaufort, a locality already known to the biological world as the site during the years 1880–1886 of the Johns Hopkins marine laboratory, a wandering institution which, under Dr. W. K. Brooks, brought fame to a number of places. The Bureau of Fisheries consented to operate a temporary station in a rented building during the summer of 1899 and each summer thereafter until 1902 with Wilson as director. By this time a bill providing the necessary funds having been passed, largely through the efforts of Professor J. A. Holmes and the Hon. Marion Butler, Senator from North Carolina, a permanent station was erected on Pivers Island in Beaufort harbor. Wilson, realizing that the enterprise was well launched and that from now on the duties of the management would be heavy enough to interfere seriously with his teaching and research, resigned his post as director. Like one or two other Bureau of Fisheries laboratories, the Beaufort Laboratory became well known as one of the more admirable marine stations of the world. Subsequent changes in federal and political policy have resulted in various ups and downs, and the station, with its original building eventually torn down and replaced with a small modern laboratory, continues under the direction of the U. S. Fish and Wildlife Service. On Pivers Island, meanwhile, Duke University acquired several acres and established the Duke Marine Laboratory there in 1938. It gradually expanded, taking over most of the work of training students and the housing of visiting investigators formerly done by the Fisheries Laboratory. Wilson, along with students and colleagues in the University of North Carolina and other univer-

sities, almost continuously from 1902 to 1938 spent the summer months in research at the Fisheries station, during twelve years as a summer assistant in the service of the Bureau, and for the remainder of the time working as an independent investigator.

The year 1902–1903 was passed for the most part in Berlin, in the hospitable Zoologisches Institut then under the direction of F. E. Schulze, world-famous for his studies on sponges. Here Wilson had brought the Agassiz collection "that he might have Geheimrath Schulze's aid in difficult points of classification, and also that he might have undisturbed leisure, the assistance of a good artist and photographer, and the use of a great library so necessary in taxonomic work." Moreover, it was essential to examine numerous type specimens stored in Berlin and elsewhere in Europe. For this purpose he spent some weeks in studying the sponge collections in the museums of London, Leiden, and Paris. The year's work was aided by a generous grant from the newly established Carnegie Institution and with this sum the expense of "engaging a substitute during his absence from Chapel Hill was partially met." The memoir describing the collection was published in 1904, as volume 30 of the Memoirs of the Museum of Comparative Zoology at Harvard College.

For the next five years Wilson pursued the question as to whether sponge cells might not be induced to behave in atypical and unknown fashion so as to produce regenerative masses of novel character. Following this idea, a method of regeneration that had been known but had been forgotten was rediscovered and partially analyzed into processes of cellular activity (*Science,* 1907) and a new type of regeneration, that from dissociated cells, was discovered (*Journ. Exper. Zool.,* 1907; *Bull. U. S. Bureau Fisheries,* 1910). During the following two or three years the regenerative capacities of dissociated cells were investigated in the hydroids and some other coelenterates and in echinoderms, with highly satisfactory results in the case of the hydroids.

In 1910 Wilson edited and contributed to the Composite Biographical Sketch of Professor W. K. Brooks in the memorial volume to

Brooks (*Journ. Exper. Zool.*, Vol. 9). In 1911 he entered upon a long investigation in taxonomy, the study of a collection of Philippine sponges made by the U. S. Bureau of Fisheries in 1907–1910. Some results of this study concerning variation were published in brief papers from time to time but the complete report did not appear until 1925. During this period minor investigations in the field of cellular behavior in relation to regeneration were carried on and a descriptive paper on the sponges of Beaufort harbor was published in joint authorship with W. C. George. Research along these two lines, cell behavior in regeneration and embryogeny of sponges and the classification of sponges, was continued for several years.

