In Memoriam
Vaughan H. Shoemaker
1938 - 1999 Professor Emeritus of Zoology

Vaughan H. Shoemaker, Professor of Zoology Emeritus, died unexpectedly at his home in Redlands, California on 22 July 1999. He was sixty-one years old. He is survived by his wife, Mary Anne Baker, his daughters Lynne and Margaret, his sister Anne, and his father Hurst. Vaughan was the quintessential university professor and colleague, respected and revered by all who knew him, and his passing has left a deep void in all of us. Vaughan was born in Chicago, Illinois, on April 4, 1938. He was raised in an academic family; his father was an ichthyologist on the faculty of the University of Illinois, Urbana-Champaign. Vaughan graduated from Earlham College in 1959, with honors in Biology and Chemistry. He received his graduate degrees at the University of Michigan: M.A. in Zoology (1960) and Ph.D. in Zoology (1964). After a year as Instructor in the Department of Zoology at the University of Michigan, Vaughan came to UCR in 1965 and devoted his entire academic career to this institution. Vaughan was a true comparative physiologist. His research career was largely devoted to studying the physiological bases of animal adaptation to environmental extremes, an outgrowth of his doctoral research at Michigan. Although his thesis was on amphibians, he worked on a variety of vertebrates, beginning with studies on reptiles and mammals as a part of his research during a year spent in Western Australia while still a graduate student. His laboratory findings were anchored by field studies in North America and augmented by sabbaticals that took him to South America, Australia and Africa. He was in his element, however, when at the bench in his laboratory, especially when designing elegantly simple ways of making measurements with the most basic tools. He once requested money from the Dean for a new piece of equipment for his research with his primary argument being that otherwise his laboratory would not have a single instrument with a digital read-out. His request was approved. The early focus of Vaughan’s research was on water and ion balance, with particular emphasis on amphibians. He later became more interested in how arboreal amphibians deal with the heat load associated with their terrestrial habitats. At the time of his death he was preparing a talk on the role of the skin in thermoregulation in amphibians for the Fifth International Congress of Comparative Physiology and Biochemistry (Calgary, Canada).

Among his many contributions, two stand out for special note both involving adaptations of frogs living in dry habitats. His studies on a South American tree frog, *Phyllomedusa sauvagei*, uncovered novel adaptations for living in a terrestrial environment. In addition to their ability to eliminate nitrogenous wastes as uric acid (a water-conserving strategy that is not a common ability in amphibians) these frogs have modified integumental glands capable of secreting a waxy covering to the skin to prevent water loss in dry air. The frogs have a complex behavioral repertoire to spread the wax over their bodies as it is secreted. At very high temperatures, however, the importance of water conservation is over-ridden by the necessity for evaporative cooling the waxy material melts and the integument allows water loss with concomitant cooling. Vaughan’s studies on an African frog, *Chiromantis*, also concerned temperature balance in hot environments. In these African frogs, the dermis contains pigment granules capable of
changing the coloration, and thus the reflectivity, of the skin. Frogs at low body temperature are capable of solar absorption; those at high body temperature are capable of solar reflectance. Vaughan and his colleagues documented these changes with precise field measurements using remote telemetry to understand the physiological aspects of this behavior in an ecological context. Vaughan enjoyed teaching immensely. He mentored eleven Ph.D. students and taught countless undergraduates in his various courses in introductory biology as well as in courses in cell and animal physiology. His lectures were models of precision in expression and he had a wonderful rapport with his students. Vaughan’s hallmark course, however, was a little one, a laboratory course in animal physiology with never more than a handful of students. Students worked in pairs, each pair with the simplest of tools designing different experiments to investigate various physiological systems. Vaughan and his teaching assistant spent the entire time rushing around the room keeping track of six or so different experiments. At the next session the students reported their results to the entire class, and at the end of the quarter (and after several written laboratory reports) they were rewarded with one unit of academic credit. The roll book for that class over the years reads as a veritable who’s who of comparative physiologists throughout the universities and colleges of the country. Not surprisingly, several scholars to have shared the podium with him at Calgary were alumni of that course. Vaughan’s judgement and wisdom was widely respected by his colleagues; few of us ever made substantive academic decisions without his consultation. He served as chair of the Department of Biology from 1982 to 1988. He accepted appointment as Associate Dean, College of Natural and Agricultural Sciences from 1996 until his retirement in 1998, largely as a consequence of his commitment to the concept of an interdepartmental undergraduate major in the Biological Sciences. Indeed, he remained administratively involved as chair of that program until his death.

Vaughan was a man of subtle, yet mischievous, wit, great patience, and profound humaneness. For many of us, our fondest memories of Vaughan will be those wonderful times at the Commons, where we shared lunch, the obligatory double espresso, and free-ranging conversations about kids, students, science, university politics, sports, and any of a hundred other topics. We will especially remember the sparkle in Vaughan’s eyes when the topic of the moment turned to the estimation of numbers \( \nu \) either vastly large or vanishingly small. Suppose you took a cup of water, with every molecule uniformly labeled, allowed it to mix freely in the world’s oceans and sampled again another cup \( \nu \) How many molecules would be marked? If you lined up a mole of marbles from the earth to the moon, how far apart would be their centers? Whenever such a question was posed, pencils flew to the backs of napkins, conversion factors were dredged from our collective memories, exponents flew back and forth and small numbers crashed against large numbers until an answer was finally agreed upon.

In some fundamentally satisfying way, those astonishingly large numbers pointed to the interconnectedness of all things, while the infinitesimally small numbers reaffirmed the importance of the individual.

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