

## Resolution of Respect

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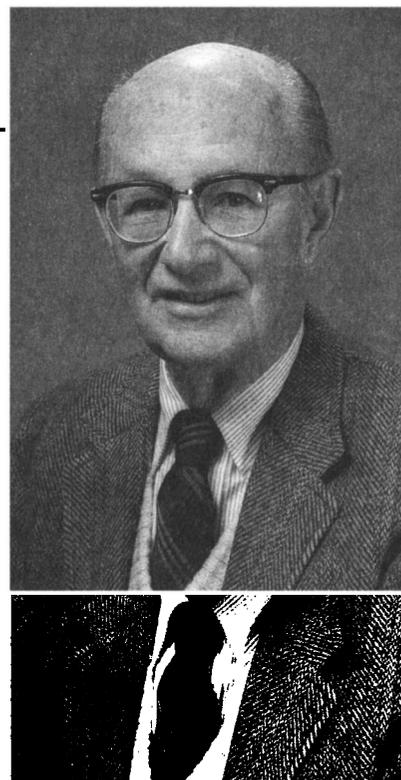
### William Dwight Billings 1910–1997

Past-President of the ESA, W. Dwight Billings died at his home in Durham, North Carolina, on 4 January 1997. In addition to his 1978–1979 presidency, Dwight served the Society as vice president (1959–1960), editor of *Ecology* (1951–1956) and *Ecological Monographs* (1969), and Interim Business Manager (1968–1969). A dedicated teacher and life-long ecological scientist, he was born 29 December 1910 in Washington, D.C. His family moved to Indianapolis where he attended high school and Butler University (A.B. 1933). He then went to Duke University for graduate study (A.M. 1935, Ph.D. 1936). Dwight passed on his love of nature and dedication to the study of ecology to 52 people who earned the Ph.D. under his tutelage in the Department of Botany at Duke University. Most of these people are engaged in research and teaching today in laboratories and universities across the world.

Dwight's own professional career started in 1936 with appointment as instructor at the University of Tennessee. In 1938 he joined the biology department at the University of Nevada, Reno, and progressed through the academic ranks, reaching full professor and head of the department by 1952. That year, he returned to Duke University to develop a world-renowned center of training and research in physiological plant ecology, a field that he defined. Duke University rewarded Dwight's distinguished stature in ecology by naming him James B. Duke Professor of Botany and Ecology. In 1989, Billings received the Nevada Medal, sponsored by the Desert Research Institute and presented by Governor Bob Miller, in recognition of his contributions as the "father" of physiological plant ecology and his personal research contributions to the field. Specifically, Dwight was recognized as striving to

examine the basic life processes on plants, focusing on how plants respond to their environment and how those responses define survival in arctic, alpine, and desert environments. In addition to the important ESA offices listed above, Life Member Billings served the Society as chair of many working committees. His contributions to ecology were acknowledged by his receipt of the 1962 Mercer Award (see below), the Distinguished Service Award in 1981, the Certificate of Appreciation in 1982 and ultimately, the Society's Eminent Ecologist Award in 1991. In addition, he became Honorary D.Sc. of Butler University in 1955, Fellow of the American Academy of Arts and Sciences in 1979, Fellow of the Arctic Institute of North America in 1980, and Honorary Foreign Member of the British Ecological Society in 1982. A listing of his chairmanships and memberships of advisory committees for the National Science Foundation, the U.S. Atomic Energy Agency, the Botanical Society of America, the American Institute of Biological Sciences, the National Research Council, and many institutes and universities consumes an entire page of his curriculum vitae.

In 1958 Dwight married Shirley Miller whom he had met at the University of Wyoming Science Camp in the Snowy Range of Wyoming. In spite of the great academic successes he experienced, several of us told him that finding and marrying Shirley were the smartest moves of his life. I once introduced Dwight and Shirley as a research team in a seminar he was presenting. She was embarrassed by the acknowledgment, but after the seminar he thanked me for recognizing her contributions. One example of their partnership was the production of their annual Christmas card. Many of us have the complete collection of the artistic cards they mailed annually to many friends and colleagues. The cards chronicle their trips to many places including New Zealand, Aus-



tralia, Europe, South America, and most of the desert, alpine, and arctic locales in North America. The 1996 card features a photo of a 1946 pastel painting by Dwight of golden quaking aspens in early Sierran snow. Shirley will continue to reside in their Durham home.

Three seminal papers established Dwight Billings as the central figure in physiological plant ecology in North America. In 1951, his paper with R. J. Morris, "Reflection of visible and infrared radiation from leaves of different ecological groups," appeared in the *American Journal of Botany* (Billings and Morris 1951). This landmark effort demonstrated the use of a reflectance attachment on a spectrophotometer and imaginative use of biophysics and physiology to describe the occurrence of energy-based functional plant groups in the Great Basin Desert. The next year, arguably his most scholarly and definitely his most theoretical paper, "The environmental complex in relation to plant growth and distribution," was published in the *Quarterly Review of Biology* (Billings 1952). These two papers attracted the attention of James Bonner, then on the editorial board of the *Annual Review of Plant Physiology*, and he invited Bill-

ings to submit a paper defining physiological plant ecology as a distinct discipline of study. The result was the landmark paper entitled "Physiological ecology" (Billings 1957).

