natural history museums, tropical diseases, and taxonomy

by Bengt Hubendick

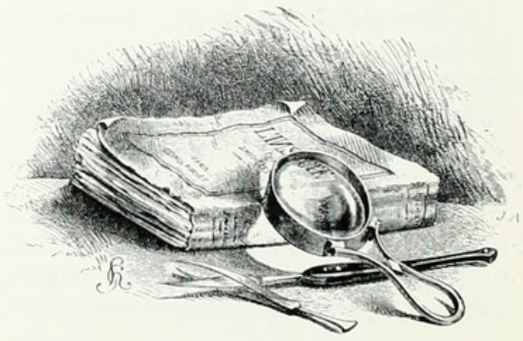
THERE was once a young zoologist who was laboring diligently on his doctoral dissertation. It was tedious work, and one day he left his laboratory for a few minutes' break. He strolled through the invertebrate storeroom, glancing casually at shelf after shelf of preserved specimens. One jar, he noticed, contained samples of a type of pulmonate snail (which breathes by means of a lunglike sac), which he knew was still anatomically unknown. His scientific curiosity was suddenly aroused, and he was taken with a desire to discover the internal structure of this mollusk. So, as a sideline, he began studying its anatomy. Some curious and unexpected observations resulted; before he could pursue them further, however, the young doctoral candidate again had to devote himself entirely to his dissertation.

In due course, after gaining his degree, he was appointed to the department of invertebrates at the principal natural history museum in his country. This was just what he had always dreamed of. Half of his time was to be spent on curatorial work (cataloguing, arranging, and otherwise caring for the collection) and the rest of it on research. Now at last, he would have time to resume his study of the pulmonate snails. He examined specimens already in the museum's collection and borrowed other material from museums abroad. Before long, he had gathered a substantial body of information on the subject and written a rather lengthy paper.

The paper was accepted for publication by a scientific journal and the author distributed reprints of it to other snail specialists in an entirely different field—tropical medicine—specialists who were particularly interested in a serious tropical disease known variously as bilharziasis, schistosomiasis, and snail fever. The young zoologist suddenly realized that his snails were of great importance as vectors, or transmitters, of this common disease.

He continued his study of freshwater snails, their anatomy, taxonomy, variation, distribution, and ecology. In the museum laboratory he worked on preserved specimens and, during the summer months, studied live snails. He found that he had become rather knowledgeable in an area that had once been just his sideline. Perhaps he had even acquired a certain international reputation in this narrow field. At least he thought so when a letter arrived on his desk from the World Health Organization (WHO), in Geneva. The letter invited him to participate in a survey team in the Philippines; there he would evaluate the bilharziasis situation and suggest measures for control of the disease. This was an exciting development indeed. The young zoologist had trained himself to do curatorial work on museum collections and to carry out research—predominantly taxonomic research—based on such collections. Now his hard-gained competence might very well prove useful in solving problems connected with a disease that afflicted millions of people.

So he went to the Philippines, became familiar with many aspects of bilharziasis and its control, did ecological field work, and collected material for subsequent taxonomical research in his own museum. Less than six months after



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returning home he was to leave on another trip—this time to Venezuela—to work out the taxonomy of the snails that transmit bilharziasis in that area, and to give a course in his field of research.

