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ON THE NATURAL HISTORY OF
GEORGE SPRAGUE MYERS¹

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At a very young age, George Sprague Myers manifested those qualities which were to remain his mark of distinction—an extraordinary sensitivity to the beauty of order in Nature, a boundless capacity to learn about what interested him, and a zest for collecting, arranging, and reasoning how things must fit together. Given such an endowment, the place where he was born and spent his boyhood—Jersey City, New Jersey—and the epoch of his birth—early part of the twentieth century—were peculiarly right for guiding him towards and into his life work. For at that time many of the nineteenth century systematic zoologists were still flourishing (David Starr Jordan, for example) and there were plenty of roads from Jersey City leading to their doors and also to back country that was still unspoiled and beckoning.

Jersey City in 1905, the year of Myers' birth, was already well established as part of what was to grow into the great Atlantic megalopolis. Like its neighboring satellite communities, it did not share any part of New York's splendor,

¹I am deeply grateful to Mrs. Mary S. McKenzie, for providing information on the family background and early history of her nephew; and also to Dr. Alan E. Leviton through whose good offices I have been permitted to consult and use several autobiographical fragments which Myers wrote at various times and deposited along with his extensive file of biographical information on zoologists at the California Academy of Sciences.

yet was close enough to attract the most unbeautiful features of industrial development.

The house where Myers was born and spent much of his boyhood was a three-story brick structure at 283 Grove Street, directly opposite the front of the city hall. Even in 1905, this was part of a dwindling genteel neighborhood in the process of being eaten away by slums that were surrounding it.

The biota of the Grove Street house was typical of relic residential sections in northeastern crowded cities. Near the woodshed in the back yard grew a large Rose-of-Sharon bush, a lilac which annually put out a few flowers, some South American spider plants (*Cleome*). There were a few *Ailanthus* trees in nearby back yards, and an ancient linden that grew out of a hole in the flagstone sidewalk near the curb. Of insects that aroused some interest in young Myers, albeit a short-lived one, were bees of various sorts. "What could you do with a bee?" he asked. The only birds were English sparrows. Mammals consisted of cats, dogs, rats, and bats which issued at dusk from a nearby church. One of the cats was a pet, the first of a series which Myers has had almost continuously ever since.

Myers' introduction to fish life was a minnow, probably *Chrosomus neogaeus*, living in a spring on a farm to which he was taken during a summer trip to Maine at the age of seven. Next he met some entrancing goldfish in a pet shop where his mother and Aunt Mary often took him during their visits to New York. He actually got to possess one or two goldfish in a bowl at various times. These experiences were no more remarkable than any other young city boy might have during his natural history phase. To young Myers, however, this was no phase, but rather a prologue to his great lifelong interest. This really began at age 12, when he first attended the Jersey City Aquarium Society's annual exhibition in the public library. Enthralled by the colorful fresh-water fishes from all over the world, he promptly joined the Society and began to accumulate aquariums in which he kept not only exotic fishes but also native ones (*Umbra*, *Fundulus*, *Enneacanthus*, etc.). These he caught on trips made by train or trolley car to various places in northern New Jersey. At the same time he collected and kept amphibians and reptiles, these being as interesting to him as fishes. When he was about 15 years old, attending Lincoln High School in Jersey City, he sought advice of his biology teacher about a trip he was planning to the Pine Barrens of Lakehurst, New Jersey, to collect the beautiful rare tree frog *Hyla andersonii*. The teacher, rather out of his depth, suggested that Myers discuss his problem with Dr. G. K. Noble at the American Museum of Natural History in New York. By following that advice, Myers became introduced to the world of research zoologists. Noble, impressed, of course, introduced him to A. I. Ortenburger; and when the two had become well enough acquainted with this interesting young fellow, they took him on the last of Noble's Lakehurst trips

to study the life history of *Hyla andersonii*. Through Noble, Myers came to know Karl P. Schmidt, and, in the Museum's fish department, John Treadwell Nichols, Arthur W. Henn, and Eugene W. Gudger. It was not long before he was spending so much time on his cold-blooded vertebrates that his school work slipped badly, for he took full advantage of the proximity of New York to meet most of the old guard zoologists at the Museum, the Zoo, and the Aquarium—Henry Fairfield Osborn, Bashford Dean, F. A. Lucas, Walter Granger, W. D. Matthew, Frank M. Chapman, Carl Akeley, Robert Cushman Murphy, Roy Chapman Andrews, C. H. Townsend, William Beebe, John Tee-Van, and Charles M. Breder. And when a young fellow from the University of Virginia was selected by Noble to go with Andrews to collect reptiles in China, Noble and Myers went out to Plainfield, New Jersey with him to teach him how to collect salamanders. His name was Clifford H. Pope.

One day in 1924 while at the Museum, Myers was introduced to Dean Carl H. Eigenmann of Indiana University, the principal worker on the systematics of the fresh-water fishes of South America. Myers had then published a few short papers on fishes and had become especially interested in those of tropical America. The result was an invitation by Eigenmann to come to Indiana as a student and have part of the cost defrayed by part-time work in caring for the Indiana fish collection.

