

Obituary

A tribute to Peter William Hochachka, OC, PhD, LL.D, FRSC

Killam Professor of Zoology at the University of British Columbia

9 March 1937 to 16 September 2002



Per F. Scholander, one of the founders and giants of comparative physiology, titled his autobiography '*Enjoying a Life in Science*'. I can think of no better phrase to describe the career of another giant of our field, Peter Hochachka, who died of cancer at age 65 on September 16th, 2002. For over three decades, Peter was the continuously ebullient catalyst of our field. He stimulated us with his creative insights into the mechanisms of adaptation to the environment and he encouraged us to enjoy the pleasures that exploration — intellectual and geographical — of the natural world had to offer. Like Per Scholander and a handful of other great figures in comparative physiology, Peter showed the intellectual and hedonistic merits of combining field and laboratory work in a creative manner. Such an approach to biology can lead to critical new insights into the mechanisms that enable organisms to perform their tasks in widely different habitats

and into how these adaptive mechanisms are fabricated during evolution. The field plus laboratory focus also keeps biologists working in the 'real world', where the abundance of different types of organisms allows one to address important questions that narrowly focused studies of so-called 'model' organisms cannot approach.

Peter's curiosity about nature was unbounded in both taxonomic and geographic senses. His study subjects included deep-sea fishes, Antarctic seals, Amazon fishes, squid, salmon, shrews, race horses, turtles and high-altitude-adapted members of our own species. And, of major importance for those of us who had the honor and pleasure of having him as our mentor, his curiosity was highly infectious. The forty-two graduate students he mentored and the large number of postdoctoral scholars and visitors who arrived at his laboratory from all over the world lived in a research environment that tended to bring out one's best, scientifically and personally. Whether the research site happened to be Peter's laboratory at the University of British Columbia, where he enjoyed a 36-year career, on a ship off the Galapagos Islands or on the Amazon River, in a shack on a mountainside in the Andes, or in a small hut on the Antarctic ice, the working environment had the special qualities that made research under Peter's tutelage so unique. What were these qualities? In a classic study, the sociologist of science Robert Merton sought to determine what accounted for the fact that a disproportionate fraction of distinguished scholars in a field cut their scientific teeth in a very small number of laboratories. Merton discovered that the key feature of these distinguished mentors was not hands-on instruction in technique or continual over-the-shoulder inspection of the student's progress. Rather, it was the intellectual atmosphere — the 'bright ambience' to quote Merton — of these special laboratories that attracted the best young scholars and led so effectively to their intellectual growth. All who experienced the atmosphere of Peter's laboratory would agree that Merton was right on target in his analysis of what makes a lab a great learning environment. We were always encouraged to engage in a sort of intellectual play, where novel conjectures could be tested and new species brought into study. Rather than engage in work on sure-things — the 'collection of stamps' — we were challenged to do something new, even if it meant taking some intellectual risks in the process. Moreover, Peter's encouragement for his associates to be creative and productive came with the clear message to be an open and interactive person willing to share

excitement and data with others. He was a role model in showing us how to conceive and do science and how to work most effectively and honestly with one's peers.

Peter was also a master of communication, whether at the podium or the word processor. His participation in scientific meetings was legendary. He seemed to be present whenever and wherever an exciting meeting on comparative physiology was held. The correlation here certainly suggests an underlying cause-effect linkage: Peter's activities at meetings, whether in presenting one of his multi-screen plenary lectures, in asking insightful questions after a talk or in discussing physiological issues over beers into the wee small hours of the next morning, provided the type of stimulating give-and-take that can make science so exciting. The impact of his publications was — and continues to be — enormous. This impact cannot adequately be measured only in terms of raw numbers of publications (about 400 papers and seven books). Rather, the impact of his writing must be seen especially in terms of how he has set the directions and raised the challenges for many sub-disciplines within comparative physiology. Peter was a master of writing a provocative theoretical paper in which a novel hypothesis was presented to the community, effectively challenging his peers to see if this bright idea had merit. It usually did — and it usually set into motion research programs in many other laboratories!

Taking the broadest possible view of Peter's contributions to comparative and evolutionary physiology, I think it's fair to say that he gave life, excitement, and relevance to the 'metabolic map'. Each of us who has taken a class in biochemistry has had to confront the complex and often bewildering inter-linked chains of chemical transformations that constitute 'metabolism'. It is common for these reactions to be presented as an abstract 'map' that entirely lacks signposts to give information about just who is carrying out these reactions and under what circumstances various functions are or are not needed. Peter's studies of metabolism provided unique insights into the ways that a relatively common set of metabolic reactions, such as those providing the ATP needed to do cellular work, could be modified adaptively to give organisms the ability to work under a vast array of environmental conditions, notably those of limiting oxygen availability. These metabolic studies taught us how invertebrates withstand exposure to low tides, how migrating salmon shuttle their energy resources to keep the locomotory muscles functioning, how seals manage to spend considerable periods of time in breath-hold diving beneath the ice, how goldfish survive hypoxia by producing ethanol, how training

shapes muscle function, how — and why — metabolism varies as it does with body size, and how humans in the Andes and Himalayas have adapted to the hypoxic stress found at high altitude. His creativity in coining questions was paired with an ability to learn and adapt whatever technologies were needed to find the answers he sought. He moved easily between *in vitro* biochemistry, field studies in extreme environments, and whole animal magnetic resonance spectroscopy.

The achievements Peter made in science brought him many rewards. He won a Guggenheim Fellowship, a Killam Research Prize, a Science Council Gold Medal, the NSERC Gold Medal for Science and Engineering, The Fry Medal of the Canadian Society of Zoologists and the Canada Council/Killam Memorial Prize. He was a Fellow of the Royal Society of Canada and was awarded the Order of Canada in 2000. The latter is approximately the Canadian equivalent of British Knighthood, but I doubt that any of us would have felt it appropriate to address our friend and colleague formally as 'Sir Peter'! He will receive posthumously the Commemorative Medal for the Golden Jubilee of Her Majesty Queen Elizabeth II.

In a moving letter written to his academic offspring a few days before he died, Peter not only re-affirmed his joy in having had such a wonderful career, but also offered us well-considered advice about our science: "*Don't 'collect stamps' in doing comparative work, don't worship technology for its own sake, and keep the organism and its environmental relationships squarely in focus*". If contemporary philosophy can be described as penning 'footnotes to Plato', much of what we do in comparative physiology can be seen as creating 'footnotes to Peter'. His creative impact will be with us for decades. Suffice to say that he figuratively and literally 'wrote the book' of biochemical adaptation.

At the final research conference that Peter was involved in organizing, one sponsored by the Company of Biologists and held at Dunsmuir Lodge in Canada shortly before his death, a final evening of tributes to him ended just as the Aurora Borealis began brilliantly to light up the dark northern sky. What a fitting way for the nature he so loved to study to applaud the 'bright ambience' that characterized this wonderful man's life and work. His research accomplishments and his personal example of how to conduct science will continue to serve as a powerful beacon to light the path of future research in our field.

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