the obstetrician contemporary of Galen's (130–220 AD) who wrote about obstetrics [2,3].

Identification of a mutant gene is not enough. To produce a mutant phenotype, a mutated gene must have substantial effects on other genes and developmental processes. A mutation with such an obvious effect on a chicken as 'preventing feathers from forming' is almost certainly a mutation in an important signalling, regulatory or switch gene. Indeed, we cannot speak of 'a mutation…preventing feathers from forming', as this implies that the gene mutation is sufficient in and of itself. It is not. Leroi's approach is to describe the example from the past and then plug our current understanding of how human mutants with two heads or a tail or claws instead of fingers, come into being by taking us from the mutated gene to alterations in downstream molecular, cellular and development events.

Studying mutants has enormously influenced our understanding of how genes mutate and how abnormal mRNA or protein directs the organism away from normality. But it has also done much more. Entire fields of research have been founded on the discovery of a chance mutation. Take the development of arms, wings, legs and fins of fishes, frogs, birds and mammals as an example.

The many research papers about limb development trace their origin to two independent studies carried out 56 years ago. John Saunders [4] saw that a specialized ridge ran along the limb buds of chick embryos. Henamed it the apical ectodermal ridge (AER). When removed, the resulting limb was shorter than normal and parts of the skeleton were missing. The late Ed. Zwilling [5] examined a spontaneous mutant in a chicken flock. The chicken had no wings but otherwise was entirely normal. Young *wingless (wl)* mutant embryos had limb buds with an AER that then deteriorated. The resulting Saunders–Zwilling model of limb development founded the field of developmental skeletal biology [6,7]. The discovery that the AER signals to cells that form the skeleton (and vice versa) set the course for studies of the epithelial–mesenchymal interactions that are at the basis of the development of most tissues and organs of human bodies. Mutants are important.

Mutations of arms and legs feature prominently in Leroi's book: dwarfs (achondroplasia), giants (acromegaly), missing arms or legs (the thalidomide syndrome), extra fingers or toes (polydactyly), and much more. But so do mutations that result in albinos, piebalds, hermaphrodites or individuals with hair all over the body (hypertrichosis). And we learn about the variant ('mutant') molecules that mutated genes encode: the receptor for fibroblast growth factor and dwarfism; bone morphogenetic proteins and soft-tissue ossification; growth hormone and gigantism; testosterone and hermaphroditism, and much more. If your interests are in historical records of diverse abnormalities, in how genes produce such abnormalities and in how to integrate the two, then *Mutants* is an ideal read.

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Leapin' non-ophidian squamates!

Lizards: Windows to the Evolution of Diversity by Eric R. Pianka and Laurie J. Vitt. University of California Press, Organisms and Environments Series, 2003. US$45.00/£29.95 hbk (xiii 1 333 pages) ISBN 0 520 23401 4

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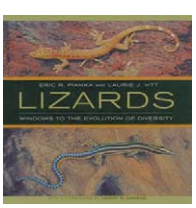

For too long, snakes have held the limelight. Snake biologists (or 'snake-grabbers', as we lizard biologists prefer to call them) have cynically exploited the public's unhealthy fascination with death-dealing serpents to advance their own dark and duplicitous agenda. No matter that most snakes are harmless little things that eat the occasional mouse. No matter that snakes are really just tubes with teeth. And no matter that snakes are, in fact, just one of several groups of limbless lizards. The snake-grabbers aren't telling. But well known ecologists Eric Pianka and Laurie Vitt are fighting back. In their ambitious new book, they put forth the case for lizards, arguing that these beautiful and astonishingly diverse reptiles are deservedly a central focus of biological research. 'What we have learned about lizards is applicable to nearly every conceptual area in modern biology…entire fields of

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biology had their origins in the study of lizards.' Snake-grabbers, be afraid. Be very afraid.

Lizards is a worthy companion to Harry Greene's landmark book about snakes [1]. It is part of the University of California's series on *Organisms and Environments* for which Greene serves as consulting editor. The two books are large format and size-matched, and look great together on the shelf – an important consideration for any serious library. More importantly, Pianka and Vitt's claim for the centrality of lizards in modern biological thought is not the empty boast of chauvinists. Indeed, lizards can lay claim to the overworked term 'model system' with greater legitimacy than most taxa, having contributed fundamentally to the fields of physiological, behavioral, population and community ecology, sociality, communication, and biogeography, to name a few [2–4].

Lizards is a wolf in sheep's clothing. Beautifully designed and lavishly illustrated, its large format, generous use of colour and esthetic appeal might trick readers into leaving the book on living-room tables ready to entertain bored visitors. But beneath its warm and fuzzy façade is a formidable set of weapons ready to engage the receptive mind. Voluminous text, incisive prose and frequent reference to tables, graphs and cladograms (many containing original data or syntheses) reveal it to be a scholarly book of the first order. This melding of coffee-table appeal and scholarly substance, one of the authors' stated goals, succeeds admirably.

The book is divided into three main sections: Lifestyles, Diversity and Synthesis. The first section ably introduces biological basics with reference to lizards, including evolutionary history, physiology, locomotion, predation, and so on. The diversity section provides a thorough treatment of all lizard families and, in some cases, subfamilies. Here, Pianka and Vitt really shine. Between the two of them, the authors have hands-on, field experience with most of the world's lizard fauna. The depth and breadth of this personal experience is directly manifested in single-authored, special topic boxes that use first-person narrative to relate personal experiences, insights and epiphanies. These sections are rich in biological detail, but also provide glimpses into the lives and minds of the authors. The subtext here is especially interesting and should be a focus of student attention, because it reveals something about the process of scientific pursuit, including the important roles that personality, experience, environment and serendipity play in the path to knowledge.

Throughout *Lizards*, Pianka and Vitt illuminate their subject with the light of history. This is especially evident where the authors present an overview of lizard evolution in a phylogenetic context. They argue that, by breaking free of ancestral constraints, autarchoglossans (skinks, lacertas, alligator lizards and their relatives) have added important new features to the lizard arsenal, such as advanced chemosensory capability and elevated activity, that enable them to outcompete iguanians and gekkotans wherever they overlap. These interactions have shaped evolutionary trajectories and structured modern-day squamate communities (driving geckos into the trees and into the night, for example). Although one might argue details, the reasoning is sound. The overview is presented through use of 'scenarios', as is appropriate for a general audience. For those seeking more data and falsifiable hypotheses, the authors have explicated their synthesis in a recent publication [5] (honesty compels me to point out my minor contribution to the latter). *Lizards* concludes with a chapter discussing the mostly negative (for lizards) interactions of lizards and humans, making the too-familiar case that this large, important and beautiful part of our natural heritage is staring into the abyss.

Lizards represents the combined personal experiences of two great herpetologists and their astonishing synthesis of a vast and varied literature. A 'must have' for herpetologists, this book deserves a far greater audience than that. Snake-grabbers might find it especially educational.

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