Vitt, L. J. and J. P. Caldwell. 2014. **Herpetology: An Introductory Biology of Amphibians and Reptiles.** 4th edition. Academic Press. 776 pp.

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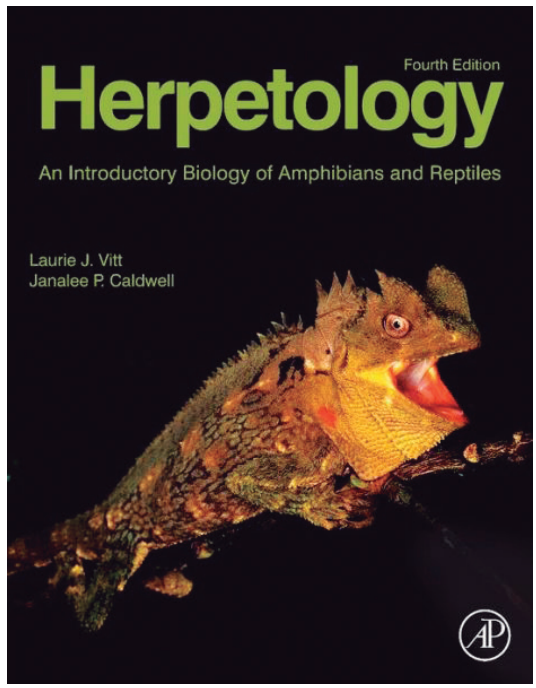

Herpetology as a field of study is anomalous in a number of ways. First of all, it is a taxonomically defined field which refers to a paraphyletic assemblage of tetrapod vertebrates. This reflects the history of the discipline, dating way back to the days when the distinction between amphibians and reptiles was not clearly understood, and through the more recent past, when no one thought to include birds among the reptiles. That the field persists is partly a practical matter. Reptiles and amphibians are often found in the same habitats. In the field, for example, they fall into the same pitfall traps as one another, and are encountered under the same turned-over logs. In captivity they require similar terrarium skills to maintain.

At a time when biologists are resisting taxonomically defined fields ("ologies") in general, finding that it makes more sense to define themselves as ecologists, physiologists and molecular systematists than as ornithologists or mammalogists, herpetology is a field which crosses disciplines. In the dedication of this new (4th) edition, the authors describe herpetology well as "a taxonomically delimited field that impacts all conceptual areas of the biological sciences".

This book is intended as a textbook for a graduate or advanced undergraduate course in herpetology. The current (4th) edition (2013) resembles the 3rd edition (2009), with the book divided into six parts: (1) evolutionary history, (2) Reproduction and reproductive modes, (3) Physiological ecology, (4) Behavioral ecology, (5) Ecology, biogeography and conservation biology, and (6) Classification and diversity. The 4th edition is longer than the 3rd (776 pages in the 4th edition versus 697 in the 3rd), reflecting that references have been added to all sections of the book to include new research up to and including 2012. Additional illustrations have been added throughout, and old ones improved with the addition of even more color than the earlier edition, because, as the authors point out in the introduction to the new edition, "color is so important in the lives of amphibians and reptiles".

A herpetology textbook presents a considerable challenge to its authors, who must keep up-to-date on changes not only to the classification of all amphibians and non-avian reptiles, a rapidly changing field, driven by progress in molecular systematics. They must at the same time be writing in parallel, other

sections of the book which amount to mini herp-focused textbooks on comparative anatomy, biogeography, physiology and ecology. With each new edition, the authors must synthesize each of these diverse fields, adding what is new and important and integrating it into what came before.

Vitt, a reptile ecologist interested in historical biogeography, and Caldwell, an amphibian behavioral ecologist are as well-qualified as any two authors could be to take on this challenge. That said, it is inevitable that some parts of the book are more successful than others, and equally inevitable that every other herpetologist who reads it will approach this book from their own areas of greater and lesser expertise. As a snake morphologist and systematist who teaches an undergraduate course in herpetology, my sense is that Parts II, III, IV, and V, collectively covering reproduction, physiology, ecology, biogeography and conservation, are the strongest sections. In Part I, the section on the fossil history of turtles has been updated to include new references as recent as 2010, yet the 2008 discovery of the fossil turtle, *Odontochelys*, older than *Proganochelys*, and providing real insight into the origin of the highly derived turtle body plan (Li *et al.* 2008), has somehow been overlooked.