With the growth of the University of North Carolina the department of biology under Wilson was eventually split into zoology and botany, he becoming professor of zoology in 1904. A generous endowment fund (the Kenan Foundation) for professorships became available in 1917 and Wilson was immediately made (by vote of the faculty) Kenan Professor of Zoology. Four other Kenan professors were elected in this way at the time. In 1929 he was "allowed a year's leave without pecuniary loss." The year was spent for the most part at the Stazione Zoologica at Naples in studying the metamorphosis of the halichondrine sponge larva. During 1915–1916 he was a Southern Exchange lecturer and in 1936 Dohme lecturer at Johns Hopkins University.

Wilson was one of the original members of the American Morphological Society (1890) which grew into the American Society of Zoologists. In the latter society he served as vice-president in 1908 and as president of the eastern branch and of the society in 1911, and as a member of the executive committee from 1914 to 1921. He was also a member of the American Philosophical Society and the Société Linnéenne de Lyon. He was a charter member of the American Association of University Professors (1915), serving twice for periods of several years on the Council. He was elected to the National Academy in 1927. At this time he was the second member in the

South, the other being Dr. Samuel A. Mitchell, the noted astronomer at the University of Virginia.

[Wilson's account ends at this point.]

PART II

H. V. Wilson as a Teacher and Scholar

H. V. Wilson was a dynamic personality. He was a small man, as he recorded, "Height 5 ft. 6½ in., weight never above 120 lbs.," with piercing blue eyes. His students remembered him long after their memories of other teachers, the subject itself, and their other associations with the campus had dimmed. Former students passing through Chapel Hill in the nineteen thirties almost invariably looked him up, to express their appreciation for a point of view impressed upon them by his forthrightness.

He was not a man lightly to tolerate fools among his colleagues, assistants, or students. He is justly renowned for having "encouraged" a student to refinish a writing-desk arm into which the student had scratched his name during a lecture. He is reported to have once dressed down a junior colleague for carelessly leaving a dropped piece of blackboard chalk where it could be stepped on. He expected his students to dress and to behave as gentlemen and did not approve of T-shirts and shorts or the other careless garb worn by students in warm weather. Furthermore, he did not hesitate to express himself about such matters. For all these rigid standards of conduct and discipline he was liked, remembered, and revered long after the names and faces of less exacting teachers had been forgotten. He expected efficiency approaching perfection in others as well as in himself, and worked with tireless energy to attempt to achieve this end. Since he was the sole member of the department for many years his status then and thereafter was much like that of a full professor at a prewar German university.

His office in Davie Hall in 1935 (when I first knew him) contained an old desk, six feet long, on which he stretched out, on the

hard surface, during each noon hour, for a brief moment of relaxation or a nap. The shelves contained numerous piles of reprints and notes, arranged roughly by subjects, to which he alone knew the system of arrangement. Notes written to himself were frequent—at the top of, or throughout, the piles.

His conferences with graduate degree students (one or two students, only, at a time) were held in the larger room outside his office. These conferences were frequent (at least two afternoons per week), and he spent many long hours working with his students while they translated foreign papers (especially to learn German and pass their language exams, as well as to glimpse into some of the major contributions being made by Europeans) on some special field of interest of the time. Unfortunately the graduate students were few in number (I believe only four doctor's degrees in zoology were granted during his first thirty-odd years at Chapel Hill) and thus were unable to benefit from the self-catalysis so frequently found in a larger group. For the most part they came from small colleges in the South, with relatively poor preparation in physics, chemistry, and mathematics, but better versed in natural history than many of their northern counterparts. Most of them, after completing the work for a Master's or a Doctor's degree, returned to teach in a small southern college. Of his twenty-nine students (four Ph.D.'s), two, who took the Master's degree under his direction, R. E. Coker and Ivey F. Lewis, later attained national distinction as biologists.

One reason for the small number of doctoral students at Chapel Hill was Dr. Wilson's view that a man was broadened by attending more than one university (especially when the faculty was small) and that it would be better for the student not to take undergraduate and graduate work (or two graduate degrees) at the same university. Consequently many were encouraged to go elsewhere for graduate work. One of Dr. Wilson's best undergraduate students and assistants of the 1890's, Dr. W. de Berniere MacNider, went into medicine (M.D. 1903, University of North Carolina), did research in pharmacology, and later was also elected to the National Academy.