Myers had not done well in high school, and lacked several credits for graduation. Moreover, with the examples before him of several then well-known zoologists who had had no university preparation, he was uncertain even whether to go to college. However, he says that Noble gave him a thorough tongue-lashing about his refusal to get the necessary schooling, and this, coupled with Eigenmann's offer, decided him to go. In lieu of his missing high school credits, Dean Eigenmann arranged to have him granted credit for the research he had already accomplished. He has always felt a great deal of gratitude to Noble and Eigenmann, without whose help his professional career might have been aborted.

At Indiana, he neglected his academic studies to accomplish some field work and to complete a synopsis of the amphibians and reptiles of Indiana. At the same time he got a superb introduction to South American fishes, and also to curatorial methods for preserved research collections. Aside from Eigenmann, the man on the Indiana faculty who had the most influence on Myers (though Myers took no formal courses from him) was the entomologist, Professor Alfred C. Kinsey (later the student of human sexuality), whose forward-looking views of evolution and systematics were then finding expression in studies of cynipid wasps. From Kinsey, Myers began to gain a very broad view of systematics as a synthesis of the comparative aspects of all other biological disciplines, a view that finally found expression in a review paper in 1930.

After Myers had been at Indiana one year, Eigenmann fell ill and was taken first to Florida and then to the San Diego region of California for his health. Since he obviously would not be able to return to the University, there seemed little reason for Myers to remain. However, he unpacked the large Ternetz South American collections as they arrived, and, with Eigenmann's permission, described some of the novelties.

Stanford University, founded in 1891, had become a center of research on fishes and their habits through the influence of the university's first president, David Starr Jordan, and the first chairman of its zoology department, Charles H. Gilbert. In 1926, both men had been long retired, but Jordan was still active and he had noticed the papers published by Myers. When he heard of Eigenmann's illness, Jordan wrote to Myers asking whether he would like to transfer to Stanford with the same sort of part-time assistantship he had had at Indiana. Jumping at the opportunity, Myers arrived in California in September, 1926.

It was shortly after his arrival at Stanford that I first met him there. As a biologist at the California State Fisheries Laboratory at Terminal Island, I had just begun a study of the California barracuda, and took advantage of an opportunity to spend a few days at the Natural History Museum to search its library and to study the sphyraenid material in the fish collection. The Museum at that time was a center of quiet excitement such as I will never forget, for many of the biology faculty members focused their interests there, and the principal interest was the study of fishes. There is a vivid picture in my mind's eye of a pleasant, fine-looking, young man, an undergraduate, working as an assistant in the Museum. "May I help you?" he asked. "Perhaps," I replied, cataloging him as a library assistant. When I told him what I wanted, he poured a steady stream of information *out of his head*: "Of course, you must already have the essential papers about *Sphyraena argentea* and *S. ensis*. You may have missed *Sphyraena idiaestes*. We have the original 1903 description by Heller and Snodgrass." And so on through the whole family Sphyraenidae around the world. No, he was not working on sphyraenids himself. Never had. It seemed to me as I talked to this enthusiastic modest fellow that he knew everything about everything. He was already a learned person when most people are scratching about, trying to make up their minds what they want to learn about.

The area surrounding the Stanford lands was then open country, and the University community (affectionately known as "The Farm" by faculty and student alike) moved at a relatively leisurely pace. Under Jordan's influence it had been, and still was, a great center for studying systematic zoology, especially fishes. Jordan was still working on fossil fishes. John Otterbein Snyder was chairman of the zoology department, with Edwin C. Starks as morphologist, Harold Heath as invertebrate zoologist, G. C. Price as embryologist, and Isabel McCracken, R. W. Doane, and G. F. Ferris as entomologists. Aside from courses

in other departments, Myers came to know Snyder, Starks, Heath, and Ferris best, as well as H. G. Schenk and S. W. Muller in the geology department, in which he eventually took his doctorate minor.

The Dudley Herbarium, the Entomological Collections, and the Zoological Collections were then housed—temporarily, it was said—in the south end of the Stanford Museum where they remained as the “Natural History Museum,” and later the “Division of Systematic Biology,” for the entire period of Myers’ active association with the University. Professor LeRoy Abrams was in charge of the Herbarium, Ferris of the insects, and Snyder of the Zoological Collections.

Although Snyder was his special mentor and friend, Myers visited Jordan, at Jordan’s warm invitation, at least once a week. Snyder, like Gilbert before him, had almost deserted systematics to work on the migrations of salmon and steelhead trout. In 1928, Willis H. Rich was appointed to the department, to teach ecology and fishery biology.

A biweekly seminar in fishery biology in 1928–29, attended by Snyder, Rich, Frank Weymouth, Starks, and about a dozen serious students including Myers, most of whom were to become leaders in the study of fishes, was a whirlwind of lively discussion and argument among and between students and professors, such as I have rarely experienced since.

