BOOK REVIEWS

Lizards Observed

The Bengal Monitor. WALTER AUFFENBERG. University Press of Florida, Gainesville, 1994. xxviii, 560 pp., illus. $79.95.

Many monitor lizards are large and impressive—they are often the centerpiece of reptile house exhibits. Monitors are not particularly tractable research subjects, but they have received an extraordinary amount of attention from dedicated students. Currently, 44 extant species are recognized, all of which occur in Africa, Asia, or Australia (the New World is sadly impoverished). Some 27 species occur in Australia, including one lineage that has evolved dwarfism (hatchlings of the smallest species weigh only 1 gram). A Pleistocene fossil monitor (dating from 19,000 to 26,000 years ago) from Australia is estimated to have reached 7 meters in total length and to have weighed over 600,000 grams. Although monitors are morphologically conservative, they vary in mass by five orders of magnitude. No other terrestrial animal genus exhibits such a range of size variation; there is proportionately almost as much difference in mass among species of monitors as there is between a mouse and an elephant.

The Bengal monitor, *Varanus bengalensis*. [From The Bengal Monitor]

Monitors are active predators, and many eat prey that are large relative to their own body size. Most monitor lizards are top predators. One species is frugivorous. Some species are aquatic, others are terrestrial, and still others are saxicolous, semi-arboreal, or truly arboreal. Monitor lizards live in a wide variety of habitats, ranging from mangrove swamps to dense forests to savannas to arid deserts. Many species have become endangered.

Walter Auffenberg has devoted 15 to 20 years to studying three species of monitor lizards in the wild. His first set of studies, of the world's largest living lizard, resulted in the publication of *The Behavioral Ecology of the Komodo Monitor* (University Press of Florida, 1981). Komodo monitors are ecological equivalents of large saber-toothed cats, using their sharp, serrated teeth and a slashing bite to disembowel large mammals; these monitors have killed water buffalo as large as 590 kilograms. Auffenberg's second book, *Gray's Monitor Lizard* (University Press of Florida, 1988), was a detailed autecological study of the frugivorous Philippine monitor. This very sedentary species, long thought to be extinct, was rediscovered and studied by means of radiotelemetry.

The third and latest book in this monumental trilogy reports on a detailed 13-year study of a more typical, insectivorous monitor. Auffenberg studied the Bengal monitor in the laboratory, in museums, and in the field primarily in India and Pakistan. He concentrates on diet and foraging behavior. Insects hiding underneath cattle dung pats constitute an important source of nutriment for these lizards in parts of their range. These lizards use their snake-like forked tongues extensively when foraging to locate prey by olfaction. They exploit very systematic search paths.

Auffenberg also includes numerous anecdotal observations on a wide variety of behaviors and a great deal of valuable information on many other subjects, including various aspects of both external and internal anatomy, color patterns, climate and microclimate, burrows, daily activity patterns, thermoregulation, competition, parasites and predators, geographic distribution and variation, habitats, seasonal variation, and reproductive activities. Over their wide geographical range from Pakistan through southeastern Asia, these monitor lizards experience climates ranging from desert to rainforest. Individual Bengal monitors range over extensive areas (a daily foraging path can exceed 400 meters) and consume large numbers of a wide range of relatively small prey items, mostly arthropods.

My biggest complaint about Auffenberg's presentation is that averages are often reported for various kinds of data without sample sizes, making it impossible to combine his data with other data to calculate grand means.

Auffenberg's three books constitute exceedingly valuable reference material for students of these magnificent creatures.

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Interfacing with Bits

Being Digital. NICHOLAS NEGROPONTE. Knopf, New York, 1995. viii, 245 pp. $23 or $C32.

In the Internet Age there are plenty of people who will tell you for a fee what computer to buy, how to network your organization's microprocessors, or how to "publish on the Web." But there are very few who can tell you what it all means or why. Nicholas Negroponte, co-founder and director of the Massachusetts Institute of Technology's Media Lab, has made a career of betting on the future, and he has not often been wrong. Consider his vision of a personalized digital newspaper, an automatically filtered and edited electronic online Daily Me featuring all the news that's fit for a readership of one. For years Negroponte and his colleagues have promoted this idea; this year, the *Wall Street Journal* has announced the real thing.

Negroponte's book is a collection of essays on such matters as the difference between publishing à la Gutenberg, where atoms in the form of paper are shipped around the world (like the journal you are reading), and the digital multimedia world in which bits are transmitted, stored, copied, and retransmitted at light speed for a fraction of the cost. In such a world, what is the meaning of copyright and what added value do publishers provide? Negroponte's answers are surprising and thoughtful.

Or what about the information superhighway that increasingly looks like a multiple-vehicle car wreck, with terabits of unsorted, uncataloged information all free for the taking? Negroponte's answer is intelligent agents, software tools programmed with a model of what their owners want, relentlessly roaming the Net to bring back the goods and leave the dreck behind. Con-

sider also his comments on the value of information about information. Once you have bits that tell you about bits, such as the header information in a video feed, then new opportunities are presented for intelligent management of large data sets.

As did Marshall McLuhan, Negroponte thinks deeply about communications and its devices. The difference is the firmness with which his feet are planted on the solid ground of real technology. For instance, take Negroponte's striking dissection of the fax machine—a device many believe to be the wonder appliance of the workplace. Yet the fax machine makes documents (and therefore ourselves) more stupid by converting carefully crafted info-rich word-processed text into dumb dots on a page. Of course the fax machine is a convenient paper mover, but one that we pay for dearly when we could be storing and transmitting intelligent documents that "know" about themselves. On this and many other topics, Negroponte's digital vision may not be to all tastes, but it is likely to be closest to what lies ahead.