A man of dynamic personality was required for the tasks which Wilson set himself: to manage a department of zoology on little or no pecuniary means, to teach large numbers of undergraduate students without adequate numbers of instructors, assistants or proper equipment, and to continue to carry on significant research at a level eliciting praise from his colleagues in this country and abroad, in an institution where research was considered to be of considerably less importance than routine teaching and where it was permitted that a professor devote his spare time (if any), holidays, and summers (without salary) to his research. In addition, he started what was intended to be a museum of natural history, with representative specimens of animals (especially from North Carolina) that could be used for teaching or reference. One of the arduous extra duties assigned to his assistants was to refill the bottles containing this ever-growing collection with alcohol or formalin at least twice a year, and to replace dried-out corks and re-paraffin the new ones. The marine fishes represented were largely collected at Beaufort by his son, Henry, Junior.

In a small town such as Chapel Hill there were many conditions which could have been annoying to one of Wilson's temperament. There were almost no stores during the first thirty years of Wilson's sojourn and those had limited stocks. Getting to Durham, twelve miles away, on clay roads, was often a major expedition. Even crossing the muddy red clay of Franklin Street in the spring of the year was a major, and messy, undertaking. Such establishments as scientific equipment companies and biological supply houses were not only completely unknown in both communities, but throughout most of the South, and there were endless red tape and delays in completing even the simplest purchasing transaction through the university and state offices. Lack of funds further complicated the picture. One must acknowledge these facts in comparing Wilson with contemporaries at, say, Harvard or Yale, during the same era. Modern roads, methods of transportation, and business efficiency have made a considerable difference since that time. Wilson's labora-

tory assistants were trained to go out and collect most of the biological materials used in the undergraduate and graduate courses. To purchase such items as hydra, amoebae, ciliates, planaria and crayfish was unheard of, even as late as 1936. These assistants, also, were required to count the pins, tacks, and micro coverglasses passed out and checked back in after use by students. Only by such avoidance of waste and through careful attention to detail was it possible to conduct the teaching of the department on the very slim budget provided.

Since library funds were practically nonexistent during his early years at Chapel Hill, Wilson subscribed personally to many of the more important biological journals, such as the *Memoirs of the Boston Society of Natural History,* the *Journal of Morphology,* the *American Journal of Physiology, The American Journal of Anatomy, The Biological Bulletin, Proceedings of the National Academy of Sciences,* and early reports of the U. S. Fish Commission (later the Bureau of Fisheries). These were deposited in the biology laboratory and became part of the zoology departmental library. Some of these, and certain of his reprints, have marginal comments written in his characteristic handwriting which give great insight into his views on many scientific matters.

H. V. Wilson had a philosophical turn of mind and his comments on such a pronounced mechanist as Jacques Loeb are of interest. These comments were written in the margins of pages 442 and 443 of his personal copy of the *American Journal of Physiology* (III, 1899) in which Loeb's discovery of artificial parthenogenesis of the sea urchin egg was announced. They are as follows:

"Loeb's conception of a living organism (egg) is that it is a congeries of chem. compounds. The properties of the organism [are] as much the prop. of the chem. comp. as those of sea water are the prop. of its constituents. All question[s] of organization and adaptation [are] left out. His conception is the very narrowest chemicophysical. Ex. of his method 1) a chem. change in surrounding medium [is] induced. 2) a reaction of living organism follows. 3)

From (1) he infers that a corresponding chem. change has been induced in the protoplasm; and he further concludes that the reaction is the direct chemico-physical result of this change, and not the result of the 'protoplasmic properties' acted upon by the chem. change as a stimulus. Loeb's conclusion is at once upset [words missing where page margin was cut for binding].