His undisputed position as the Dean of North American physiological plant ecologists was solidified by his definition of the field in every edition of the *McGraw-Hill Encyclopedia of Science and Technology* from 1960 to 1992 (Billings 1992), and by the classic paper co-authored with his graduate student, H. A. Mooney, "Comparative physiological ecology of arctic and alpine populations of *Oxyria digyna*," published in 1961 in *Ecological Monographs* (Mooney and Billings 1961). This paper was recognized as being exceptional when it was selected to receive the 1962 Mercer award of ESA.

One word best describes Dwight's ecological philosophy: "holocoenosis." If you are unfamiliar with the concept or want to read more on his understanding of the ecological nature of the earth, I recommend the third edition of his textbook *Plants and the Ecosystem* (Billings 1978). Examples of his personal expression of important events and characters in the development of ecology may be found in his Past-President's address, "American deserts and their mountains: an ecological frontier" (Billings 1980), and in an essay published in the book, *The Physiological Ecology of North American Plant Communities* (Billings 1985), edited by Chabot and Mooney (1985). His encyclopedic knowledge of the ecology of North America was applied in the book *North American Terrestrial Vegetation*, which he co-edited with Mike Barbour (Barbour and Billings 1988). Mike will complete the editing of the revised and enlarged second edition that they were working on when Dwight passed away.

With all of the attention garnered from the above publications and honors, Billings began to receive applications from many of the brightest students in the country. This, combined with increasing availability of research and graduate training funds, made Dwight's laboratory and Duke

University the place to be for training in physiological plant ecology from the mid-1950s through the mid-1980s. From his first Ph.D. student, Larry Bliss, who received the degree in 1956 to his last Ph.D. student, James Luken, who finished in 1984 when Dwight was 74 years of age, Billings supervised 52 graduate students, including two of H. J. Oosting's people who finished under Dwight in 1969 after Heinie passed away in 1968. When it is realized that Oosting trained 34 Ph.D. students, including the two above, the impact of the Oosting/Billings era on North American plant ecology, with 84 degrees awarded, is truly amazing.

Many people have seen the mobile of silver medallions, each engraved with the name of a plant ecologist and arranged in an academic family tree that has hung in Dwight's Duke office since it was presented to him by his students and friends at the 1980 ESA Annual Meeting. Dwight's academic heritage extended back to John M. Coulter and Henry Chandler Cowles at Chicago, through W. S. Cooper at Minnesota to H. J. Oosting at Duke. The mobile includes all of Heinie's students, all of Dwight's students, and many academic grand- and great-grandstudents as well.

Dwight originally became interested in plant ecology as a high school student at Shortridge High School in Indianapolis, Indiana. He liked to tell the story of the day he first heard of ecology when Stanley Cain spoke to the high school biology class. Another of his favorite high school yarns was that his team played basketball against Johnny Wooden, who was going to another high school in Indianapolis. At Butler University he studied with Ray C. Friesner and John Potzger, who further contributed to his developing ecological interests. In the economically tight times of the Great Depression, he attended the only graduate school that offered financial support, so his association with H. J. Oosting began rather fortuitously. The synergism of their lifetime association was remarkable, however, and led to published collaborative studies of hemlock and

spruce-fir forests in the North Carolina Appalachians, red fir forest in the California Sierra Nevada, and coastal vegetation on the North Carolina Outer Banks.

From his classic dissertation study, entitled "The structure and development of old field shortleaf pine stands and certain associated physical properties of the soil," published as 62 pages in *Ecological Monographs* (Billings 1938), through more than 125 published papers, with 40 coming after his retirement in 1980 at the age of 70, Dwight Billings defined, examined, and redefined the subdiscipline of physiological plant ecology. In the preface of a recent book entitled *Arctic Ecosystems in a Changing Climate* (Chapin et al. 1992), his colleagues, led by Terry Chapin, wrote:

*William Dwight Billings has provided inspiration, advice, example, argument, and encouragement to generations of students of ecology. He has played a leading role in the development of physiological ecology over the past forty years, and his research continues to lead the way to important advances in our understanding of the Arctic. Virtually every chapter in this book has been influenced, directly or indirectly, by Dwight's contributions. It is thus with respect and affection that we dedicate this book to William Dwight Billings.*

It is with respect and affection that I offer this resolution to the memory of my academic grandfather, my colleague of 28 years, and my friend of 36 memorable years, W. Dwight Billings.

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*Boyd R. Strain*  
*Department of Botany*  
*Duke University*  
*Durham, NC 27708*