

Editorial

The late Peter Hochachka was best known as a world leader in the field of biochemical adaptation — ‘how molecules make organisms work best within their own specific environmental conditions’ is the way that a *Science* review of one of his recent books described his research area. Perhaps because a major part of his work focused on defense adaptations against limiting oxygen (where he was the unchallenged world leader for some three decades), he recognized early on the implications for areas far beyond his own disciplinary boundaries. He facilitated important and stimulating back-and-forth interactions between pure and applied (mainly clinical) research fields and became one of the world’s theoreticians on hypoxia defense mechanisms. Within his own university community, recognition of his awe-inspiring inter-disciplinary method led to cross appointments into the Division of Sports Medicine, the Department of Radiology, the Brain Research Center and the Prostate Center at Vancouver General Hospital. Indeed, he is probably the only scientist on earth to have written a seminal paper on the hypoxia connection in prostate cancer with co-authors that included surgeons involved in his own prostate cancer therapy! This is a quintessential example of the two-way communications between science and technology that Peter had the magic to facilitate.

I was one of many young undergraduates in the early 1970s who were weaned on Peter Hochachka and George Somero’s first book ‘*Strategies of Biochemical Adaptation*’. Until reading that book, biochemistry to me was a dim and dismal affair, set in stone to memorize, in a whole host of unmemorable textbooks. Then came ‘*Strategies*’, breathing life into a subject I had all but given up on. Suddenly, biochemistry became a dynamic subject: it was revealed how enzymes and their isoforms could be tailor-made to enable animals to cope with environmental extremes of temperature, pressure and oxygen availability. It also revealed how these enzymes could be differentially expressed in the course of one’s lifetime as well as in an evolutionary time frame. These early insights in evolutionary adaptation provided a theoretical framework within which adaptational biology could grow and flourish. Hochachka’s gift was to see connections that others could not, to seamlessly integrate seemingly unrelated areas into a cohesive whole. He was both theoretician and empiricist, whose stature in the scientific community is best witnessed by

the breadth of those that read him. Clinicians read him to understand more about the cellular basis of renal failure, stroke and heart disease, researchers in sports medicine to see what sets the limits on elite performance, and zoologists to understand how biochemical adaptations arising through evolutionary history separate the tortoise from the hare.

Peter Hochachka’s laboratory was guided by the August Krogh principle where for almost every problem there is an animal upon which it can be most conveniently studied. Over the years, various aspects of metabolic adaptation to limiting O₂ availability were dutifully explored with marine invertebrates, hypoxia-tolerant fishes, diving turtles, marine mammals, especially the Antarctic Weddell seal, and humans, especially high-altitude-adapted natives. Various aspects of exercise adaptations were contemporaneously explored using fishes, seals, greyhounds, thoroughbreds, llamas, hummingbirds, rats, moles, shrews and humans. The Hochachka philosophy was to adapt technology to the problem rather than to apply a single kind of technology to a variety of animals.

The idea for this Review Volume arose out of a conversation I had with Peter Hochachka in the autumn of 2000. I had just read his 1999 review article entitled ‘*The metabolic implications of intracellular circulation*’ (*Proc. Natl. Acad. Sci. USA* 96, 12233-12239) and asked him if he felt it might be timely to produce a JEB Review Volume dedicated to this theme. He took up the challenge with his usual blend of good humour and unbridled enthusiasm. Within six months of that conversation, I received his ‘Mark 1’ list of prospective authors and topics under the title ‘*Roles of Intracellular Movement and Intracellular Structure in Metabolic Regulation*’. By that time, we had also recruited our colleague Peter Lutz into the fray. With few exceptions, all of the people we initially contacted were quick to respond in the affirmative and if they did not they got a call from P.W.H. who pointed out the error of their ways! The range of authors and topics herein highlights the breadth and scope of Peter Hochachka and his vision of where the future lies in the study of metabolic regulation.

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