"Loeb's theory falls in the category of those which you are asked to disprove or else believe. 'Prove that this does not follow—or else believe.' But the data and the conclusions are so *far* apart that to connect the two causally (i.e. to establish a close chain of sequences) is to produce raw guess-work."

Marginal comments of somewhat similar type (but not relating to Loeb) are to be found even on a reprint of his own 1907 paper which appeared in *Science,* probably written after he perused it about ten years later.

In the *University Record* for 1897 there was a brief statement by H. V. Wilson on the department of biology, its offerings and its facilities. The printed account finished up with these words: "We have about reached the limits of our resources here. To go on and improve, means the outlay of some thousands of dollars. . . ." (In the margin at this point are pencil comments by H. V. W., dated 1931, "I had forgotten this—not so bad"). . . . Will not someone step forward and endow the Laboratory and Museum with a name and a proper equipment?" (. . . . and the pencilled margin comments, 1931: "No—not yet!!").

At that time (i.e., 1897) he was offering courses in general biology, in systematic botany and zoology, in elementary physiology, in comparative anatomy, embryology and medical histology, in microtechnique and invertebrate zoology, as well as directing original research. He said (*University Record,* 1897, p. 8), "The classes are large . . . and difficult [for one man] to handle. A permanent instructor or assistant professor has been needed badly for two years." ". . . . A new departure in the history of this institution . . . which will undoubtedly affect graduate work favorably—was made two years ago, when

the graduate and the most advanced undergraduate courses were thrown open to women." ". . . for the doctorate . . . where the major subject is Zoology, the student must expect to spend three years of constant work." In 1902 the biology department was strengthened by the addition of W. C. Coker, a botanist, but in 1908 it was moved into new quarters in Davie Hall and split into the departments of zoology and botany. H. V. Wilson was the only full-time member of the staff of the zoology department until 1922, though he had from year to year the help of laboratory assistants or temporary instructors.

Henry Van Peters Wilson would not have approved of the overlavish outfitting of many modern-day laboratories. He was the type of man who placed more reliance on the mentality of the investigator than on laboratory equipment. He did his own excellent work with a minimum of paraphernalia. A large brass Zeiss research microscope, a sliding microtome, a view camera and a photomicrographic camera were his chief aids. The last, a cumbersome device by modern standards, was described by him in a note published in 1909. It was an enormous horizontal photomicrographic camera on two stands, one for the microscope and camera, the other for a large flickering carbon arc. This outfit was so long that remote control attachments were needed to manipulate the fine adjustment of the microscope while focussing on the ground glass with one's head submerged under a dusty black cloth. In later years this outfit was irreverently known as Froggie's White Elephant. With it he laboriously took many photomicrographs to illustrate his papers and for use in teaching, and several of his graduate students received lessons in its use when the time came for them to illustrate their theses or dissertations.

The sledge microtomes purchased in the 1890's were still being used by H. V. Wilson in the 1930's, and he always impressed upon his graduate students the need to be able to cut very thin sections with them.

Another item was a relatively low power inverted microscope,

which was said to have been custom-made to his specifications by the Bausch and Lomb Optical Company. This he used to study closure of the blastopore in the normally placed frog's egg (1901), to follow up some observations made in 1900 indicating that delamination occurred during gastrulation in inverted eggs. The objective lens and a prism were below the stage; the prism serving to direct the image into a long eyepiece tube, which was at an angle of about 45° to the vertical.

His earliest microscopic work was done using daylight or the illumination from an oil lamp. For projection or photography, a carbon arc was later employed. Much of his work was done, of course, before the invention of modern tungsten-filament electric lights, and there were still some carbon filament bulbs in use in Davie Hall in the 1930's.