Because the Stanford group then most interested in the theory of systematics was led by Schenk in geology, Myers gravitated to that quarter. In connection with one of Schenk’s seminars, Myers published a review of a recent botanical revision in Schenk’s *Micropaleontology Bulletin*, in which the ideas he had developed after contact with Kinsey at Indiana and Schenk at Stanford were synthesized into a view of systematic biology that was unusually broad for its day. When it is recalled that Myers was then an undergraduate student, without much knowledge of what was then being done on theoretical systematics by several isolated men or groups in America and Europe, his statement is remarkable.

Myers’ university work went slowly, not only because of his part-time employment but also because he was able only slowly to force himself to neglect extracurricular work in ichthyology and herpetology enough to get good marks. One objection to granting him a bachelor’s degree was that he had not taken enough required courses in English. Snyder later confided to me (with much amusement), that he had demolished this hurdle simply by waving in the faces of the objecting English Department’s faculty members a handful of the publications Myers had produced since he entered college, saying, “Look, see how much *he* has written!” He had published a good deal by the time he was granted his A.B. degree in June, 1930, seven years after he entered Indiana as a freshman. After that, things went more rapidly. He obtained an A.M. in 1931, and his Ph.D. in June, 1933.

Of his Stanford student years, Myers has said that he learned more morphological zoology from Harold Heath and Tage Skogsberg at the University's Hopkins Marine Station (where he spent the summer of 1929), than from all others. Nevertheless, Snyder, Starks, and Rich ranked high in his training years. For four years he saw and talked with Jordan almost weekly, gaining a great wealth of information about ichthyological workers and history.

In 1928, Dr. Albert W. Herre, a former pupil of Jordan, was appointed to a non-faculty position as Curator of the Zoological Museum at Stanford with an arrangement by which he would be retired only upon the President's pleasure. Myers says that he owes much broadening and maturing to Herre's influence, not only while he was a student, but also after he returned to Stanford in 1936.

In 1933, Myers was appointed Assistant Curator in charge of the Division of Fishes at the U.S. National Museum, with a first assignment to pack and ship many National Museum fishes that had been at Stanford in the hands of the late Charles H. Gilbert. He arrived in Washington in March, 1933.

At the National Museum, Myers took charge of the most important ichthyological research collection in America but one which had suffered from nearly 40 years of impoverishment and neglect. Moreover, the great financial depression of the 1930's had worsened the situation so much that for the first two years of Myers' tenure, the Division lacked even the services of a typist. Besides Myers, the staff consisted only of one elderly but enthusiastic scientific aid, Earl D. Reid², and a laborer who cared for the alcoholic collections. For the next three years, Myers and Reid spent most of their time in sorting, bottling, and registering an enormous backlog of specimens and putting the Division's offices, files, and records into working condition. During most of this period they trained and supervised squads of up to a dozen temporary workers at a time, these having been supplied free to government bureaus by successive federal agencies set up to relieve unemployment.

Although there was precious little time for research during these three years, Myers and Reid initiated a survey of the fresh-water fishes of Virginia. The only help from the impoverished Museum was for bottles and alcohol, but using Reid's old automobile and paying all other expenses themselves, they made many collections from the Dismal Swamp to the mountains of western Virginia.

Myers says that in Washington he had the best and most cooperative superior administrators that a curator could have. His immediate superior was the late Leonhard Stejneger, Head Curator of Zoology and Curator of the Division of Reptiles and Amphibians, whose kindness and enormous memory he has always remembered with pleasure. The other was Alexander Wetmore, then Assistant

² Myers always expressed the greatest admiration for Reid, who was invalided out of the U.S. Marine Corps after being wounded in the eyes while in Nicaragua. Reid became a doorman in the Museum and worked his way to the Civil Service subprofessional grade of Aid by taking night courses in zoology at George Washington University.

Secretary of the Smithsonian and Director of the National Museum, whose administrative ability and thoughtfulness for his staff were boundless.

In 1936, Myers was invited back to Stanford, and after considerable thought, accepted a position as Associate Professor of Biology and Head Curator of Zoological Collections, with the provisions that he be advanced to Professor by 1938, that half his time be spent on curatorial duties and half on teaching, and that Dr. Herre's employment as Curator of Zoology not be terminated as the department head had planned. With Herre's retention assured, Myers assumed his new position in September, 1936.

