

such things as equation fitting, that I'd dismiss as trivial were they not so frequent in papers I review. Indeed, the precautionary admonitions for beginners in systematics, development, and physiology may be the most useful items in the book.

Especially effective is the gentle approach to allometry, something whose revelations too easily get bumped aside by the commonly non-intuitive nature of logarithms. A pointed example, mammalian eyeball size, where the scaling rule is itself scale-dependent, provides a needed reminder of lurking pitfalls. And nearly everywhere the biological stories are nicely chosen and then told with just enough detail for their intrinsic intrigue to keep the numbers from numbing.

Still, *Biology by Numbers* has its share of deficiencies. It makes allusion to S.I. units, but it fails to make a strong case for their utility or even to give the rules for their use. Indeed, the format of the table of conversion factors reduces it to being illustrative rather than useful. Nor is the reader referred to a more useful source, such as Colin Pennycook's (1988) *Conversion Factors*. The book hints at but is not sufficiently explicit on the difference between rates (productivity) and amounts (standing crop) in trophic pyramids, something garbled in most elementary textbooks. Similarly unspecific is the difference between interval and ratio scales of measurement in the section on comparisons and percentages. Statistics, which inflict on us more than their share of complications and misconceptions, get only minimal mention.

For both better and worse, the book is a ramble—decently organized but somewhat casual and self-indulgent. Its sins are almost all ones of omission. Every biologist who reads it must suppress the sense that one's favorite examples are not here, that lots of other points should have been made, and that little practical help (such as references) is given for anyone aspiring to do something particular. It is, and it makes no contrary claim, a book about quantification, not one about how to use mathematics. What it does have is personality, with a charm sufficient to offset any scientific or heuristic deficiencies and to keep the attention of even a reader motivated by no specific academic compulsion.

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STEVEN VOGEL
Department of Zoology
Duke University
Durham, North Carolina 27708
 E-mail: svogel@acpub.duke.edu

Osteology of the Reptiles. ALFRED SHERWOOD ROMER. Krieger Publishing Company, Malabar, Florida, 1997. xxvii + 772 pages \$96.50 (ISBN 0-89464-985-X).

This major work, originally published in 1956 by the University of Chicago Press, has become a bible for those interested in reptilian anatomy. Page iv of the reissue proclaims the reprint edition to have a new

preface and taxonomic table. Given the spate of reissues of classic anatomical, developmental and more theoretical books over the past decade, I was excited to learn that Romer's magnum opus was to be reissued with an update of the preface and a revised approach to the classification employed therein. Expectation turned to anti-climax, however, when I discovered that the new preface, by Thomas C. LaDuke, occupies significantly less than two full text pages, and the classificatory table encompasses barely four more.

In reality, therefore, this is simply a reprinting of the original book, with little in the way of information to bring the reader up to date in both practical and theoretical aspects of reptilian osteology and its implications that have accumulated in the forty-one years since its original publication. In order to check on the faithfulness of the reprinting, I brought out my trusty 1956 original hard-backed edition and leafed through this and the Krieger volume in tandem. Such a process revealed that the original had been scanned and reproduced exactly, including all of the minor printing errors of the original. Such comments may initially be perceived as simply quibbles, but the strength of Romer's book lay as much in its illustrations as in its text—and in the reissue the text has not been updated and the illustrations have been reproduced in an inferior form. The original book was printed on cream paper, with excellent contrast and definition afforded to the hundreds of line drawings. In the reissue the paper is stark white and the scanning process has lost many of the subtleties of the original stippling on the line drawings. Thus, whereas in the original the stippling skillfully displayed the nuances of surface morphology of the various skeletal elements, in the reissue many of these features are lost as the stippling has "bled" together during the scanning process to reveal large areas of featureless black. This is evident in various places throughout the book—a few examples will suffice. In Figure 65B (page 120) the details of the posterior part of the primary palate of the mosasaur *Platecarpus* are greatly obscured; in Figure 111B (page 214) the medial view of the lower jaw of *Edaphosaurus* bears large areas of dense black; and in Figure 225 (page 616) much of the skeleton of *Aublysodon* (*Gorgosaurus*) is simply an indistinct collection of black smudges. This pattern of significant reduction in the clarity of the illustrations is evident throughout.