The men who actually knew him over a long period were in a far better position to appreciate his many-faceted character than the present writer, who knew him only during the last three years of his life. I therefore quote Ivey F. Lewis, who, in his brief note, "H. V. Wilson as a Teacher" (1942) characterized him (p. 12) as follows:

"All in all, Dr. Wilson was one of the most independent men that ever lived. He was the perfect illustration of the old saying, 'the game fish swims upstream.' He would not follow the crowd, and his refusal to identify himself with any group led to delay in national recognition of his services to zoology. It did not matter to him. His beacon was an inner light within his own breast. Like Ulysses he followed 'knowledge like a sinking star'—'strong in will to strive, to seek, to find and not to yield.' His independence showed itself in the outward man. A certain jauntiness of bearing was merely the outward and visible sign of an inward and spiritual quality. There was no compromise in him, no traffic in half truths, no tolerance for error. He was true to himself. . . . By every test, Dr. Wilson rang true."

After his children had grown up and moved away from Chapel Hill, Wilson lived the life of a confirmed bachelor, moving, while

college was in session, within the confines of the little village, and migrating to Beaufort for the summer. He did not own a car, but walked, regardless of the weather, in a circuit which included his large old-fashioned house on East Franklin Street at the edge of town, Davie Hall, and one of the local restaurants where he took his evening meal. In the evening he read and smoked in an easy chair. After his working hours at the laboratory were over he enjoyed the company of many friends, and discoursed jovially on a wide variety of topics. Inside the laboratory he was always busy, believing that he owed the university an honest day's work each day. He was conscientious and thorough in everything that he did.

H. V. Wilson died on January 4, 1939, about a month before his seventy-sixth birthday. He had lived a full life, and was still Kenan Professor of Zoology, actively engaged in teaching, until the time of his death. It seems especially fitting that during the last year of his life the University at Chapel Hill served as host for a meeting of the National Academy of Sciences, of which he was one of the few members in the South. He thus had the opportunity (October 24–26, 1938) of seeing such old friends and fellow-biologists as Ross G. Harrison (1870–1959) and Edwin G. Conklin (1863–1952) for the last time. At this meeting he presented, also, his last scientific paper, *Vacuolation a Factor in the Division of Animal Cells.*

PART III

H. V. Wilson's Scientific Contributions

Despite the general sociological importance of teaching, a biologist's real contributions cannot be judged on the basis of how many premedics he has prepared for medicine or how many future housewives have been made aware of some of the principles of biology. Scholars are judged not by the number of lectures given, nor by the number, weight or volume of papers published, but rather by the quality of the original ideas that have been thoroughly worked out

and then clearly expressed, and on the impact of these ideas upon contemporary thought and upon posterity.

As is apparent from the accompanying bibliography, between 1886 and 1939 Wilson produced a total of ninety-one published contributions, of which fourteen were of major importance.

Wilson's first scientific work was published while he was still a graduate student, in 1886. It was on some parasitic medusae (Cuninas) found in the hydromedusan, *Lirope,* at Beaufort. In the next year he published further observations on adult and larval stages of these interesting coelenterates of the genus *Cunoctantha.* This work served as an introduction to his doctoral dissertation problem, the development of the coral, *Manicina areolata,* for which material had been collected at Nassau. This carefully done and beautifully illustrated work is typical of the papers published in the *Journal of Morphology* in the 1880's, with German-made lithographs hand-copied from drawings made by the author. At this time, the structure and development of many of the lower phyla were being extensively studied from the viewpoint of evolutionary significance and biogenetic relationships. The result was a remarkable series of long papers on the morphology and embryology of many of the more primitive invertebrates. In all, Wilson published seven papers or notes on marine coelenterates.

After completing his degree work, and accepting employment as scientific assistant at the U. S. Fish Commission Laboratory at Woods Hole, Massachusetts, he naturally turned his attention to vertebrate embryology as a very fertile field (in 1888) for original investigation. This turned out to be a monumental piece of work on teleost development which, more than any other single project, exemplified H. V. Wilson's early energy. He began his investigation with fish eggs collected in the early days of June, 1889. On July 22, 1890, the completed manuscript was submitted for publication under the title *The Embryology of the Sea Bass.* It appeared in print in 1891 and comprised sixty-eight printed pages, twelve text figures and one hundred forty-eight plate figures. The paper covered segmentation, periblast

formation, development of notochord, mesoderm and endoderm, alimentary canal, neural cord, eyes, ears, branchial and lateral line sense organs, heart, circulatory system, etc., of the sea bass, and a comparison of gastrulation in various vertebrate forms. Any one of these topics might have constituted the material of a modern-day paper. The stages of development covered were from fertilization to the free-swimming larva of one hundred sixty hours (they hatch at about seventy-five hours under the conditions employed by Wilson).