George Myers has told me many times that his most important contributions to ichthyology and herpetology have been the help and guidance he has been able to give to the long line of graduate students who worked with him at Stanford. When he began teaching in 1936, no formal course dealing with more than the barest rudiments of taxonomic ichthyology appears to have been given anywhere. In those days, prospective taxonomists were supposed to pick up knowledge of their field without any formal guidance. The Stanford fish course initiated by Charles H. Gilbert and continued by John O. Snyder had consisted solely of identifying specimens with the aid of Jordan and Evermann's "Fishes of North and Middle America." Myers has told me that his own background in ichthyology and vertebrate evolution was very defective as a consequence, so that between 1936 and 1938 he found it necessary to prepare himself by doing a great deal of reading and studying. The books of Goodrich and Romer and the papers of C. Tate Regan proved to be of the greatest help. In 1938, for the benefit of a small group of students, including W. A. Gosline and E. S. Herald, he attempted a general summary of fish classification and evolution, with emphasis on the literature and history and on major groups down to the family level. This first attempt developed into a more formal course, called "Advanced Systematic Ichthyology," which was usually given every other year, alternating with a shorter, somewhat less advanced course in herpetology. This course in ichthyology formed the genesis of other more or less similar courses, such as that given by W. A. Gosline first at the University of Michigan and later at the University of Hawaii. Myers also gave annually a course at first called "Vertebrate Paleontology" and, later, "Evolution of the Vertebrates," and a short course on zoogeography. Myers' most popular course, planned and given by himself and his botanical colleague, Professor Ira L. Wiggins, was a general survey of plant and animal ecology, including ecology of man. It was given for two or three years in the late 1940's primarily for non-biologists. In this course, Myers was one of the first to emphasize the rapidly increasing danger to the human race caused by the unrestricted growth of human population. Unfortunately, other work forced Wiggins to withdraw from the course, and, as Myers felt himself incompetent to handle the botanical side, the course was regretfully dropped.

Myers has maintained that graduate teaching is greatly helped by the presence of a "critical mass" of at least four enthusiastic students working under one professor on different dissertations in related fields. The presence of such a group was barely attained in his laboratory when World War II intervened. Students vanished, and he was sent to Brazil for two and one-half years. It was not reattained until the late 1940's; but from that time until well into the 1960's a "critical mass" was continuously present, rising at one point to as many as 12 or 13, usually two or three of them herpetologists and the rest ichthyologists. As he says: "Those were the most exciting and rewarding years that I have experienced. As a matter of principle, no graduate student was assigned a doctorate problem, or encouraged to choose one closely related to any of my own research. They were forced to select their own, my only requirements being that the problem be reasonably interesting and difficult but not impossibly time-consuming, and that it be concerned with areas within which I felt myself fairly competent to judge quality of performance. The atmosphere was never dull. Everybody helped and taught everybody else, the professor learning as much from the students as they did from him. Chores in the old Natural History Museum, such as registering and care of material, helping with the editing of the *Stanford Ichthyological Bulletin*, and the like, were often done almost as much by those who were not paid to do the work as those who were. My own contribution was largely that of arbiter, critic, walking bibliographer, ruthless editor of often poorly expressed, first attempts to write up scientific results, father-confessor, cheerleader, and especially as the provider and keeper of a laboratory atmosphere conducive to hard work, cooperation, enthusiasm, and high attainment. There was little of the formality that often separates professor from student. Evening seminars or meetings often ended in a nearby Bierstube, and I was usually invited to student parties. Former students have often remarked on the uniqueness of human relations in the Museum and recall them with nostalgia—as do I. Yet, I must have commanded a modicum of respect for I have noted with some amusement that none of my former graduate students ever tried to address me by my first name (a common enough thing in the U.S.A.) until 10 or 15 years after obtaining their doctorates; and several have never been able to bring themselves to do so. But when the number of graduate students rose to eight, ten, or a higher number, I got comparatively little research of my own done, for I was available to all of them almost every day—an arrangement at which some other groups of graduate students, both at Stanford and elsewhere, marvelled. Yet near the height of my graduate student load, economic necessity forced me to write extensively for—and manage—a popular aquarium magazine (*The Aquarium Journal*). This very difficult regime went on for two years (1952–54) until my Stanford salary rose enough to make it possible to give up most such writing."

The Stanford fish collection was originally small, consisting largely of duplicates from the field work of Jordan and his pupils. Through the years it grew slowly through an unexpressed policy of growth in diversity without amassing long series of individual species, a policy which Myers enforced in more recent times. It gradually attained a diversity among American collections second only to the National Museum, although in numbers of specimens (between 750,000 and 1,000,000) smaller than several other large research collections. It has been especially useful for morphological work in systematics such as has been emphasized in recent years.

The herpetological collections were small when Myers took charge in 1936, consisting of fewer than 2,000 amphibians and 10,000 reptiles, mostly collected during early work in the days when John Van Denburgh was a student. Myers built these collections up judiciously until now they total about 60,000 specimens, half amphibians and half reptiles—numerous enough and diverse enough for many systematic purposes.

For curatorial work and the management of the Zoological Collections primarily as a laboratory for graduate students, Myers was greatly aided by Margaret H. Storey. She had obtained her A.M. degree with Willis Rich while Myers was at the National Museum, had stayed on as a volunteer assistant later to be appointed Assistant Curator of Zoological Collections. She supervised the paper-work and curating, helped edit *Stanford Ichthyological Bulletin* and was a tower of strength and help to all those who worked in the Zoological Museum until her untimely death in 1960.

Myers and Storey together worked out systematic methods, some of them new, for sorting, registering, bottling, labelling, arranging, installing, and finding bottled museum specimens. These methods, described chiefly in three of the Museum's mimeographed circulars, made it possible for much of the work to be done by untrained student helpers, and to handle a large research-collection operation (up to a million specimens) with less than half the staff and funds usually available for such purposes.

