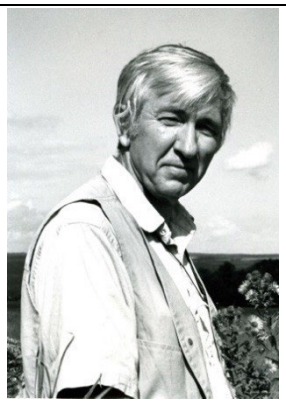

Richard B. Root

September 7 , 1936 – January 22, 2013

Richard Bruce (Dick) Root, Professor of Ecology and Evolutionary Biology and of Entomology, died in Ithaca on 22 January 2013 with his family around him. Dick was an exquisite blend of theoretician and empiricist, testing core theories with beautifully designed experiments based on unsurpassed knowledge of natural history. He was a distinguished biologist, as well as a prolific and profound contributor to the literature, especially in ecology. He was also an inspiring mentor of students.

Dick Root was born in Dearborn, Michigan, and spent much time as a child wandering in nature, and enjoying the outdoors on the family farms of his grandparents. He attended the University of Michigan where his childhood interests in nature and his budding interest in ecology were reinforced and much expanded. Graduate studies were at the University of California, Berkeley. In 1964 Dick received his Ph.D. and became an assistant professor of Entomology at Cornell. While an undergraduate at Michigan, Dick married Elizabeth (Betsy) Eichstedt. They separated in 1978 and after another ten years, Dick married Barbara Page.

Dick's doctoral research at Berkeley focused on several insectivorous bird species, especially the blue-gray gnatcatcher. He sought to define the ecological niche of its local population and to compare critical niche dimensions with those of other insect-feeding species, revealing often subtle differences in foraging behavior that permit coexistence of several apparent competitors in the same habitats. The primary publication from his doctoral work on the bluegray gnatcatcher marked the first in a series of distinguished research papers. It is particularly well known for introducing the concept of the ecological "guild" – "a group of species that exploits the same class of environmental resources in a similar way" (such as the foliage-gleaning guild of birds he studied). This has become such a foundational concept in ecology that few remember its origins.

Moving into the Entomology department at Cornell meant switching his research focus from birds to insects. Dick recognized and developed the extraordinary potential of agricultural systems for elucidating ecological principles, and focused on insect-plant interactions for the

duration of his long and productive career. Although based in Entomology, Dick became affiliated with the new Section of Ecology and Systematics in the Division of Biological Sciences, which was founded at Cornell not long after his arrival. Even when just a joint appointee in Ecology and Systematics, with a base in Entomology, Dick was one of the most important influences on shaping the direction of that department, and he became among the most visible icons of Ecology and Systematics, inside and outside of Cornell. It would have been impossible then to think of Ecology and Systematics at Cornell without Dick Root, and it is not much easier now.

Dick spent his first years at Cornell studying the insect fauna of human food plants, especially crucifers such as cultivated collards. He was primarily interested in discovering how the trophic structure and abundance of arthropod species are organized, how they depend on plant density, proximity to plants of other species, and more generally how such "component" ecological communities, as he referred to them, are organized in space and time. The most notable paper to come from this work was his 1973 paper in Ecological Monographs, "The organization of a plant-arthropod association in simple and diverse habitats: The fauna of collards, *Brassica oleracea.*" In this paper Dick introduced the "Resource Concentration Hypothesis:" specialized insect herbivores are more likely to find and accumulate on acceptable host plants that are concentrated than on those that are dispersed among diverse vegetation.

Subsequently Dick took up goldenrods (genus Solidago) and their insect fauna and continued to work on different aspects of this native system, so common throughout upstate New York, until he retired. Themes that ran through this work include the use of powerful field experiments to elucidate underlying factors and relationships, the emergence of important conceptual advances in the resulting publications, studies of unusual duration, and extensive, well conceived field work with its attendant dedication to natural history observations and copious field notes. Two hallmark studies of the goldenrod work were the mowed grid in which the experimental removal of insect herbivores from the dominant meadow goldenrods caused a dramatic shift in plant species relationships, and the Cayuga Survey in which standard sampling of the goldenrod insect fauna from the same 16 sites over many years allowed a nuanced assessment of the degree of organization of a complex, native community and how it varied over space and time. He also gave his research an international dimension, spending a study year with his family in Cali, Colombia, under the sponsorship of the Rockefeller Foundation, studying milkweeds and their associated fauna. Dick's scientific papers were widely read and cited by others. Both the gnatcatcher and the collard fauna papers have been cited well over 1000 times.