David Voss

Vignettes: Using Math

The majority of the population avoids mathematics like herpes. But math is really good stuff. With algebra you can figure out how much sugar you need in chocolate mousse for eleven when you have a recipe for six. With calculus you can calculate how much you'll have for college in thirteen years, five months if you save $117.60 a month at 3.62 percent.

—*Thomas K. Landauer*, in *The Trouble with Computers: Usefulness, Usability, and Productivity* (MIT Press)

Mathematics is after all only a concise shorthand description of the world, and if a position-finding calculation based, say, on trigonometry and stellar observations, gives two results, equally valid, that you are either in Greenland or Barbados, you are entitled to discard one of the solutions if it is snowing outside.

—*J. F. James*, in *A Student's Guide to Fourier Transforms, with Applications in Physics and Engineering* (Cambridge University Press)

Other Books of Interest

Fullerene Research, 1985–1993. A Computer-Generated Cross-Indexed Bibliography of the Journal Literature. T. BRAUN, A. SCHUBERT, H. MACZELKA, and L. VASVÁRI. World Scientific, River Edge, NJ, 1995. vi, 473 pp. $93 or £64. Advanced Series in Fullerenes; vol. 3.

This work, emanating from the library of the Hungarian Academy of Sciences, is a compilation of over 3000 references to journal articles published between 1985 and 1993 on the now famous carbon-cage molecules named after Buckminster Fuller. The main entries (occupying 183 pages) are grouped according to journal and then chronologically, with a numbering system that assigns A-1 to the first entry (one of 13 from *Accounts of Chemical Research*) and proceeds through the alphabet to Z-67, the one paper listed from *Zhurnal fizicheskoi khimii*. This is followed by an author index, a nation-by-nation index of authors' institutions, and a "partially permuted title word index" that occupies 216 pages. The format of the work facilitates the making of counts, and the compilers present the results of some such efforts in a section of tables and charts at the end. One learns, for instance, that the number of papers on fullerenes grew from 4 in 1985 to 1400 in 1993 and that *Chemical Physics Letters* and *Physical Review B* have published the most, with *Nature* and *Science* accounting for 118 and 100, respectively. There are 50 authors whose names have appeared on 20 or more papers, the most productive being Y. Achiba. Of the 42 nations contributing to the field, the United States accounts for the largest number of papers (1406), with Japan, Germany, the United Kingdom, France, and Russia each having three-digit totals. To assess the comprehensiveness of the work would be perhaps a larger project than its compilation, but one hopeful indicator is that it even includes book reviews. Continuations are planned.

Katherine Livingston

Turbulence. A Tentative Dictionary. P. TABELING and O. CARDOSO, Eds. Plenum, New York, 1995. xii, 149 pp., illus. $65. NATO ASI Series B, vol. 341. Special Program on Chaos, Order, and Patterns. Based on an institute, Cargèse, France.

In their preface the editors of this volume note that students excited by the idea of churning flows or violent jet streams soon find themselves faced with high-order structure functions of velocity increments or spectra of the enstrophy. Acknowledging that such terms are not only long and technical but "poorly evocative," Tabeling, Cardoso, and other participants in a recent conference on turbulence have set out to provide, in lieu of the usual sort of proceedings volume, a work that will explain the meanings of some key concepts in the field. The result is more akin to an encyclopedia than to a dictionary, with discursive entries several pages in length. One purpose of the meeting from which the work derives was to consider both fully developed turbulence (in two and three dimensions) and weak turbulence (one- and two-dimensional systems), and this is reflected in the coverage. In all there are 23 entries, dealing with decaying two-dimensional turbulence, experiments on 1D and 2D turbulence and spatiotemporal chaos, extended self-similarity, hot-wire anemometry, intermittency, numerical simulations, optical and phase turbulence, predictability, probability density functions, Rayleigh-Bénard turbulent convection, scaling in hydrodynamics, shear flows, shell models, singularities, spatiotemporal intermittency, the statistical approach, structure functions, vorticity filaments, and wavelet analysis. Each entry has its own bibliography, and the book includes a subject index. Some flaws in the editing might be noted: the English is not always smooth, and there are inconsistencies in the information given about the Cargèse conference.

Katherine Livingston

Publishers' Addresses

Below is information about how to direct orders for books reviewed in this issue. A fuller list of addresses of publishers represented in *Science* appears in the issue of 26 May 1995, page 1220.

Alfred A. Knopf, Inc., Westminster Distribution Center, 400 Hahn Rd., Westminster, MD 21157. Phone: 800-733-3000; 410-848-1900. Fax: 800-659-2436; 410-386-7013.

Plenum Publishing Corp., 233 Spring St., New York, NY 10013–1578. Phone: 800-221-9369; 212-620-8000. Fax: 212-463-0742.

University Press of Florida, 15 NW 15th St., Gainesville, FL 32611. Phone: 800-226-3822; 904-392-1351. Fax: 904-392-7302.

World Scientific Publishing Co., 1060 Main St., River Edge, NJ 07661. Phone: 800-227-7562; 201-487-9655. Fax: 201-487-9656.