

PREFACE

Although interests and passions for studying an organism may make biology exciting, it is the question that makes us scientists. As a freshman in college, I remember not knowing exactly where a bachelor's degree in biology would take me. As a first-generation college student my greatest aspiration, an admirable one at that, was to become a high school science and math educator. That aspiration changed upon meeting a professor who not only changed how I would think about biology, but my life-long career path. For those of you who know me well, you also know this individual, Dr. Howard K. Reinert. I'm sure most of us can offer stories and accounts of how one person in our educational path made a dramatic difference in how we think and where we would finally end up. For me, the study of biology came "alive" one March weekend in 1985 when my work-study hours of cleaning dirty microbiology test tubes became an opportunity to radio-track timber rattlesnakes in the New Jersey Pine Barrens. I guess as a freshman, naivety had the best of me for I thought only the *Marlin Perkins* and the *Jacques Cousteaus* of the world got to do things this cool and exciting.

By the time I became a senior, I had shed some of this naivety — just some — as I learned about experimental design and conducted a senior research thesis to begin embarking on this idea of becoming a scientist. A presentation at the joint herpetology meetings at the University of Michigan and my first publication in *Herpetologica* created such a passion for investigative science that it steered me toward graduate studies with Richard A. Seigel and later with Victor H. Hutchison. Throughout my graduate career I was often asked to reflect upon my opening point; although the study of timber rattlesnakes made biology come "alive" for me, this is simply not enough as my mentors (Howard, Rich, and Vic) instilled the importance of hypotheses and the ability to ask the right questions. Interests and passions for the beast may create excitement and motivation in science, but addressing hypotheses, questions, and theories make the scientist.

Today, herpetology is much more than taxonomy. It is an integrative science where scientists use amphibians and reptiles and this breadth of taxonomic diversity to ask the most interesting and novel questions. I often wonder if herpetology as an integrative science would have appreciated a much earlier start if not for the powerful influences of Carolus Linnaeus. Some of you may remember Linnaeus's passage (1758) presented in Kenneth R. Porter's 1972 herpetology text (p. 2; Porter, KR. 1972. Herpetology. Saunders Pub. Co., Philadelphia, Pennsylvania. 524 Pp.):

These foul and loathsome animals are distinguished by a heart with a single ventricle and a single auricle, doubtful lungs and a double penis. Most amphibians...

("amphibia" included amphibians, reptiles, and cartilaginous fishes) ...are abhorrent because of their cold body, pale colour, cartilaginous skeleton, filthy skin, fierce aspect, calculating eyes, offensive smell, harsh voice, squalid habitation, and terrible venom: and so their Creator has not exerted his power to create many of them.

Was it the influence of Linnaeus that discouraged biologists from fully exploring reptilian biology? For 150 years after, from the time of Linnaeus through the 19th century, herpetology was mostly a descriptive science and consisted of only alpha taxonomy (Porter 1972); most likely due to limited interest among scientists to work on this group. My mentors remember discussions of the stigma that still lingered even in the 1960s, 70s, and 80s where "real" experimental science required the use of "real" vertebrate models such as mammals and birds. Outstanding research and the advancement of science was indeed a part of herpetology, just not fully appreciated by the general scientific community. The now integrative field of experimental herpetology hails from the history and efforts of countless talented research scientists. Their contributions have graced the pages of *Science*, *Nature*, *American Naturalist*, *Ecology*, *Evolution*, (as well as other prestigious peer-reviewed journals) and have helped the scientific community fully recognize the utility and significance of amphibians and reptiles as experimental models in science.

As we illustrate in the research programs showcased in this book, reptiles undoubtedly serve a major role in investigative science. The spirit of the August Krogh Principle, *For a large number of problems, there will be some animal of choice on which it can be most conveniently studied* (Krogh, A. 1929. The progress of physiology. *Science* 70:200–204), is often acknowledged as an essential part of experimental design and investigation. Past generations of scientists have used this principle in establishing common experimental models that include the laboratory mouse (*Mus musculus*; common house mouse) and rat (*Rattus norvegicus*; brown rat), the African clawed frog (*Xenopus laevis*), the zebra fish (*Danio rerio*), the fruit fly (*Drosophila melanogaster*), the green alga (*Chlamydomonas reinhardtii*), the bacterium (*Escherichia coli*), and even the human (*Homo sapiens*) with a cell line derived from a cancer that ultimately took the life of Ms. Henrietta Lacks on October 4th, 1951.

Although the utility of these models is most certain, their utility is often limited to the purposes of studying processes for the sake of understanding the process itself (e.g. cell signaling mechanisms) or for advancing treatments and care in the human health industry. I might add, for some scientists, these experimental models hold little interest other than a means for answering a question far removed from the ecology and evolution that has "shaped" the organism in the first place. So what about my opening point that "hypotheses, questions, and theories make the scientist". For most of us "the question" is most important, but our model organisms are not just mere vehicles of methodology but "actors" on an ecological stage in an intricate evolutionary play, if I may take the liberty in paraphrasing the title of GE Hutchinson's book — *The Ecological Theater and the Evolutionary Play*. Here, the contributing authors of *Reptiles in Research* illustrate how our interests lie in the environment-organism interaction, so we are naturally drawn to model systems and not just model organisms. The passionate spirit of investigative science combined with the fascination of the organism naturally leads to an appreciation for (1) how good questions create opportunity to learn more about the organism, and for (2) how passion and study of the organism can create opportunity to address good questions.

I thank *Nova Science Publishers* for the opportunity to organize, direct, and edit this volume. I express my deepest appreciation to the contributing authors who have worked so hard in allowing us to bring together this showcase of *Reptiles in Research*. I truly realize that the success of such a volume ultimately rests on the talents and captivating research of the contributing scientists and our ability to bring our works together in a unified effort and theme — we feel that we have done just that. I thank Patrick T. Gregory for writing the *Foreword* to this book and sharing his perspectives and words of wisdom. His years of experience, as a senior research scientist in herpetology, give us an opportunity to reflect on his message for the importance of reptiles as experimental models in science. I also give my sincere thanks to Laurie J. Vitt, Emeritus Curator of Herpetology at the University of Oklahoma's Sam Noble Museum of Natural History, for providing and so generously allowing me to use several of his amazing photographs for this book.

Finally, I acknowledge a number of colleagues who have helped in the review of certain chapters and the content presented in this book: Carla L. Atkinson (University of Oklahoma), Richard L. Boyce (Northern Kentucky University), Patrick Cain (Indiana State University), Kristen Cecala (Davidson College), Tamara J. Cook (Sam Houston State University), William E. Cooper, Jr. (Indiana University - Purdue University), Natalie A. Clay (University of Oklahoma), Martha Crump (Utah State University), Jesse Czekanski-Moir (University of Oklahoma), Juan D. Daza (Villanova University), Richard D. Durtsche (Northern Kentucky University), Chad W. Hargrave (Sam Houston State University), Tom Jenssen (Virginia Tech), Madeleine Kern (Davidson College), Emily Khazan (University of Oklahoma), Margaret Lamont (U.S. Geological Survey), Deborah I. Lutterschmidt (Portland State University), Harvey B. Lillywhite (University of Florida), Tim Patton (Southeastern Oklahoma State University), Jake Pruett (Indiana State University), Christina Romagosa (Auburn University), and Coleman M. Sheehy III (University of Florida). We applaud their efforts and are most grateful for their willingness to help with the peer-review process. Without their unselfish dedication of expertise and time, such a volume would not have been possible.

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