For all of Myers' years on the faculty, the Zoological Collections had no more than four employees besides himself—A. W. Herre, until World War II, Margaret Storey and later Warren Freihofer, as aid or associate curator, one half-time student assistant, and, after World War II, one typist-secretary who also served entomology. This staff handled large and growing research collections of fishes, amphibians, and reptiles as well as sizable collections of mammals, birds, and aquatic invertebrates. They were also responsible for the time-consuming processing of extensive loans to researchers elsewhere, running from about 500 to as many as 5,000 specimens annually. In one thing, Myers was adamant. Collections of animal groups in which he had no direct interest were also kept in good condition and order. Such curatorial conscience

is rare. Moreover, collections which had strayed away from the Museum to other parts of the University and elsewhere were retrieved and set in order. Types were rigidly labelled and segregated with blue (holotypes) or red labels. Species presumed to be extinct received green labels.

The library on Systematic Ichthyology at the Museum was rich in the older literature and in reprints, all from Jordan's personal library. It was kept up by exchanges for *Stanford Ichthyological Bulletin* and by judicious buying with the small funds available. Concurrently, Myers personally purchased many ichthyological and herpetological books that were not present in the Museum, and his library books and reprints admirably supplemented the Museum's holdings. Today, since Professor Carl L. Hubbs' library has gone to Scripps Institution, Myers probably has the most extensive private fish library in the world. It is especially rich in reprints but lacks such expensive items as the great works of Bloch, Bleeker, and Agassiz.

Myers started *Stanford Ichthyological Bulletin* in 1938. It was printed cheaply by offset (the text being typed by the Museum staff), since funds for this journal were always miniscule. They began at \$133.00 annually and never rose over \$750.00. All sorts of schemes to get outside funds were tried, usually with only moderate success. Of the eight volumes that eventually appeared, less than half were or could be paid for from regular funds.

Myers and Miss Storey were the principal movers in two local groups. The old "Stanford Zoology Club," which originated in the 1890's and was supported by generations of Stanford students, was revived as the "Natural History Club" and survived until the 1950's. A new, informal group, the "Fishverein," composed of those at Stanford interested in fishes and the many local fishery biologists working for the Federal Fish and Wildlife Service and the California Division of Fish and Game, was formed by Myers and met fairly regularly for many years.

During his early preuniversity years (1920-24), Myers' papers reflect the growing interests and ability of an untrained young man deeply interested in the habits and taxonomy of the lower vertebrates. He published his first articles on aquarium fishes at the age of 15, in 1920. These early attempts give an inkling of the extensive boyhood observations representing dozens of families of live fishes, and also amphibians and reptiles, either in captivity or in the field in New Jersey and North Carolina. As Myers says: "By the time I was 19, I knew in a general and sometimes specific way a great deal about fish behavior that has of late been 'discovered' and formally categorized by the fish behaviorists, in the same way that the field ornithologist becomes familiar with bird behavior."

By the end of 1923, Myers had published his first really scientific papers, one on a new poeciliid from Hispaniola with J. T. Nichols and others on the nomenclature of anabantids. By the end of 1924, he had published nine tax-

onomic papers on fishes, and one herpetological paper. It was in 1924 that he made his first longer field trip, to Wilmington, North Carolina, where he made many observations and discovered what is now known as the common dusky shiner (*Notropis cummingsi* Myers) of the southeastern coastal plain, the description of which he published in 1925.

Although the beginning of university work in 1924 curtailed his output of papers, he continued publishing on a variety of ichthyological and herpetological subjects up to the time he finished his schooling at Stanford and went to the Smithsonian in 1933. To refer to only a few of the papers which he published during his student years at Indiana and Stanford (1924–33), there is a synopsis of Indiana amphibians and reptiles (1926), four papers on amphibians (1930–31), descriptions of many South American fishes collected by Ternetz (1927), a revision of the genera of neotropical cyprinodontids (1927), three or four important papers on Chinese fishes, and a prophetic paper on the phallostethids which foreshadowed some of the important features of Rosen's radical reclassification of the atheriniform fishes in 1964. In addition, Myers found time in 1929 to write a sizable addendum to the final volume of Eigenmann's "The American Characidae."

Myers was faced with such exceptionally time-consuming curatorial duties at the Smithsonian that his research during those years (1933–36) suffered. However, he reviewed the genera of triacanthids in 1934, published on the cyprinodonts of Hispaniola as well as the opistognathids (and owstoniids) in 1935, and revised the genera of Polynemidae in 1936. In that same year, in a report on fishes from Lake Tanganyika, he briefly pointed out for the first time some of the strange features of lake-fish evolution.

After beginning his teaching and curatorial work at Stanford in 1936, Myers' first paper was one that he had read before a meeting in New York in 1934 and which he based on observations made in the 1920's. In this short paper, he arrived independently at the same conclusions as had C. M. Breder, Jr. in regard to the evolution of oral brooding in cichlid fishes.

