

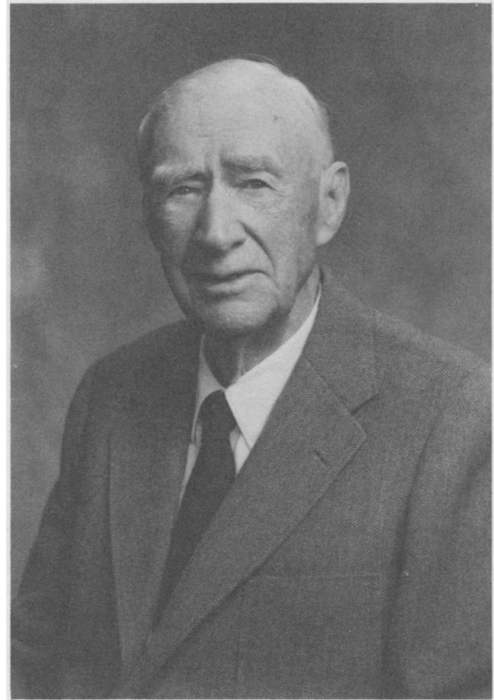
# resolution of respect

FRANK W. PRESTON 1896–1989

Frank W. Preston died on 1 March 1989 in Butler, Pennsylvania. His papers on the commonness and rarity of species provided ecology with one of its most important and enduring conceptual advances. The Ecological Society of America benefited, as well, from Frank's counsel and generosity in a number of other ways, reflected in the Distinguished Service Award conferred by the Society. His accomplishments in ecology are especially remarkable because he was an amateur who earned his living by practicing a completely different and equally challenging profession. Frank was a prominent consulting engineer in the glass industry, but his scientific contributions extended into a variety of other fields. His great intellectual breadth is reflected in his standing as a Fellow of the American Physical Society, the American Ornithologists' Union, and the Geological Society of America.

Preston was born on 14 May 1896 in Leicester, England. As the eldest child in a family of modest means at the close of the Victorian era, he received an education that was quite outside our modern American experience. His major formal instruction took place at the Wyggston Boys' School in Leicester, where the primary emphasis was to prepare local boys to pass the examinations in Greek, Latin, and mathematics for entrance to Oxford and Cambridge. Frank always identified strongly with the experiences and friendships of his years (1908–1912) at Wyggston. His small circle of classmates included some excellent naturalists (most notably George Mercer and David Vaughan Carnegie), with whom he spent much time afield making geological observations and collecting insects and birds' nests. The deaths of many of these classmates in World War I left a deep impression on Preston, and is reflected in the title and dedication to his autobiography. *The Boys of the Old Brigade* (Preston 1988).

Frank passed the entrance examinations to Oxford with distinction but did not attend because, even with a scholarship, the expenses would have been a heavy burden for his family. Besides, he observed that most members



of his social class who graduated from universities during that era became clergyman, teachers, and government officials. These careers had little appeal to him, for he had concluded by age 16 that his talents and interests were better suited to dealing with "things" rather than "people." As a result he elected to become an "articled" pupil (a special form of apprenticeship) of Albert Harry Walker, the Surveyor and Water Works Engineer for the town of Loughborough. Under Walker's tutelage, Preston learned the skills of civil engineering by taking on a graded series of public projects culminating in the design of reinforced concrete structures and the development of a city plan. He supplemented this training by attending evening classes on geology at the Leicester Museum and on physics and materials science at the Leicester Technical School. He also went to the public libraries almost daily to read on a wide variety of technical subjects. The strenuous reading

habits and independence of thought that he developed during this period were critical ingredients in his exceptional ability to provide new insights by drawing from his knowledge of previously unrelated fields. In 1916 he took the external examinations administered by the University of London and was awarded a B.Sc. with First Class Honors in engineering.

In 1917 Frank accepted a position as Research Director at Taylor, Taylor & Hobson, Ltd., makers of fine optics and precision instruments for special scientific, military, and industrial applications. Following World War I, this firm was involved in a number of joint ventures with the Eastman Kodak and American Optical Companies, which required Preston to spend extended periods working with his counterparts in the United States. In 1925, while he was helping to develop new polishing machines for the Standard Plate Glass Company in Butler, Pennsylvania, he was caught in the middle of a business dispute about which firm should benefit from his work. He decided that the most honorable course was to resign his position. He returned to England where he submitted his previously published papers on the structure of abraded glass surfaces as a doctoral thesis at the University of London. After an examination, chaired by Frank Twyman, FRS, he was awarded a Ph.D. in 1925. (The University of London also awarded him a D.Sc. in 1950 for his work in glass technology. The fact that a scholar as distinguished as Preston never attended or worked in a university calls in question many widespread assumptions about scientific education and the status of institutions.) After receiving his doctorate, Frank set out on a self-financed trip around the world. He lingered for extended periods in South Africa, Australia, and New Zealand to pursue again his boyhood interests in natural history and geology.