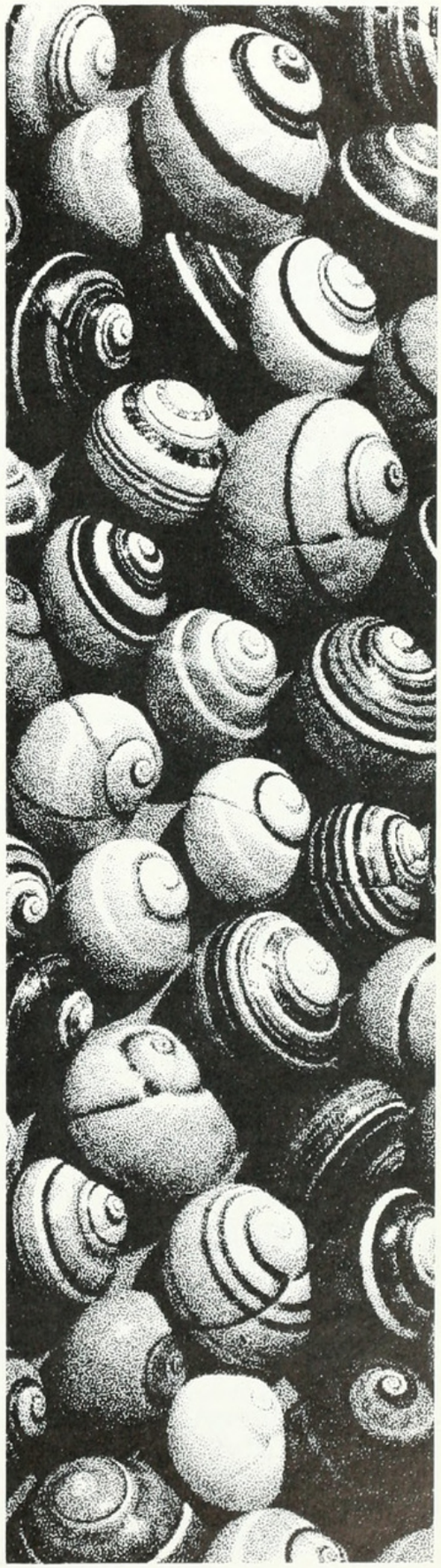
Back at his museum once more, he worked out the body of material that he had gathered in Venezuela. The outcome was a taxonomic paper; he also produced a manuscript for a snail identification guide mainly to be used by public health workers trying to control the disease. The manuscript was not published, but later it was sent to WHO. Ultimately, it did lead to the establishment of the "Pan American Health Organization/World Health Organization Working Group for the Development of Guidance for Identification of American Planorbidae"(!). In the meantime the zoologist—no longer very young—was sent to the west African countries of Gambia and Sierra Leone by the British Medical Research Council, and to Puerto Rico by WHO for further work in medical malacology (the study of mollusks). In addition, from time to time, he attended various professional meetings and congresses.

The working group with the extraordinarily long name required a body of basic information for its work. So, in due course, our zoologist was sent by WHO/PAHO to London, Paris, Brussels, Frankfurt am Main, Philadelphia, Washington, D.C., Ann Arbor, and other cities to examine type specimens* and other materials in museum collections. Such studies were essential for ironing out problems of taxonomy and nomenclature—difficulties that had heretofore made the identification and naming of vector snails virtually impossible. During meetings, discussions, and visits to Europe, North and South America, through a vast correspondence with colleagues around the world, and most of all through further study of specimens in various museum collections, our zoologist continued to work on his identification guide. Thanks to the availability of museum collections in many countries he was, together with some colleagues, at last able to create a workable identification tool for malacologists, public health workers, and other engaged in bilharziasis control.

Zoological classification, or taxonomy, based on zoological systematics and dependent on zoological nomenclature, is often denigrated as a sort of scientific "hobby" or as a nonreputable specialty of limited interest and significance. But pure zoological systematics is, in fact, a most important discipline, because the zoological system is based not on zoological types, but on natural phylogenetic relationships between animals and groups of animals; thus, it presents a picture of organic evolution that has already taken place. In taxonomy the principles of systematics are applied for the purpose of identification and classification. Reputable or not, this is an indispensable process in many areas of zoological research.

The taxonomic worker relies heavily on reference material, such as type specimens, for comparison. He may also be dependent on extensive series of specimens within a species, race, or strain. These series may exhibit significant variations in developmental stages or in sexual dimorphism or polymorphism; intrapopulation or interregional variations may also be expressed.

In environmental research, ecology, parasitology, economic entomology, in virtually any branch of zoology, correct taxonomy is basic as well as essential. If man is to fully understand the ecological system to which he contributes and on which he depends, if he hopes to fully utilize renewable natural resources, if he wishes to defend himself effectively against his ecological competitors, if in fact it is his intention to continue inhabiting this plant, then he must apply his knowledge of taxonomy. ➤



Individual specimens on which definitive descriptions of a species, genus, or other group are based.

And this includes the taxonomy of plants and microorganisms as well as of animals.

Today man has a good taxonomic understanding of the malarial parasites that affect him—the microscopic sporozoa as well as the mosquitoes which transmit the sporozoa. This knowledge was a prerequisite before effective defense against the parasites was possible. Researchers have also found that the schistosomes as well as the disease-transmitting snails in bilharziasis form intricate complexes of different races and strains, each with its own unique behavior. Susceptibility and resistance vary between these races and strains, and such characteristics may be determined by not just one gene but several. So the taxonomy of these organisms must, perforce, concern itself with the most subtle distinctions between closely related forms. Similarly, it is important to have taxonomic knowledge of other protozoa, flukes, tapeworms, and roundworms that are parasitic in man or in his domestic animals, or which ruin his food supplies, or which are harmful to him in other ways.