The most widely known and influential of Myers' papers, prepared for the 1937 Smithsonian Report (1938) was his "Fresh-water Fishes and West Indian Zoogeography." He had been highly dissatisfied with most writings on historical zoogeography, particularly the prevalence of the ideas of Matthew and others based largely on the tetrapod evidence, and especially with the use made of the evidence of fresh-water fishes. In this paper, dealing specifically with the West Indies but ranging over the fishes of all continents, Myers pointed out that what had previously been taken for true fresh-water fishes are really divisible into two physiologically different groups, one with considerable salt tolerance and the other ("primary fresh-water fishes") much more strictly confined to fresh water. The primary fresh-water fishes are much less able to spread across continents

and sea gaps than are mammals and even amphibians, and thus their dispersal patterns provide a much more conservative and dependable guide to the past existence of these gaps than do those of tetrapods. Myers' zoogeographical conclusions, although stated only cautiously and tentatively, agreed with those of Matthew in regard to the absence of past continental connections of the West Indies, but disagreed with Matthew in the strong evidence provided by the primary fresh-water fishes for a past southern trans-Atlantic connection. It is notable that 20 years after publication this paper was acknowledged by P. J. Darlington in his great book "Zoogeography," as the prime reference on which he built that part of his book dealing with fishes. Myers' 1938 work combined with his later papers on salt tolerance of fresh-water fishes (1949) and East Indian zoogeography (1951), gave new direction to later studies on the historical zoogeography of continental vertebrates. Myers seemed more than half convinced of the truth of continental drift in 1938, and although he faltered in that conviction in his 1951 paper, he later reaffirmed it in 1966 and 1967, because by then the weight of his evidence favored the primary fresh-water fishes as the most significant vertebrate indicators for establishing past continental connections.

Early in 1938, Myers was able to accompany that year's expedition of the Allan Hancock Foundation's ship *Velero III* to the coasts of Mexico, Cocos Island, the Galápagos, Peru, Ecuador, and Panama. This resulted in collaborative papers with C. B. Wade on eels (1941), atherinids (1942), and other fishes (1946). In addition, a study on the zoogeography of the fishes of the Pacific Ocean appeared in 1941.

Herpetological work had been impossible in the Division of Fishes in Washington; but on Myers' return to Stanford he began a number of smaller studies on amphibians and lizards which culminated in six herpetological papers in 1942. One of these described the now well-known black toad of Deep Springs Valley (*Bufo exsul* Myers), which has perhaps the smallest range of any living amphibian.

Following the entrance of the United States into World War II, Myers was posted to the Museu Nacional in Rio de Janeiro, as part of a governmental plan to maintain good relations with Latin America in troubled times. He arrived in July, 1942, for a one-year period, which eventually lengthened to nearly 2½ years. In Rio he helped with curatorial and library methods, with setting up civil service categories for the museum staff, with exhibits and with museum administration. For the federal fish and game division and the São Paulo fish and game department, he helped by devising better methods of gathering fish-catch statistics. In addition, for a period of over a year, the Museum lent his services to the Rio office of the U.S. Coordinator of Inter-American Affairs. There was little time for research, and the wartime shortage of gasoline made travel by

automobile next to impossible. Nevertheless, he managed to take many local trips, principally by tramway on weekends, to the wilder areas in the metropolitan region. These trips were mostly for frogs, in the company of Dr. Bertha Lutz and Joaquim Venancio or Antenor Carvalho. Eventually, there were longer trips with Carvalho or others by train and other conveyance, to the Rio São Francisco at Pirapora, to Santa Teresa in Espirito Santo, and southward along the coast to Rio Grande do Sul. Papers resulting from the Brazilian years were few, most of them appearing in 1944 and 1945.

On Myers' return in 1944, he hoped that the survey of Brazilian marine market fishes that he had helped to originate would result in taxonomic studies of these fishes at Stanford by Brazilian students; but the students did not appear and the project languished after 1950. The sole results have been the amassing of an excellent representation of Brazilian shore fishes in the Museu Nacional, and a smaller duplicate set at Stanford.

A trip to attend the Pacific Science Congress in New Zealand in 1949 resulted in two zoogeographical papers, one on East Indian fishes (1951 and 1954, published twice) and the other on East Indian amphibians (1954) both of which tended to firm up the concept of Wallace's Line. Myers had become editor of an aquarium magazine for two years in the early 1950's. Several of the articles published then have ichthyological interest, chief of them being "Annual Fishes" (1952), which brought together and greatly strengthened by original observations what had consisted of scattered and mostly nonscientific reports of tropical cyprinodontid fishes which exhibit a diapause when no individuals are alive except as zygotes.

At the 1958 International Congress of Zoology in London, Myers presented a paper on the endemic fishes of Lake Lanao having an important bearing on evolution. In this paper, published in 1960, he was able to show that this cyprinid fauna, now diverse enough to be allotted to several genera, almost certainly evolved very rapidly from a single ancestral species, perhaps within 10,000 years. He also pointed out similarities in the evolution of other lake faunas, and was able to establish an evolutionary sequence: 1) an increasing number of very similar species belonging to a single genus, culminating 2) in a "species swarm;" then 3) the differentiation of a few species into new endemic genera, and finally 4) considerable reduction in the total number of species. Thus the number of species of the large genus gradually diminishes while the number of distinctive endemic genera increases. Myers also pointed out the strong possibility that on a grand scale the evolution of Amazonian fishes and of deep-sea fishes might parallel that of lake fish faunas and indeed, the original evolution of the animal phyla.