This teleost material was very different from the parasitic coelenterates on which Wilson had worked earlier, and from the coral, *Manicina,* used for his doctoral dissertation. What investigator today, one year removed from his graduate studies, has the mind or training to undertake and complete so effectively such a task in a new and relatively untouched field in such a short space of time? One must pay tribute to W. K. Brooks for having permitted Wilson to develop his abilities so admirably, as well as to Wilson for having done so. Feats which now seem prodigious were in those days accepted as a matter of course, because workers set their goals enormously higher. Needless to say, this paper is a classic, and is still the chief reference for Woods Hole embryology students (among many others) who study the development of pelagic fish eggs.

After this year on teleost development, Wilson returned to the problem of the development of sponges in which he had become interested while at Green Turtle Cay during his six-months' stay in the Bahamas immediately after receiving his Ph.D. degree. This occupied him during his second (and last) year at Woods Hole, and this interest continued after moving to North Carolina in 1891. Later he returned to the study of vertebrate embryology in experimental studies, publishing, in all, six additional papers.

Wilson's training had prepared him for intensive concentration on any biological material that was brought to his attention. Thus, when he took up the study of the structure, development, and taxonomy of sponges in 1890 he applied himself so vigorously that he soon became recognized as one of the world's leading authorities.

The sponges of the Albatross Expedition were sent to him by Alexander Agassiz for taxonomic study. Much of the ten-year period (1894–1904) was spent on this colossal task. Meanwhile, in 1902, he published his first major work on the morphology and taxonomy of sponges, a report on the sponges collected off Puerto Rico by the Fish Commission Steamer *Fish Hawk*. The longer work on the Albatross Expedition sponges was published as a memoir of the Museum of Comparative Zoology at Harvard, and its completion necessitated the consultation of original type material in the museums of Europe, where Wilson spent the school year of 1902–1903. Six letters, of presumably many, written to H. V. Wilson by Alexander Agassiz over the years 1891–1903 are still extant and indicate some of the many problems that arose during the preparation of the manuscript and plates for this monograph. The first of these was written to H. V. Wilson at Woods Hole on September 15, 1891 (before Wilson left for Chapel Hill) requesting Wilson (who had just received the collection of sponge material) to "put aside" the refuse from the bottoms of the collecting bottles, together with locality numbers, since this refuse is one of the richest sources of Foraminifera. The next letter (September 25, 1891) indicates that possible delay due to the press of other matters would not seriously interfere with Agassiz's plans. The third, written on November 21, 1892, indicated that Professor Schulze, in Berlin, requested permission to examine the hexactinellid material in Wilson's possession. The fourth letter, written by Agassiz from Castle Hill, Newport, is not dated, but indicated that he would gladly pay for the services of an artist in preparing the plate figures.

The last two letters were written from Paris (Grand Hotel del'-Athénée) on January 15 and 17, 1903, to H. V. Wilson, who was then in Schulze's Laboratory in Berlin. They relate to details of sizes of plates, pages, etc., as measured from copies of other monographs of the series at the Jardin des Plantes. Wilson's report on the sponges of the Albatross Expedition included descriptions of forty-seven species or subspecies, of which twenty-six were Hexactinellida, seven

Tetractinellida, and fourteen Monaxonida. No calareous or horny sponges, or Lithistids were taken. Since this expedition was made to unexplored waters, a large percentage of the forms (thirty species and subspecies) proved to be new to science.

