David E. Fairbrothers

Dr. David E. Fairbrothers (1925-2012) had a long, illustrious career in plant science, plant conservation and education. In the era prior to DNA sequencing, he was a pioneer in chemotaxonomy, using serological methods to assess systematic relationships. He was also a tireless advocate for the preservation of rare and endangered flora in the United States, and particularly in the state of New Jersey.

David Fairbrothers was born Sept. 24th 1925 and grew up in Absecon, New Jersey, USA. He served in Europe during World War II as Sergeant Squad Leader in the 94th infantry. During the Battle of the Bulge he nearly lost his legs to frostbite, but refused amputation and eventually regained their use. Following the war, he received his bachelor's degree from Syracuse University in 1950. He attended graduate school at Cornell University (NY, USA) earning his master's degree in 1952 with the thesis entitled "A cytotaxonomic investigation within the genus *Echinochloa.*" He continued at Cornell and in 1954 earned a Ph.D. with his dissertation "Relationships in the *Capillaria* group of *Panicum*."

After a short stint as an Instructor in Botany at Cornell in 1954, he started at Rutgers, The State University of New Jersey (NJ, USA) as an Instructor in the Department of Botany that same year. David stayed at Rutgers for 34 years, climbing the ranks, to the highest academic position attainable, Distinguished Professor II. He served in various administrative positions at the University, including Director of the Rutgers' Botany Graduate Program (1969-1972), Chair of the Department of Botany (1971-1978 and 1980-1981), and after departmental mergers, David served as Chair of the then newly formed Department of Biological Sciences (1981-1982). Following retirement in 1988, David held the title Professor Emeritus and was associated with Cook College (now called School of Environmental and Biological Sciences). Thirteen years after David's retirement, I (Lena) was hired as his replacement to teach and do research in plant systematics at Rutgers University, and during the intervening time the herbarium at Rutgers had moved to Cook College from Busch Campus.

During his career David was integral in the growth and activity of the Rutgers University's Chrysler Herbarium (CHRB), first serving as Curator (1954-1972) and eventually becoming Director (1972-1990). Over this time period the herbarium collections tripled from approximately 40,000 specimens to over 120,000 specimens through active collecting as well as acquisition of orphaned herbaria from institutions in the state (Rutgers-Camden, Douglass College, Willowwood Arboretum, etc.).

David recognized that the specimens at CHRB (and other herbaria in the region) served as an important resource for assessing the distribution of rare plants in New Jersey. In 1973 he and Mary Hough produced the first "red list" of rare and endangered vascular plants for a U.S. state. The New Jersey Red List preceded the 1973 Federal Endangered Species Act and inspired other states in the nation to assess species' rarity and compile similar documents. After the passing of the Endangered Species Act of 1973, which primarily provided protections for threatened and endangered (T&E) animal species, the Smithsonian Institute was directed to prepare a report on T&E plant species in the United States. David served

as a member of the committee that prepared this report, and when completed, this document included definitions for rarity statuses and a list of over 3000 potentially T&E plant species. The report influenced the U.S. Fish and Wildlife service to review the status of the listed plants, and eventually led to the inclusion of more substantial plant-specific regulations in the Endangered Species Act.

David also had a tremendous impact on the conservation of the biodiversity and habitats of the New Jersey Pine Barrens, an internationally important ecological region located in southeastern New Jersey, USA. The pinelands overlies the ~17 trillion gallon Kirkwood-Cohansey aquifer and has characteristic sandy soils and a variety of habitats including pine/oak upland forests, Atlantic white cedar and hardwood swamps, wet meadows and oligotrophic lakes, bogs, and streams. It encompasses approximately 1.1 million acres (22% of New Jersey's land area) and is home to many rare plant species including curlygrass fern (*Schizaea pusilla*), bog asphodel (*Narthecium americanum*), and American chaffseed (*Schwalbea americana*).

David possessed a great ability to translate botanical scientific information and terminology so that the general public and both private and governmental agencies could understand and then use such information in important decision-making processes. In that capacity, he presented expert testimony to the U. S. Senate Committee on Parks and Recreation and Natural Resources advocating for the development of the Pinelands National Reserve (PNR). The PNR was subsequently created by Congress, under the National Parks and Recreation Act of 1978 and was the first National Reserve in the nation. In 1983, the United Nations, through UNESCO's Man and the Biosphere program, identified the Pinelands Reserve as one of the world's outstanding natural areas and designated the area a U.S. Biosphere Reserve. In 1988 it was recognized as an International Biosphere Reserve.

Following the formation of the PNR, David continued to provide his expert assistance by preparing the report *Threatened and Endangered Vascular Plant Species of the New Jersey Pinelands and their Habitats* for the newly formed Pinelands Commission. This report, and a book chapter, *Endangered, Threatened, and Rare Vascular Plants of the Pinelands and their Biogeography*, were the foundation for determining the initial species to be protected under the Pinelands Commission's Comprehensive Management Plan. He also presented to the Commissioner of the New Jersey Department of Environmental Protection the appropriateness and scientific background for the formation of a New Jersey Natural Heritage Program.