In the 1960's, Myers returned to zoogeographical studies of fresh-water fishes. His paper on the North American fauna (1963) was published only in an ab-

stract which lacked the section on continental drift; but his 1966 paper on the derivation of the fresh-water fishes of Central America directly opposed Darlington's idea that the ancestors of the South American fish groups originated in Holarctica, and suggested continental drift as an answer. In 1967 appeared his "Zoogeographical Evidence of the Age of the South Atlantic Ocean," a brief exposition of his belief that the cypriniform fishes had originated in a South Atlantic continent which split in the Triassic or Jurassic to form the South Atlantic Ocean. In 1966 was published a collaborative work by Greenwood, Rosen, Weitzman, and Myers, "Phyletic Studies of Teleostean Fishes, with a Provisional Classification of Living Forms," which broke strongly with traditional classifications of the teleosts.

Myers intended his series of apparently not directly related studies on fish zoogeography (1938, 1949, 1951, 1963, 1966, 1967), together with his two 1960 papers on lake fish evolution and the 1966 collaborative teleost study, to form an integrated whole indicating as nearly as can be done at present how and when the ostariophysan (and particularly the cypriniform) fishes evolved and dispersed. In these papers the problem is attacked from several directions on the basis of the living world fauna and the few known fossils, ecological constitution of the fishes, their probable place and time of origin from the salmoniform fishes, their dispersal and evolutionary patterns as seen against the background of paleogeography, all within the strictures imposed by the greater known fossil evidence derived from tetrapods. Considered in this way, the nine papers concerned form an impressive contribution to knowledge of the fresh-water fishes of the world.

One thing that Myers has said of his papers is that not many of them are as important, or represent as much thinking, as do a number of his reviews, mostly published since 1930 in *Copeia*. Many taxonomic and other conclusions first appeared in these reviews. Moreover, the column called by Myers "Phylax Telescopus," which he maintained for a couple of years in *Copeia* during the 1960's, contains some of the best biological criticism that has appeared anywhere. Myers has said to me that if he is remembered for anything, he would like it to be for just a few things—his graduate pupils, his critical comments and reviews, his early espousal of the need for curtailment of human population growth, his pioneer urging of the conservation of non-food and game fishes, and his integrated series of papers on the evolution and dispersal of fresh-water fishes.

Despite the number of publications listed in his bibliography (nearly 600), I doubt that he ever engaged in any research simply to increase the quantity of his publications. He has always avoided humdrum taxonomic questions unless they were of some special significance, for he is completely devoted to seeking and elucidating principles. Thanks in large measure to his scholarly creativeness, as well as to his subtle and boundless patient teaching, systematic ichthyology is

alive and well today and the subject of vigorous teaching in many centers of learning where it is appreciated. It is a pity that Stanford has not appreciated the tradition it had inherited through Jordan or the treasure which he started in the Museum collection and libraries, and which Myers built up and organized. Instead, the university authorities have callously determined to give this treasure away and discontinue—*discontinue*—further teaching in this field! This is particularly tragic at a time when the natural history of the earth and its resources is the most important thing we can know.

CHRONOLOGY

- 1905 Born February 2, Jersey City, New Jersey, son of Harvey Derwood Myers and Lily Vale (Sprague) Myers.
- 1911–18 Public elementary schools, Jersey City.
- 1918–24 Public high schools, Jersey City.
- 1919–20 St. John's Military School, Ossining, New York.
- 1922–24 Association with American Museum of Natural History, especially G. K. Noble and J. T. Nichols.
- 1924 Field work during May in vicinity of Wilmington, North Carolina.
- 1924–26 Indiana University, with Carl H. Eigenmann. Curatorial assistant, fish collection.
- 1926 Married Martha Ruth Frisinger, Decatur, Indiana, September 25.
- 1926 Entered Stanford University, October. Beginning of association with D. S. Jordan, C. H. Gilbert, J. O. Snyder, E. C. Starks.
- 1926–31 Museum assistant, Stanford.
- 1929 Field work during April–June in western Texas and Arizona with Gregory M. Kranzthor. Rediscovery of *Elaphe bairdii*.
- 1930 Field work in Death Valley—Amargosa region—with Joseph H. Wales. Discovery of *Cyprinodon diabolis*.
- 1930 Bachelor of Arts, Stanford, June.
- 1931 Master of Arts, Stanford, June.
- 1931–32 Teaching assistant in comparative anatomy, Stanford.
- 1932–60 Associate editor, *The Aquarium*, Philadelphia, edited and published by William Thornton Innes, also scientific editor, 19 successive editions of Innes' "Exotic Aquarium Fishes."
- 1933 Appointed Assistant Curator, in charge, Division of Fishes, U.S. National Museum, Smithsonian Institution, Washington, D.C., January 1.
- 1933 Doctor of Philosophy, Stanford, June.
- 1934–36 Field work, freshwater fishes of Virginia, with E. D. Reid.
- 1935 Birth of first child, Thomas Sprague Myers, Washington, D.C., August 28.
- 1936 Awarded Silver Medal of the "Société National d'Acclimatation," Paris, for work on acclimatization, habits, and taxonomy of exotic aquarium fishes.
- 1936 Resignation from Smithsonian. Appointed to faculty, Department of Biological Sciences, Stanford University, as Associate Professor and Curator of Zoological Collections, September.
- 1937 Birth of second child, John William Myers, Palo Alto, California, December 15.
- 1938 Member, Hancock Pacific Expedition, aboard M. V. *Velero III*, from January–March, visiting coasts of Mexico, Guatemala, Cocos Island, Galápagos Islands, Ecuador, Peru, Chinchas Island, Gorgona Island, Colombia, Panama.

