Jerrold Meinwald

January 16, 1927 – April 23, 2018

Jerrold (Jerry) Meinwald died in Ithaca, New York, on April 23, 2018 of cancer. He was the Goldwin Smith Professor Emeritus of Chemistry & Chemical Biology at Cornell. A member of the American Academy of Arts & Sciences, the U.S. National Academy of Sciences and the American Philosophical Society, Jerry made numerous seminal contributions to organic chemistry spanning physical and mechanistic organic chemistry to synthetic and analytical techniques, but he was perhaps best known as one of the two founders (along with the late Thomas Eisner) of the modern discipline of chemical ecology. Jerry's research over the past sixty years had a profound impact on that field. By elucidating the structures and functions of messenger molecules, Jerry Meinwald brought understanding at the molecular level to the workings of nature.

Born in New York City to Sophie and Herman Meinwald, Jerry developed a passion for chemistry as a boy after reading a biochemistry textbook on the beach together with his good friend, Michael Cava. Soon the two were producing homemade fireworks displays for their neighbors, and began performing experiments in a home laboratory, acquiring the necessary chemicals from drug stores and supply houses. The instructions for their syntheses were copied by hand from books and journals at the New York Public Library. Jerry graduated from Stuyvesant High School, and briefly attended Brooklyn College and Queens College. During 1945-1946 he served as an electronics technician in the US Navy, then earned a Ph.B. (1947) and B.S. (1948) in Chemistry at the University of Chicago. At Harvard University he completed M.A. (1950) and Ph.D. (1952) degrees, working with R.B. Woodward. Jerry joined the Cornell faculty in 1952 and spent most of his subsequent career in Ithaca. He was named Goldwin Smith Professor of Chemistry (1980-2005) and held the Andrew Mellon Foundation Professorship (1993-95).

It is difficult to overstate the impact of Meinwald's work in the field of chemical ecology, since as one of its earliest practitioners, he set the standards of excellence by which others in the field are judged. By focusing on biotic interactions and their mediating molecules–on the signals of

courtship, defense, and parental maintenance–Jerry (along with the late Tom Eisner) established beyond any doubt that chemical signals contribute to almost any type of communication in nature. Through discoveries that have become landmarks, he has elucidated the intricacies of countless natural interactions, both mutualistic and antagonistic, involving insects and plants, the dominant life forms on land. Acutely aware of the long-range implications of species loss, he and Tom Eisner argued persuasively, through their extensive publications and lectures worldwide, for the preservation of nature and the chemical capital it provides.

Jerry's first major plant-related chemical discovery was to establish the structure of nepetalactone, the component in "catnip" that attracts and intrigues cats. Returning to plants again years later in a spectacular study of the chemistry of lepidopteran courtship, Jerry showed how female moths used compounds from a plant dietary source to screen for the fittest male sexual partners.

In essence, the female tiger moth, *Utetheisa ornatrix*, emits a mixture of C_{18} trienes and tetraenes that attracts males from a distance. A courting male then signals the female at close range with a pheromone biosynthesized from a pyrrolizidine alkaloid that the male has sequestered from his plant diet.

Females avoid mating with males that don't provide this chemical cue. However, males emanating the appropriate alkaloid-derived perfume are accepted and allowed to transmit to the female a large spermatophore (up to 10% of their body weight!) containing not only sperm, but also a heavy dose of pyrrolizidine alkaloid, which is toxic to most animals, but not *Utetheisa ornatrix*. Some of the alkaloid is retained by the female and some is incorporated into her fertilized eggs, rendering the female and her eggs unpalatable to predators and parasites.

Not only did Jerry's research elucidate for the first time the structure of a male-produced pheromone, but it also revealed the pheromone's origin from a plant alkaloid, and uncovered its role in guiding female sexual selection. This study constitutes the first example of sexual selection based on a *chemical* criterion for male "fitness."

Jerry Meinwald's work was widely recognized across the world. He was elected to the National Academy of Sciences (1969), the American Academy of Arts and Sciences (1970, serving as secretary from 2005-2016), and the American Philosophical Society (1987). He was an Alfred P. Sloan Foundation Fellow (1958-62) and twice a John Simon Guggenheim Foundation Fellow (1960-61 and 1976-77). He received an honorary Ph.D. from the University of Göteborg (1989). His awards include the Tyler Prize in Environmental Achievement (1990), the Heyrovsky Medal of the Academy of Sciences of the Czech Republic (1996), the American Chemical Society's Roger Adams Award in Organic Chemistry (2005), the Grand Prix de la Fondation de la Maison de la Chimie (2006), the Benjamin Franklin Medal in Chemistry (2013), and the Nakanishi Award of the Chemical Society of Japan (2014). In 2014, President Obama presented him the 2012 National Medal of Science.

During his long career at Cornell, Jerry trained generations of chemists, including many leading researchers in both organic chemistry and chemical ecology. He published over 400 journal articles with some 200 collaborators. In the early 1970s, he was a founding Research Director of

the International Center for Insect Physiology and Ecology headquartered in Nairobi, Kenya.

Examples of organic chemistry playing an unexpectedly important role in the world of nature made intriguing stories for a general lecture audience. With his extraordinary ability to excite and educate diverse audiences about chemistry, Jerry was always in demand as a lecturer. Jerry presented more invited general talks (five) at the American Chemical Society's *National Organic Symposia* than any other scientist.

Jerry Meinwald was also a superbly gifted teacher, and taught Cornell's legendary "Introduction to Organic Chemistry" (Chem 3570/3580) for many years. He went on to create the highly innovative course, "The Language of Chemistry," which helped many hundreds of nonscientist Cornell undergraduates meet their science requirement while learning a significant amount of contemporary organic chemistry. Educating nonscientists was important to Jerry; he strove to boost scientific literacy among non-science majors at the college and university level. In 2010 he co-headed an *American Academy of Arts and Sciences* study of "Science in the Liberal Arts Curriculum," which was aimed at examining what science requirements our institutions of higher learning have established for their non-science majors, why they have these requirements, whether those requirements actually produced the desired results, and whether current curricula might be modernized and strengthened to produce a more science-literate citizenry.

Jerry was a talented flutist. He studied flute with Arthur Lora, James Pappoutsakis, and Marcel Moyse. Throughout his life he enjoyed playing music with (and for) colleagues, friends, and family members, often with his wife Charlotte Greenspan at the keyboard. And there was hardly a scientific meeting he organized that did not feature a live music component, often with himself as one of the contributors. One of his friends recounts traveling with him when a flight to a chemical meeting was (typically) delayed. He sat down in the midst of an impatient crowd, took out his flute and started playing, to the delight of the people around him. He and his wife were present at, it seems, every Cornell musical event; Jerry truly loved music. Another thing that gave pleasure to Jerry and the people around him was food. He was an excellent cook. The dinner parties he prepared are warmly remembered by the guests who attended them. He was also sought out by friends and colleagues for recommendations for restaurants in cities around the world.

Meinwald is survived by Charlotte Greenspan, his wife of 37 years; their daughter, Julia; and Constance and Pamela, daughters of his first marriage. He is also survived by his first wife, Yvonne Chu, who was his earliest long-term chemical collaborator.

To everyone, not just his colleagues, Jerry was a sweet man. It is impossible to think of him without a smile. And that is how we will remember him.

Written by Frank Schroeder (chair), Bruce Ganem and Roald Hoffmann