Later (1919) he was to describe (with W. C. George) the sponges of Beaufort (which included thirteen new species) and the siliceous and horny sponges of the Albatross Expedition to the Philippines (1925) with descriptions of thirty-eight new species and nineteen new varieties. In all, he published fifteen papers dealing with the morphology and taxonomy of sponges.

The "press of other matters" referred to in Agassiz's 1891 letter eventually included setting up a full roster of courses (and teaching them) at Chapel Hill, establishing the Beaufort Laboratory of the U. S. Bureau of Fisheries and serving as its director, working in the field of experimental vertebrate embryology and publishing two papers, which attracted a great deal of attention at the time (1900–1901), on the formation and closure of the blastopore of the frog's egg, discovering and describing the giant amoeba *Pelomyxa carolinensis* and working up the sponges collected by the *Fish Hawk* off Puerto Rico. In addition, between the time he had acquired the *Albatross* sponges and when their study was completed, he had married, sired three children, and gained fame as an exacting teacher of the new modern science of zoology.

For a long time after working up this material Wilson continued to receive countless requests from other investigators in all parts of the world to identify this or that specimen of sponge. Since proper taxonomic identification required cutting sections of sponges for microscopic examination, Wilson was eventually compelled (by the mid-1920's), from sheer lack of time, to decline to supply this help except in unusually significant cases. It would be conservative to state that H. V. Wilson was the world's leading authority on the morphology, taxonomy and behavior of sponges for over three decades.

His discovery of a giant freshwater amoeba (*Pelomyxa carolinen-*

sis) at Chapel Hill is typical of his varied interests and ability to fix his attention on any specific object. In preparing protozoan cultures for class use he routinely took an old wooden tub, added four inches of sand, tap water, some opened mussels, and some *Nitella,* then added a cut-up crayfish and placed the tub in north light a few yards from a large window. Such cultures showed a regular succession of bacteria, flagellates, ciliates and small amoebae, and eventually *Tubifex* and copepods. In one particular culture he found numbers of a large rhizopod of the genus *Pelomyxa,* which he named *P. carolinensis.* His paper (1900) describing this amazing form is a classic, and indicative of the accuracy of expression of his scientific writing. His interest in the giant amoeba was, of course, centered around the finer structure (by light microscopy) of the protoplasm and reflects an influence of the work of Bütschli and of Mrs. Andrews.

Other early papers ranged widely in field of interest. The joint paper with Kirby (1896) gives descriptions and synonymy for the muscles of the cat, modifying and correcting earlier descriptions by Strauss-Durckheim and St. George Mivart. In 1897 he published a brief account of the natural history (especially on insectivorous plants of the savannahs and Annelida of the shoals) of the Wilmington, N. C., region. In the same year a paper on the origin of the vertebrate sense organs inquired into the nature of the original primitive areas. Presumably all the superficial sense organs of the head, the lateral line and the auditory sac are derived from a common foundation. Wilson found this to be a long ectodermic furrow on each side of the head region on the teleost embryo (especially *Serranus*). Together with a student, J. E. Mattocks, the form of the anlage was investigated for the salmon (1897).

In 1904, in Dr. Wilson's alcove in the Beaufort Laboratory, there were dishes of sea water containing sponges that had disintegrated due to the unavoidably abnormal conditions to which they were subjected in keeping them in the laboratory. Before throwing the material away, he stopped to examine it and happened to observe a large number of minute bodies which, under the microscope, ap-

peared to be slightly differentiated small sponges or tissue aggregates. It occurred to Dr. Wilson to ascertain what might happen if the cells of a fresh sponge body were separated by mechanical means. He brought about the separation by the simple method of cutting up lobes of the red oyster sponge, *Microciona,* wrapping the fragments in fine bolting silk and squeezing the bag under sea water until the cells flowed out through the meshes of the silk as a pink cloud of loose cells and small cell clumps. He described the method as "rough but effective." The cellular debris obtained was placed in dishes of clean sea water and subsequently examined at intervals. He observed that the dissociated cells and clumps came together, fused and went through processes of growth and differentiation that, in many cases, led to the development of new sponges of considerable size and with normally differentiated parts.