At the end of his world tour, Frank settled in Butler, Pennsylvania, where he established himself as a consulting engineer to the numerous glass industries that are located in the Ohio Valley and Great Lakes regions. His firm weathered many difficult trials during the Great Depression, but by 1937 Preston Laboratories, Inc., had grown to the point that he moved the business to new buildings near Meridian, Pennsylvania. Preston became a prominent figure in the glass industry. He was granted 20 United States patents involving several dif-

ferent aspects of glass technology and he played a key role as an expert witness in legal proceedings that threatened to severely limit the glass container industry. He was a pioneer in the field of fracture analysis and he investigated basic questions concerning the "creep" of molten glass and the design of efficient furnaces; he published over 60 papers in physics and engineering journals. Even though Frank stepped down from the management of his firm (which was the forerunner of American Glass Research, Inc.) several years ago, he remained active in the field into his 90s. He made periodic visits to the Corning Glass Works in upstate New York throughout the 1970s and 1980s. During these visits he always invited one or two ecologists from Cornell to join him at dinner. Frequently he was accompanied by a Corning executive, and on these occasions he took delight in raising questions that he wanted to examine from the differing perspectives of his guests' separate fields. On such evenings one caught a glimpse of how naturally Frank drew on his experience in engineering and business to reach fresh conclusions about ecology.

Frank became interested in ecology after his business was well established and he had the opportunity to indulge his interests in natural history on the extensive grounds of his new laboratory at Meridian. Late in the 1930's he hired Russell T. Norris, who had degrees in forestry and wildlife management, to oversee the grounds and assist in biological investigations. It was Norris who pointed out to Preston that ecology was the field that best encompassed his broad interests and recommended that he join the Ecological Society of America. Together with Norris he started investigations on the density and height of birds' nests in different habitats. In these early papers (Preston 1946, Preston and Norris 1947), Frank had already adopted the approach that was to lead to his major contributions; he was primarily concerned with discovering the statistical distribution of nest heights and then using the parameters of the distribution to gain insight into the factors that were responsible for producing the pattern.

Frank's interest soon turned to the distribution of commonness and rarity of species. His key insight, that the abundance of species is distributed lognormally (Preston 1948), occurred late one evening while he was reading Aretas Saunders' *Birds of Quaker Run Valley*

on a train. He wrote the entire outline of his argument in the blank spaces of his newspaper, but it took him three years to work out the details and assemble suitable examples. In this connection it is interesting to note that throughout his career Preston obtained some of his most enlightening examples by tracking down naturalists with long runs of observations and compensating them to tabulate their notes in an appropriate form. Preston explored the further implications of his theory in a series of papers (Preston 1960, 1962) on species–area relationships and the “canonical” distribution of commonness and rarity. In these papers his distinction between the attributes of “samples” and “isolates” led him to comment on several topics (e.g., the special nature of island biotas and the relationship of extinction to island or refuge size) that were developed further in MacArthur and Wilson’s theory of island biogeography. Like many other pioneers in ecology (e.g., Elton and Allee), Frank found that sociology and economics provided a rich source of analogies for understanding patterns in biotic communities. His caution about carrying such analogues too far, however, is nicely reflected in his treatment of the seductive parallel he discovered between the distribution of individuals among species in natural communities and Pareto’s “law” describing the distribution of wealth among individuals in human communities. Frank’s last paper in *Ecology*, published in 1979 when he was 83, was entitled “The Invisible Birds,” and dealt with a neglected but important problem, the estimation of the numbers of individuals and species that are missed by a census taker.

Frank’s boyhood fascination with birds and geology continued throughout his life. The fruitful combination of the engineering and natural history approaches, so evident in his ecological work, is also reflected in his major contributions to ornithology. In a long series of papers (published in *The Auk* between 1953 and 1974), Preston extended his interests in the properties of glass containers to investigations of the size, shape, and surface of birds’ eggs. He also published several papers on bird migration and nesting biology. Preston continued to investigate the Late Pleistocene geology of western Pennsylvania until his late 80s, when he was slowed down after taking a serious fall while examining a rock outcrop. Some of his geological observations were

published by the Carnegie Museum, but probably the most important consequence of this work was that it led to his involvement in landscape preservation. In late 1940s, as an outgrowth of his weekend forays around Pittsburgh, Frank conceived of a regional network of parks. In 1951 he helped form the Western Pennsylvania Conservancy; he and his wife were the first donors to the organization and played a significant role in the development of Lake Arthur and Moraine State Park. During these years, through his involvement with the ESA, he was active in the events that led up to the formation of The Nature Conservancy. In 1951 he became the first patron of The Nature Conservancy.

