



VICTOR ERNEST SHELFORD
EMINENT ECOLOGIST—1968

Victor Ernest Shelford will be 91 years old on September 22, 1968. He was born in 1877 in Chemung, New York, and married Mabel Brown in 1907. Mrs. Shelford died while the two were on a field trip to Panama in 1940. They had two children, and Dr. Shelford is now living with his daughter and family at his old home at 506 W. Iowa, Urbana, Illinois.

Dr. Shelford obtained most of his college training at the University of Chicago where he received his B.S. in 1903 and Ph.D. in 1907. He continued at the University of Chicago as Associate and Instructor in Zoology until 1914 when he transferred to the University of Illinois where he taught for 32 years, retiring in 1946. Also in 1914, Dr. Shelford assumed the position of Biologist in charge of the research laboratories of the Illinois Natural History Survey, which he held until 1929. The year, 1914, was an important one in his career since he also was put in charge of marine ecology at the Puget Sound Biological Station where he worked during the summer months until 1930. The year, 1914, also brought the first discussions concerning a national ecological society, and Dr. Shelford was appointed vice-chairman of an organizing committee. The following year saw the formal organization of the Ecological Society of America with Dr. Shelford as its first president.

While at the University of Chicago, Victor Shelford was inspired toward making ecology his life work, especially by Henry C. Cowles who had recently completed his own Ph.D. studies of plant succession in the sand dune

region around the southern end of Lake Michigan and by Charles Manning Childs who was doing experimental studies on regulatory processes in living organisms. Although Dr. Shelford's first studies were with the tiger beetles that inhabit the sand dune region, he quickly expanded his interests to take in the entire fauna and to seek physiological explanations for the segregation of different species to different habitats. This led to a series of five publications on *Ecological Succession* in the Biological Bulletin in 1911 and 1912 and papers in physiological ecology. Much of this material was brought together and resynthesized in his book on *Animal Communities in Temperate America* published in 1913. This book is generally recognized as furnishing the impetus for getting animal ecology recognized as a distinct biological science.

Very few ecologists have shown as broad an interest or have contributed to the development of so many different aspects of the science as has Victor Shelford. He was greatly concerned with experimental studies both in the laboratory and in the field and with the fabrication of appropriate equipment and facilities both for promoting research and for training of students. He had one of the first courses in physiological ecology given in the country. In 1920 he began using photoelectric cells for measuring light penetration into sea water at the Puget Sound laboratory but experienced so many difficulties that he associated himself with Professor Jakob Kunz of the Department of Physics of the University of Illinois during the next 10 years for improving this equipment. Dr. Shelford's interest in equipment for testing the physiological and behavior responses of both terrestrial and aquatic animals also included temperature, relative humidity, pH, current, oxygen, and water pollutants. The Vivarium Building on the University of Illinois campus housed much of this special equipment including climate-simulating cabinets. His ideas, equipment, and methods for such experimental studies were brought together in his book, *Laboratory and Field Ecology*, published in 1929.

Perhaps the most important experimental research of Dr. Shelford's, supported by the Illinois Natural History Survey, dealt with the relations of the codling moth and the chinch bug to weather and climate (Survey Bulletins 16, 1927; 19, 1932). He demonstrated that temperature could not be summed directly to show its accumulative effects on growth and introduced the concept of development units. Of special importance was the way that temperature and relative humidity interacted. This led to his extensive use of paired factor diagrams. In some of his later studies he paired rainfall with ultra-violet solar radiation. His last paper, somewhat of a summary of his concepts along this line, was published in the *International Journal of Biometeorology* in 1962.

In 1933, Dr. Shelford initiated in the William Trelease Woods, owned by the University of Illinois, a "century-cycle" project for the measurement of invertebrate and vertebrate populations throughout the year and from year to year for correlation with fluctuations in weather and other factors. This research program has been continued since his retirement and is now in its 35th year. He summarized the first 15 years in two publications in *Ecological Monographs* for 1951. Shelford's interest in population ecology is further evident in two publications resulting from his studies at Churchill at tree line in northern Manitoba, one dealing with lemming cycles (*Ecol.* 24, 1943), the other with snowy owl cycles (*Auk*, 62,

1945), and in his analysis of population fluctuations of the chinch bug in the Upper Mississippi Valley (Ecol. 24, 1943).

Although Victor Shelford did much to establish physiological ecology and population ecology on a firm basis, perhaps his major contributions and interests as well as reputation are in community ecology. These began while he was still at the University of Chicago and later expanded to include descriptions of communities in the sea, in fresh-water, and in all sorts of environments on land. The many years' studies that he and his students made in the Puget Sound area of northwestern Washington culminated in a lengthy report in *Ecological Monographs* in 1935, a description of stream communities appeared in *Ecology* in 1929, and one of bottom communities in western Lake Erie in 1942. He has an analysis of the transcontinental coniferous forest seral and climax communities in 1935, of tundra communities around Churchill, Manitoba, in 1941, and of Mississippi floodplain communities in 1954, all in *Ecology*.

Dr. Shelford was early impressed by the similarity in morphological responses to the environment of sessile marine animals and terrestrial plants (Amer. Nat., 1914; Journ. Ecol. 1915). Motil animals, on the other hand, he believed responded more by adjustments in behavior. Plant and animal communities on land were in agreement when the growth form of the plant community was correlated with the conditions selected by the animals. On the seashore, the dominant organisms were the sessile or slow-moving animals; on land they were principally plants. The distribution and coactions between plants and animals were so closely knit that biomes must be recognized as the essential community both in the sea and on land. In order to expound this biome concept to a fuller degree, Shelford collaborated with Frederic E. Clements in publishing a book on *Bio-Ecology*, in 1939.

With the biome concept now established, Dr. Shelford set himself the task of describing all the biomes and major seral communities in North and Central America both in regard to vegetation and the animal constituents. This involved numerous trips, often accompanied by students, to many parts of North America from the tundra to the tropics and resulted in his last major book, *The Ecology of North America*, published by the University of Illinois Press in 1963.

Dr. Shelford's interest in the study of biotic communities made him a strong advocate for the preservation of representative samples of all major types in as near primitive or natural condition as possible. He was one of the first to insist that whole communities must be preserved—not just single species—and as early as 1917 was chairman of a Committee on the Preservation of Natural Conditions of the Ecological Society. He continued as chairman until 1938. This Committee, with help from other organizations and individuals, prepared a *Naturalist's Guide to the Americas* of 761 pages in 1926 that gave detailed descriptions of the ecology of various parts of North and Central America, natural preserves already set aside, and those being planned.

Dr. Shelford believed that the Society's decision in 1945 to place a limit on the Committee's authority "to take direct action designed to influence legislation on its own behalf" was a denial on the part of professional ecologists of a responsibility for the preservation of natural areas

that was rightfully theirs. As a result, he instigated the organization of a new action group, the Ecologists Union, in 1946. The Ecologists Union was later renamed the Nature Conservancy which has now developed into a large and important organization.

Victor Shelford was an outstanding teacher as well as a scientist. Although not a polished lecturer he was full of ideas, enthusiasm, and energy. He always had a large number of graduate students working toward advanced degrees and inspired them to do their best. His courses were highly field oriented with trips every Saturday regardless of the weather or football games, or anything else. He took classes to Reelfoot Lake in western Tennessee over Easter vacations for some 16 years. Extended summer camping trips went to the Pacific Coast, the Arctic tundra, Mexico, and other parts of the country.

One can only conclude that Victor Shelford, more than any other one person, because of his researches, ideas, aggressiveness, teaching, and leadership, deserves to be known as the father of animal ecology in this country.

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