This important discovery was investigated for two additional summers before notes were prepared to be published in *Science* and in the *Journal of Experimental Zoology* (1907). It opened up new vistas for studies in regeneration and differentiation and was continued with great vigor whenever possible for the next eleven years, remaining one of his interests for the rest of his life.

In 1911 he extended his studies to the behavior of dissociated cells from hydroids, horny corals, and the starfish *Asterias,* but these materials added relatively little to the concepts formulated on the basis of his work with dissociated sponge cells.

In his 1911 paper on the development of sponges from dissociated tissue cells Wilson reached a climax of lucid writing. He gives thirteen pages of experimental protocols, starting each day's record with a question, then giving a brief answer and later a detailed account of the manner in which it was solved. This is a typical example (p. 17) of one of his questions (and brief answers): *"Experiment Record 1, August 2, 1906.*—Question involved: If regenerating tissue that is formed in a degenerating sponge is forcibly freed from the sponge and broken up, will the elements recombine outside the sponge body? They do."

This work on the reaggregation of sponges from dissociated cells is undoubtedly Wilson's most significant work, since it had enormous effects in influencing contemporary concepts of embryonic differentiation. The later work of Spemann, Holtfreter and others, on cell relationships during dependent differentiation, represents related further investigations of cell behavior. Unfortunately we are still in no position to really explain fully cell attractions, repulsions, or dependent relationships in physico-chemical or even in biological terms.

In addition, Wilson's results on coalescence and regeneration of sponges (and especially the fact that protoplasms of different species do not fuse) affected not only his own views on the nature of protoplasm, but those of the entire biological world. His thinking and the planning of experiments in this field had been greatly influenced by the famous essay by Mrs. E. A. Andrews (G. F. Andrews) on the *Living Substance as Such and as Organism* (1897) and by her paper on *The Spinning Activities of Protoplasm* (1897). Thirty years later (1937) Wilson wrote a stirring tribute to this far-seeing woman investigator in an obituary notice in *Science*.

Wilson expresses his own philosophy when he comments (*J. Exper. Zool., 5,* 1907, p. 258), ". . . she consistently subordinates the idea of the individual, whether entire organism or cell, to that of the specific substance of which it is but a more or less detached piece . . . . this way of looking at an animal or plant (or piece of the same) is in my opinion a habit of mind that will justify itself and indeed is doing so today, in that it leads to discoveries concerning the nature of protoplasms as revealed by what they can do."

KEY TO ABBREVIATIONS

Anat. Anz.=Anatomischer Anzeiger
Amer. Nat.=American Naturalist
Bull. Amer. Assoc. Univ. Prof.=Bulletin of the American Association of University Professors
J. Elisha Mitchell Sci. Soc.=Journal of the Elisha Mitchell Scientific Society
J. Exper. Zool.=Journal of Experimental Zoology
J. Morph.=Journal of Morphology
J. Roy. Micr. Soc.=Journal of the Royal Microscopical Society
Mem. Mus. Comp. Zool.=Memoirs of the Museum of Comparative Zoology
Proc. Amer. Soc. Zool.=Proceedings of the American Society of Zoologists
Proc. U.S. National Museum=Proceedings of the United States National Museum
Trans. Med. Soc. State of N.C.=Transactions of the Medical Society of the State of North Carolina
Univ. N.C. Record=University of North Carolina Record

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* While I have listed in H. V. Wilson's bibliography the abstracts published in the *Journal of the Royal Microscopical Society,* the *American Naturalist* and elsewhere, it is unlikely that he wrote these review abstracts. Most of them appear to have been prepared by the special editors of these sections of the journals. In one case, noted below, T. H. Morgan wrote the review abstract. The practice of duplicate and more or less simultaneous publication of articles in the *Elisha Mitchell Journal* and in another journal of more national circulation seems strange today, but was apparently common at that time.

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