The establishment of the Mercer Award in 1947 (the ESA’s first award) was one of Frank’s many contributions to the ESA. George Mercer was a classmate and field companion of Preston who made extensive observations on the distribution and biotic associations of the plants of Leicestershire. His only paper, entitled “The Flora of Belgrave and Birstall,” appeared in the Transactions of the Leicester Literary and Philosophical Society for 1914. Mercer, an officer in the Leicestershire Regiment, was wounded by shrapnel during the fighting in France in 1917. After convalescing in England, Mercer volunteered to return to France where he was killed a few days before the armistice in November 1918.

In 1947 the ESA was in such a difficult financial state that the President, Aldo Leopold, asked Frank, along with Alfred Redfield and Henry Oosting, to help sort things out. Frank chaired the Finance Committee during a crucial period in the Society’s history and in 1958 he served as Vice President. He received the Distinguished Service Award in 1986. In accepting the award, he reminded us that amateurs, such as himself, could play an important role in ecology if we did more to encourage their participation. Over the years Frank quietly “took care” of a number of things that most of us take for granted. For instance, I am aware that he made contributions to cover the special costs of certain publications and that he was responsible for erecting a memorial to Alfred Russell Wallace and Henry Bates in Leicester. He was a Trustee of the Carnegie Museum for several years.

Frank is survived by his wife, Jane Hupman Preston, whose keen intellect, broad interests, and independent spirit greatly enriched

his full life. They were married in May 1942. Frank worked outside the academic and governmental network that employed most ecologists during his era. His day-to-day interactions were with assistants trained in quite different fields. (I suspect that one assistant, T. C. Baker, who had an M.S. in physics, might have been Frank's major sounding board on statistical problems.) On the one hand, this partial isolation probably contributed to Frank's highly original way of defining and approaching questions in ecology; on the other, Frank left no students or junior colleagues to carry on his tradition.

Since so few ecologists knew Frank well, I will close with some personal observations. Frank had pleasant, old-fashioned manners and a dignified carriage. He was warm and friendly even though I suspect that he was a bit shy by nature. His high expectations of himself and others were underlaid by a deep and obvious fondness for those around him. He often tempered his criticism with wry humor. For instance, in recent years, he disliked the style of writing that scientific journals have come to require; he felt it suppressed individuality and made science too uniform and dull. He made his point by offering junior authorship to the editor of one of his papers, arguing that so many changes had been made in the manuscript that it was as much the editor's work as his own. Frank Preston was one of the most fascinating people I have had the privilege to know. The world, and ecology, have changed; I do not expect to know another quite like him.

#### *Selected Publications*

- Preston, F. W. 1946. Nesting heights of birds building in shrubs. *Ecology* **27**:87–91.  
 ———. 1948. The commonness and rarity of species. *Ecology* **29**:254–283.

- . 1960. Time and space in the variation of species. *Ecology* **41**:785–790.  
 ———. 1962. The canonical distribution of commonness and rarity: Parts I and II. *Ecology* **43**:185–215, 410–432.  
 ———. 1966. The mathematical representation of migration. *Ecology* **47**:375–392.  
 ———. 1968. On modeling islands (review of MacArthur and Wilson). *Ecology* **49**:592–594.  
 ———. 1969. Diversity and stability in the biological world. Pages 1–12 in G. M. Woodwell and H. H. Smith, editors. Diversity and stability in ecological systems. Brookhaven National Laboratory Symposia in Biology 22. Brookhaven National Laboratory, Upton, New York, USA.  
 ———. 1979. The invisible birds. *Ecology* **60**:451–454.  
 ———. 1988. The boys of the old brigade. This two-volume typescript is an indexed autobiography that contains a complete list of Preston's publications and patents. My copy will be deposited in the library of the American Philosophical Society in Philadelphia. Of the other 24 copies that were distributed in October 1988, I know that sets were placed in the Carnegie Library and the Carnegie Museum in Pittsburgh, the Archives of the Smithsonian Institution in Washington, D.C., the library of the Leicester Museum in England, and the library of the Western Pennsylvania Conservancy.  
 Preston, F. W., and R. T. Norris. 1947. Nesting heights of breeding birds. *Ecology* **28**:241–273.

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