- 1938 Co-leader, with Rolf L. Bolin, of Crocker-Stanford Deep-sea Expedition, aboard yacht *Zaca*, off California coast in September.
- 1938 Initiated *Stanford Ichthyological Bulletin*. Editor to end of volume 8 in 1967.
- 1938 Advanced to full Professor, Stanford, September.
- 1939 Member, Fishery Organizing Committee, 6th Pacific Science Congress, Berkeley, California.
- 1940-41 Intensive extracurricular work with William Allen White's "Committee to Defend America by Aiding the Allies."
- 1942 Elected Corresponding Member, Zoological Society of London.
- 1942-44 Posted to Rio de Janeiro (State Department funds) to aid Museu Nacional and Divisão de Caca e Pesca. Lecture course on ichthyology and fishery biology in Rio. Brief visits en route to Mexico City, Guatemala, Panama, Cali, Bogota, Mariquita, Lima, Arequipa, Santa Cruz (Bolivia), Corumba. Intermittent field work near Rio, and (with Antenor Carvalho and others) to Minas Gerais, Espírito Santo, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, and Belém do Pará.
- 1944 Return to Stanford, October.
- 1945-51 Vice-President and Council Member, California Academy of Sciences, San Francisco.
- 1946 Beginning of post-war upswing in graduate-student enrollment at Stanford.
- 1947 Bikini Scientific Resurvey, U.S. Navy, aboard U.S.S. *Chilton*. Field work on Bikini and Rongerik atolls. Plankton Survey, Bikini lagoon. Visits to Kwajalein and Honolulu, summer.
- 1949 Pacific Science Congress, Auckland and Christchurch, New Zealand. Some fish and reptile collecting on South Island and Auckland Harbor. Visits to Hawaii, Samoa, Noumea, Canton Island and Johnston Island en route.
- 1949-51 President, American Society of Ichthyologists and Herpetologists.
- 1950 Brief trip to Brazil during August and September, visiting Recife, Salvador (Bahia), Rio, Belém do Pará, Manaus, and Puerto Rico.
- 1951-53 Special taxonomic work, U.S. Fish and Wildlife Service, Washington, D.C., summers.
- 1952-54 Managing editor, *Aquarium Journal*, San Francisco.
- 1954 European trip for Fish and Wildlife Service and FAO. Paris, with stop in London, December.
- 1958 Field work and fish collecting during February, upper Rio Caquetá basin, vicinity of Tres Esquinas, Colombia, with General Thomas D. White. Visit to Bogotá.
- 1958 International Zoological Congress, London. Visits to Copenhagen and Hamburg, summer.
- 1958-59 Organizing Committee for First International Congress of Oceanography, held in United Nations headquarters, New York, summer of 1959.
- 1959 Elected honorary fellow, Zoological Society of India.
- 1960 Field work and fish collecting during February, upper Rio Guaviare basin, near Sierra Macarena, Colombia, with General T. D. White.
- 1960 Six-month study trip to Europe, visiting Hamburg, Copenhagen, Lund, Goteborg, Amsterdam, Leiden, Brussels, Frankfurt, Vienna, Lucerne, Paris, London.
- 1963 Field work and fish collecting during February in Nicaragua; Managua area, Lake Nicaragua, Rio San Juan, with General T. D. White.
- 1963 International Zoological Congress, Washington, D.C., August.
- 1964 International Conference on Tropical Oceanography, Miami. Arranger and convener, section of zoogeography, November.
- 1966 Marriage to Frances Edna Felin, Palo Alto, California.

- 1967 Primer Foro Internacional sobre Planificacion y Desarrollo Pesquero, Caracas, Venezuela, August. Followed by brief travel in eastern Venezuela and lower Rio Orinoco with Agustin Fernandez-Yepez. Visits to Trinidad, Panama and Puerto Rico en route.
- 1969-70 Vice-President, Cactus and Succulent Society of California.
- 1970 Statutory retirement on August 31 from faculty, Stanford, August.
- 1970 Appointed Henry Bryant Bigelow Visiting Professor of Ichthyology, Harvard University.



Walford, Lionel Albert. 1970. "On the natural history of George Sprague Myers." *Proceedings of the California Academy of Sciences*, 4th series 38, 1–17.

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