Specimens that are studied by the taxonomist must be kept as documentary material. In time, these specimens may have to be reevaluated. New discoveries and further research may reveal information that supersedes previous observations. And changes in nature itself, spontaneous or man-made, may make comparisons between collections from different periods of time highly significant. Where reliable taxonomic information is wanting, zoological investigation often becomes valueless. If, on the other hand, the material is properly documented, specimens can be accurately identified as a matter of routine. Documentary material of this kind is seldom available at universities or most other institutions with scientific departments. It is the natural history museum, almost exclusively, which is the repository of such material. The taxonomist, therefore, relies on such museums for much of his research. These institutions also provide a taxonomic service to other scientific institutions and agencies. This service, which is truly indispensable, involves a wide range of techniques in morphology, morphometry, histology, and even serology. Some museums provide a taxonomic service based partly or entirely on histological and/or biochemical methods.

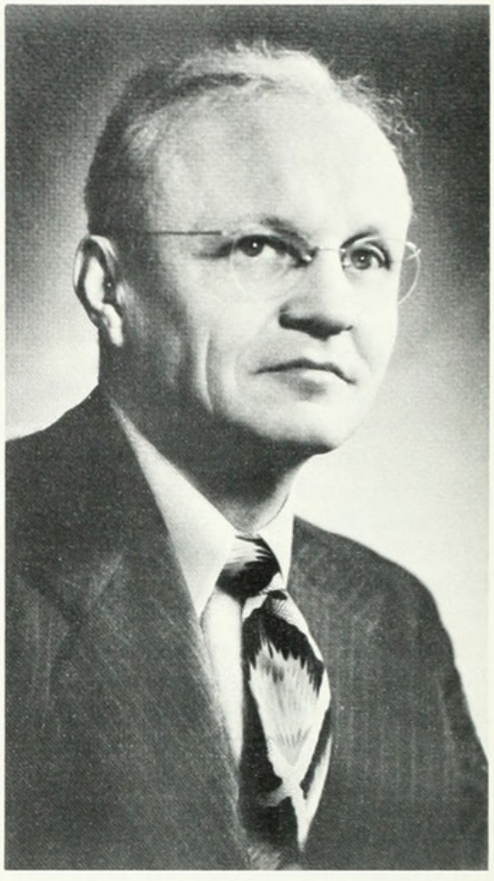
The natural history museum, then, is today much more than a repository of specimens, where one can spend a delightful afternoon viewing stunning exhibits of exotic specimens. It is a vital part of the world's scientific community, helping in its unique way to advance the frontiers of science.

So our young zoologist, fascinated years ago by some curious preserved specimens, was led into vital taxonomic research—research that proved valuable in man's fight against a serious disease. And still later it was our zoologist's fate to become a museum administrator, and in that role it was quite appropriate that he write this brief essay. □

Clifford H. Pope, 1899-1974

Clifford H. Pope, formerly Curator of Amphibians and Reptiles, died at his retirement home in Escondido, California, early in June. He joined the staff of Field Museum in June, 1940, and retired in December, 1953. The author of numerous scientific publications, Pope was considered to be *the* expert on Chinese amphibians and reptiles. That stature was a result of his having spent five years in China during the 1920s as a member of the famous Roy Chapman Andrews expeditions. But he was best known as the author of several remarkably successful popular books on reptiles. His *Snakes Alive* has probably been read by more young—and some not so young—would-be herpetologists than any other book in the last forty years.

It was perhaps typical of Clifford (it is impossible for those who know him well to refer to him in a more conventional, formal mode) that he converted his interest in keeping and feeding a young Indian python into a means of educating his neighbors out of their prejudices against snakes and into an excellent popular book, *Giant Snakes*.



Clifford H. Pope

Clifford had such a nice facility at this kind of educational activity that he decided, quite sensibly, to end the commuting hassle, retire from the Museum at an earlier than customary age, and devote himself to popular writing.

When he died, a friend writing in the *Escondido Daily Times-Advocate*, said she was certain that Clifford, wherever he had passed on to will, ". . . set about in his low keyed, tongue-in-cheek manner debunking all the myths about serpents being the symbols of evil and the cause of original sin.

"Just as he did for a long lifetime on earth, he will quietly convert the children to the side of the snakes, and then demonstrate to the worried mothers . . . that a snake, freed of the prejudice against him, is the child's friend, to be respected and handled gently."

— *Robert F. Inger, assistant director, science and education*