Early in his career at Cornell Dick began a relationship with Archbold Biological Station in Florida that flourished for decades, to their mutual benefit. Dick developed a graduate field course at Archbold where students honed field skills and did research projects, and left with fond memories of Dick, the place, and their class experiences. Dick also conducted research projects there and was on its Scientific Advisory Board (member, chair) and Board of Trustees, helping bring science into its decision-making. Dick loved Archbold—the species and habitats, the scientific staff, and the institution—and he thrived on playing a role in keeping it a healthy, vibrant institution.
One of Dick's great loves was the Ecological Society of America.

He served the Ecological Society as its President (1985-6) and as an Editor of its journals (*Ecology*, 1971-3; *Ecological Monographs*, 1970-3; *Ecological Applications*, 1988-1992). He was honored with its Eminent Ecologist Award in 2003 and the Eugene P. Odum Award in 2004.

Dick was an accomplished mentor of graduate students. His wide ranging interests were reflected in graduate students who worked in fields such as agricultural ecology, plant demography, mathematical modeling, avian ecology, animal behavior, and the history of science in addition to insect ecology. The Root lab was a spirited group, typically with 4-6 graduate students at any time, resulting in 40 obtaining degrees, mostly Ph.D. degrees, over the years. Many of those former students now hold distinguished positions primarily in academic and nonprofit sectors.

Dick experienced a gradual decline in mental and physical abilities during the last decade of his life. Although sad to witness and often frustrating to Dick, the decline, especially in the early years, progressed slowly so that he continued to enjoy life. Hobbies and interests included art, running, travel, observing nature on a piece of land he owned in the region, nature walks, and meditation. Dick's entire family lived nearby, making it easy to also spend time with them. While Dick's life became simpler and slower in his last years, he insisted on remaining active, and Barbara Page, his wife, supported and comforted him, while ever enjoying his company. He continued to go to Cornell regularly, stayed interested in science, and travelled while he could. One marveled at how committed he remained under difficult circumstances. For example, during weekly lunch meetings at Cornell with Marks, Dick would comment on an interesting paper he had read and summarize its findings. Or he would describe a lecture or a colleague's lab meeting he had attended, and here too he could recount the main points. On a trip to Pennsylvania with Marks, Dick had a grand time visiting several field sites with local expert and former student, Carol Loeffler, and then enjoyed touring the Gettysburg battle sites. On trips like this, Dick occasionally got confused or needed help doing things; but for the most part he enjoyed himself and was a good travel companion. Dick had a wonderful sense of humor and this remained, in somewhat muted form, to the end. This served him especially well when he sometimes enjoyed a good laugh after realizing that something he had just said made no sense. Also to his credit, Dick was never bitter or angry about his condition during the years of decline.

Finally one couldn't help but notice Dick's wonderful sense of style, quality, and beauty, evident in the clothes he wore, his offices at Cornell and at home, the gear he packed for a field outing, and even in his field notes (both appearance and content). He "paid attention" in the Buddhist tradition he so greatly admired, and he was a big man, physically and figuratively—not in the sense of dominating others, but rather in his obvious, enthusiastic engagement with whatever occupied him at the time.

Dick Root is survived by his loving wife, Barbara Page, his ex-wife, Betsy, two children, two stepchildren through his marriage to Barbara, eight grandchildren and step-grandchildren, and three greatgrandchildren. He will be missed by friends, family, and colleagues alike.

Peter L. Marks, Chairperson; Paul P. Feeny, Harry W. Greene

Our piece used material from: "Resolution of respect: Dick Root, 1936-2013;" Bulletin of the Ecological Society of America, July 2013, pp. 210-215, by Simon A. Levin, Peter L. Marks, and Robert T. Paine