Part VI, covers classification and diversity of amphibians and reptiles. The authors note in the introduction the impossibility of keeping these sections up to date given the extremely rapid rate of publication of new and changing phylogenies versus the relatively slow process involved in producing a printed textbook, and sensibly point the reader to refer to various online databases for the most up to the minute taxonomies. The stability of a textbook, though, means that a textbook can really help students of herpetology to see and understand the bigger picture, rather than being overwhelmed by fast-changing phylogenies with ever increasing numbers of groups to learn the names of. In my herpetology course, the two most difficult parts of the course to teach are (1) the anuran families and (2) the phylogeny of colubroid snakes. In both cases students tend to be overwhelmed by the large number of groups to learn, especially in the absence of any larger groupings supported by synapomorphies they can understand or morphological or biogeographical trends to help them make sense of the phylogenetic tree.

For example, in the 3rd edition, the tree of 45 anuran families was daunting, and I dealt with it in class by dividing it up into the basal (and paraphyletic) Archaeobatrachia versus the Neobatrachia clade, the latter then subdivided into the Ranoidea (distribution of families worldwide or old world) and Bufonoidea (distribution of families worldwide or neo-tropical). There are 49 families in the tree of anurans in the 4th edition. I am pleased to see some labeling of larger clades (e.g. Anomocoela, Nobleobatrachia), though there is little explanation of what shared characteristics unite these clades beyond that this is the branching order represents the latest molecular phylogeny. The use of color to add a geological timescale to this and other phylogenies in the book is a helpful addition. The format of the taxonomic accounts in Part VI is a write up for each family providing often quite detailed information on morphological characters, for example, and it would be especially helpful in future editions to see this type of information better integrated into the phylogeny diagram and into the "Overview" section which provides background and historical context for each order, particularly in groups with large numbers of families, where students may otherwise fail to see the patterns and morphological trends.

The taxonomy of colubroid snakes present the other great challenge in teaching herpetology, for a number of reasons. The Colubroidea include more than 2/3 of snake species, including a number of well-defined lineages (e.g. the front-fanged venomous clades Elapidae and Viperidae) surrounded by a paraphyletic underbrush formerly known as Colubridae. In recent years well-defined lineages are starting to be discernable within this assemblage (e.g.,

Psammophiinae, Natricinae, Colubrinae etc.) though the branching order of these groups and the assignment of all species to them is still being sorted out. In recent years, understanding of the relationships among and delimitations of lineages within the Colubroidea has changed very rapidly and not in one consistent direction, with additional confusion resulting from taxonomists being too quick to assign names to higher taxa, and reusing identical or very similar names to mean different things (e.g., "Colubrinae", "Colubridae", both names used in different senses by different authors). Colubroid systematics does appear to be starting to stabilize, and hopefully we will see more recognition of that in the next edition. For this edition, the authors have chosen not yet to really take on the Colubroidea. As with the anurans, the snakes section is a part of the book in which it would be especially helpful to have the morphological details of the taxonomic accounts integrated into morphological trends that could be understood on the phylogeny of snake families. For example, great detail is given on the phylogenetic relationships among small groups of basal snakes, and information is provided in individual taxonomic accounts about limb vestiges and tracheal lungs. Integrating these into the phylogeny could help flesh out the narrative the branching diagram provides.

Instructors of herpetology courses who are considering whether or not to ask their students to buy this textbook, may have additional practical questions, which I will address in conclusion: is this herpetology textbook perfect? No, but it is very good. Is this the best herpetology textbook available? Yes. Will I use it in my one semester course for upper-level undergraduates? Yes, this book will challenge them and would certainly also be suitable for a graduate course. Is it worth having students buy the new (4th) edition over the 3rd? Yes, updates to the content and to the references cited and enhancement of illustrations are worth it. The price is reasonable compared to other biology textbooks, and I am thus able to justify having my herpetology students purchase this textbook and also have them buy the Powell *et al.* (2012) key for use in lab.

References

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