This classic book is very deserving of reissue, but also it is deserving of much better treatment than is given here. Not only has the quality of the original been lost in terms of production values, but also the work done in the past forty years in reptilian osteological anatomy has been given short shrift. Romer's work (and this book is a summary of much of that) has inspired significant and detailed projects to be undertaken, many of which continue today. A large number of paleontologists and neontologists will be quite taken aback to learn from the new preface that "anatomical description has become a lost art" and that "modern systematists rely heavily on old, obscure texts for descriptions and illustrations to support their work, but rarely provide reviews of the anatomy of their taxa." A brief scan of primary literature sources,

or of the many pertinent volumes of the *Biology of the Reptilia*, will reveal a very different picture.

In his preface LaDuke (1997) indicates that the main reason for the reissue is the first part of "Osteology", *i.e.*, the part that deals with the details of skeletal anatomy of reptiles. The second part, that dealing with reptilian classification, he regards as now being of primarily historical interest. Both parts, for different reasons, would have benefitted from a much longer and more synthetic preface to put the changes that have occurred in the last forty years into context. Much has happened in both anatomy (descriptive and functional) and systematics, including the demise of the "Reptilia" as a monophyletic taxon in the eyes of many—a question not deemed important in the context of this reissue (LaDuke 1997). So cursory is the treatment of the literature that not even the detailed reviews of the original edition (Grobman, 1957; Olson, 1957; Savage, 1957; Watson, 1957) have been cited, each of which had pertinent comments to make about this book. Placing the original reviewers' comments in the light of what has happened in the intervening forty years would have been of interest in itself.

Romer's book remains of great value to those interested in the skeletal anatomy of reptiles (in the broadest sense), and the easy availability of this work because of the current reprinting is of significance. My advice, however, would be to scour the second-hand booksellers' shelves and lists for a good, clean copy of the original edition, as this will provide the clarity of illustration that is vital for a full appreciation of the text. Only if that quest fails would it be worthwhile to purchase the handsomely-bound but scarcely updated reissue.

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ANTHONY P. RUSSELL
 Department of Biological Sciences
 The University of Calgary
 2500 University Drive N.W.
 Calgary, Alberta, Canada T2N 1N4
 E-mail: arussell@acs.ucalgary.ca

Selection in Natural Populations. JEFFREY B. MITTON.
 Oxford University Press, 1998. 240 pages; \$60.00,
 (ISBN 0-19-506352-x).

The title of this readable little book about evolution is really a subtitle. The title should be something like *Enzyme Polymorphisms*. The book's focus is on evolutionary genetics, in particular the genetic loci responsible for enzymes and their polymorphisms that are revealed on an electrophoretic gel.

The introduction of starch gel electrophoresis to population genetics in 1966 opened eyes to a world of unsuspected genetic variation. It offered the hope of determining the direct influence of natural selection upon individual gene loci. This book tells us what has been learned over a period of about 30 years, starting with studies of protein polymorphisms and ending in the molecular era of gene cloning and sequencing. Selection, natural selection, does indeed play a key role in affecting observable genetic variation. Drift does too, although its possible role is not explored to anything like the same degree.

A strong theme running through the book is that heterozygotes have a selective advantage over homozygotes. Theory on the effect of environmental heterogeneity upon genetic variation, as assessed by levels of heterozygosity, is explained and discussed. The conclusion reached from broad-scale surveys is that the expected relationship does indeed hold in nature. Therefore natural selection is inferred from observed patterns. The same conclusion is reached from a survey of several case histories of this relationship. The survey provides good coverage of the important work by Ward Watt and colleagues on butterflies, by Dennis Powers and colleagues on killifish, and by others. These studies have established links among genotypes at individual loci, the enzymes they produce, the respiratory physiology that is regulated by the enzymes, and the temperatures at which those enzymes work best. Mitton considers whether the loci coding for proteins are a random sample of the genome, and concludes that they probably are not.

A chapter devoted to a good-genes model of sexual selection by female choice is highly selective and seems out of place. Nevertheless, it includes a nice field study of pierid butterflies (again), which shows that heterozygous males at the important PG-1 locus experience a mating advantage; good (heterozygous) genes are sexually selected.

Another chapter addresses the issue of explaining differences in genetic variation among species. A survey of studies finds some evidence for variation to be highest in the most fecund, numerically dense, ecologically generalist and wide-ranging species. But reading between the lines, there is much variation left to explain.

Take-home messages provided in the final chapter can be summarized as follows. Natural populations are dynamic and rarely at equilibrium; discordant patterns of population structure reveal different evolutionary forces on different genetic marker systems; natural selection discriminates among the genotypes at a single locus, the intensity of natural selection can be quite high, and balancing selection maintains genetic variation in a heterogeneous world. The book closes with a few implications from studies of heterozygosity for life history evolution, speciation, and for industry and conservation.