The Fairbrothers' laboratory group worked in many different areas of plant science including morphology, anatomy, ecology, floristics, genetics, and systematics. The lab conducted pioneering research using immunological methods (quantitative and double diffusion precipitin tests and immuno-electrophoresis) and electrophoretic techniques (PAGE, iso-electric focusing, 2-D) to compare plant proteins and elucidate evolutionary relationships. At that time, in the period prior to DNA sequencing, these were cutting edge methods in plant systematics. These techniques were initially used in the Fairbrothers lab to study groups in the Poaceae, and were subsequently used to assess higher-level relationships within Annoniflorae, Amentiferae and monocots, the orders Typhales and Cornales, as well

as relationships in numerous families (Apiaceae, Betulaceae, Caprifoliaceae, Cornaceae, Magnoliaceae, Nyssaceae, Oleaceae, Rubiaceae), sub-families, genera (*Abies*, *Alnus*, *Amphipterigium*, *Betula*, *Carex*, *Coffea*, *Festuca*, *Leitneria*, *Osmunda*, *Typha* and *Viburnum*, etc.) or species therein. The lab also investigated cytogenetic, biochemical, morphological and anatomical variation, as well as the ecology of various species including *Opuntia humifusa*, *Danthonia sericea* and groups including oaks, oak relatives (*Nothofagus*) and *Mentha*.

As an undergraduate botany student in Sweden, I (Lena) had already read and cited David's papers on serology-based studies when I was investigating evolutionary relationships and classification history of the Gentianales for my undergraduate research thesis. A few years ago, I handed David my marked up copy of his paper from those years in the late 1980s, showing him how his research had became internationally known and was included in my early work.

In addition to research in systematics, David and his students conducted floristic works in New Jersey, producing inventories of William Hutcheson Memorial Forest, a tract of land in central New Jersey containing likely the oldest primary forest of this area, and assessing the floristic differences of sphagnum bogs in northern and southern New Jersey. He documented the introduction of non-native species such as *Nelumbo nucifera*, *Setaria faberii*, *Eragrostis curvula* and *Microstegium vimineum* to the US, and in 1965, Fairbrothers and Moul published *The Aquatic Vegetation of New Jersey*. In 1985, James Montgomery and David used herbarium records to document the distribution of ferns and fern-allies in New Jersey resulting in the publication the book *New Jersey Ferns and Fern-Allies* in 1992.

David served on numerous scientific committees for the National Science Foundation (NSF), The New York Botanical Garden, and American Institute of Biological Sciences (AIBS), and served as advisor to the Pinelands Commission, member of the Board of Trustees for the Willowwood Arboretum Foundation, and as advisor for New Jersey Rare and Endangered Plant Species and Critical Habitats Program of the Natural Heritage Program. He also was on the editorial board of Bartonia, The Journal of the Philadelphia Botanical Club, and the review board of the Australian Journal of Botany.

With a vibrant research program at Rutgers, he advised in total 29 Master's and doctoral students and six post-doctorates, and hosted numerous visiting scholars from around the world, helping to produce the next generation of plant researchers, many who became distinguished professors in their own right. David was a wonderful mentor to his students, fostering significant individual development as researchers and as honorable human beings. He provided not just scientific training, but also encouragement to attend botanical meetings and present papers, and participate in local botanical activities. The learning environment created by David, and the unconditional, personal support towards his graduate students, provided an outstanding place for young botanists to grow and develop. This is also true for us that met him late in his life, and he became an important mentor and friend to both of us in the last decade. David's wife, Marguerite Fairbrothers, was a tremendous companion for David through their life together and is still wonderfully supportive to all of us. She as well serves as a role model

especially for me (Lena) in her generosity with her time and attention, great sense of humor, as well as her deep honesty.

As a graduate student, I (Sasha) greatly appreciated David's encouragement and his remarkable stories about his life and research, botanical history, and the diverse New Jersey flora. I was serving as the collections manager for the Chrysler Herbarium at the time and he always expressed his great appreciation for my efforts in improving the herbarium and promoting its great scientific and historical value.

His extensive positive influence on the profession and the personal careers of his students and mentee's was noticed by many and led to several official recognitions. David received Rutgers' Lindback Award for Distinguished Teaching in 1981, the Rutgers' Presidential Award for Distinguished Public Service in 1983, the Rutgers University Medal (the University's highest award) in 1988, the Botanical Society of America medal (that society's highest award) and many other commendations and awards for service to botanical organizations in New Jersey and the nation.

After retirement, David continued to advocate for the preservation of New Jersey's flora. He was a founding member of the Flora of New Jersey Project, whose goal is to produce an updated atlas and a complete manual, for the Flora of New Jersey. David worked to develop the Emily De Camp Herbarium at Island Beach State Park, one of the last undeveloped coastal barrier islands in New Jersey. He continued to share his knowledge of plant science and conservation with many different community and governmental groups, giving lectures and leading numerous fieldtrips to the wonderful environments that he worked so hard to conserve.

With the passing of David Fairbrothers, the botanical community worldwide has lost a tireless advocate for plant biodiversity conservation and exploration. He was a fantastic mentor and champion for botanical education at all levels, from outreach toward the general public to graduate education, and he was a dear friend to many of us. We feel lucky that we got to know David while we have worked at Rutgers, and had the opportunity to be inspired by his strong dedication to science, ethics, and service to the world.

Sasha W. Eisenman & Lena Struwe