Book Reviews

Megaherbivores: the influence of very large body size on ecology

R.N. Owen-Smith
Cambridge University Press, Cambridge, 1988
369 pages
Price: £40.00

The relationship between body size and ecology has been a pervasive theme underlying research on African large herbivores. This book explores various hypotheses relating allometric scaling to ecological processes, and examines the extent to which these hypotheses are supported or refuted by current knowledge. The complex threads relating body size to digestive physiology, foraging behaviour, food selection, social organization and demography are presented with masterly thoroughness and clarity. The excellent use made of published data to assess underlying principles serves as an inspiration to field researchers to design their studies in such a way as to facilitate comparison with the work of others.

The comprehensive treatment of well-documented but important concepts, such as the Jarman-Bell Principle, may benefit the student more than the specialist, but the latter will find much in the book that is original. Those responsible for the conservation of megaherbivores (and indeed large herbivores in general) will find useful and thought-provoking information in the chapters on demography, population regulation and dispersal. These chapters are particularly satisfying because of the clear way in which the implications of scientific facts for conservation problems are identified.

Coverage of the relevant literature is impressive and the extensive references provide the student with a wide background. The reviews of published information on the various megaherbivore species, although no doubt valuable as reference material, make for slow reading in parts. In general, however, the pace of the book is rapid and interesting. A particularly attractive feature is the abundant chapter summaries which make revision of the material easy.

Presentation is on the whole clear and correct (the only errors I noted were one or two references mentioned in the text but omitted from the reference list), but unfortunately many of the figures have been excessively reduced to save space — reading the small print is a severe strain.

A very valuable book for anyone seriously concerned with the ecology of large herbivores, academics and applied biologists alike.

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Comparative Physiology of the Vertebrate Kidney

W.H. Dantzler
Springer-Verlag 1989
198 pp. (Hardcover)
Price: DM 168,00

Dantzler's Monograph in the 'Zoophysiology' series is an excellent collation of many papers on non-mammalian renal tubule research. It is, however, not the usual 'kidney' book concerning structure and function or the relationship between the kidneys and the rest of the body. For instance, the effect of hormones on and the release of hormones by the kidney is not dealt with in an integrated overall manner as would be customary in a treatise on mammalian kidneys; the topic of acid-base balance is similarly omitted. Rather, this book is a formidable discussion of vertebrate renal tubules ranging from hagfish to hens!

This book is for the specialist. No attempt is made to discuss techniques in any way, and rightfully so, since it is targetted at the physiologist who is completely conversant and *au fait* with microelectrodes and the measurement of electrical potentials, resistances and ion fluxes. Most of the information was gathered using *in vivo* micropuncture and *in vitro* microperfusion techniques on different segments of the renal tubule.

Dantzler has tackled an enormous field of research in a methodical and logical manner. The list of references is quite daunting (more than 500) and since his own work accounts for at least 10% of this, his expertise and ability cannot be questioned. The book is possibly the most interesting in those places where he reiterates his own work on snakes.

Chapter 1, the Introduction, is extremely short and deals briefly with the regulatory functions of kidneys. Chapter 2 goes on to discuss morphology in a neat, precise manner. The discussion of evolutionary trends of renal mechanisms is avoided although one of the stated aims of the book is to 'shed light on the evolution of physiological processes'. The diagram on morphology (p. 7) could possibly have been incorporated in the final summary (Chapter 8) and evolutionary aspects re-analysed. Chapter 3 deals with urine production and contains many useful pages of tables of GFR (glomerular filtration rate) of the variety of species in different habitats and conditions (fresh water, seawater, salt or water-loaded). Chapters 4, 5 and 6 deal in fine detail with the transport of inorganic ions, organic ions and fluid, their mechanisms and sites of transport. Simple diagrams throughout these chapters depict, in an excellent fashion, the models postulated for these processes or mechanisms. These three chapters are really the essence of this book providing a useful guide and reference text for the serious researcher in comparative or tubular physiology. Chapter 7 is a synopsis of the concentrating and diluting mechanisms of tubules and the consequent urine osmolality.

The only drawback to the book is perhaps the extremely compartmentalized manner in which it has been written. This style is not easy to read but unfortunately, the nature of the topic makes it difficult to visualize any other treatment of the material. Dantzler has included as many species as possible such as hagfish, cartilaginous and bony fish, frogs, tortoises, crocodiles, snakes, lizards and birds in as many environments as possible from the arid desert through fresh water to seawater. The serious student could sift through all this quite happily to glean the comparative aspect and stated intention of the book whereas the researcher will find it an excellent desk-top reference edition.

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Atlas on the Biology of Soil Arthropods

G. Esenbeis and W. Wichard
Springer-Verlag, Berlin 1987
437 pp.
Price: DM 198,00

Scholars in the field of soil zoology will welcome this book. I am not aware of anything similar in the market.

Soil arthropods exhibit a fascinating variety of adaptations. The electron microscope provides us with an excellent means of capturing and explaining the diversity of forms. This atlas is a unique contribution especially since it discusses not only the functional morphological aspects but relates them to soil ecology in general and also emphasizes physiological aspects.

As intended by the authors this book will reach further afield not only to scientists, but also to naturalists and environmentally conscious readers.

The authors of this atlas succeeded in convincing the reader that the richness of form and function of the soil arthropods is an inexhaustible source of biological interest. As an atlas this book will probably not satisfy the specialists in certain fields since they will miss certain detail. The book, however, provides a very good overview of certain arthropod form and function and the examples were selected with great care. The major contribution of this atlas lies in its visual qualities. It contains 1 133 scanning electron micrographs, 192 photographs and 219 figures. The text is well written and will also interest those zoologists outside soil zoology. It will definitely serve to increase an environmental awareness of the soil biotope. The biotic communities of the soil have an important role to play in the future existence of man owing to their role in maintaining the productivity of soils.

Soil biology is becoming a teaching and research subject of increasing importance. If soil biology has not always taken its rightful place in general ecology until now this was partly due to the fact that an adequate and visually stimulating overview of the abundance of form and function was not available. This atlas will serve to fill this vacuum. This book is highly recommended as a teaching tool. It not only provides an overview but includes the latest literature and also offers an index allowing for easy access to the various aspects of the subject.

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Primate Vocal Communication

Edited by D. Todt, P. Goedeking and D. Symmes
Springer Verlag, Berlin (1988).
DM 136,00
Price: DM 136,00

The analysis of primate vocalizations has a history as long as that of field primatology itself. Nevertheless, it is only in the last decade or so that there has seemed to be any real reason for focussing on *primate* vocalizations, as opposed to those of social animals generally.

This change is due to two interrelated factors. Firstly, there is increasing, compelling evidence that the vocal communication of monkeys and apes is as subtle and complex as their social lives and intellectual capacities might lead us to expect. Robert Seyfarth and Dorothy Cheney's analyses of the semantic components of vervet vocalizations provide an appropriate and well-known example. It is not that other, non-primate taxa do not also exhibit similar complexity but, rather, that primate behavioural studies are now geared to understanding social skills. This is not possible without understanding communicatory potential and constraints.

Secondly, making good field recordings is now mercifully much easier than it was in days of yore. Carrying around a large Nagra or Uher taperecorder under the African sun seemed to be, to those who experienced it, a particularly baroque form of torture. New generation equipment make field recording much easier, an important development since the complexity of animal sounds will only ever be manifest in the natural social world. There is now, consequently, a generation of primatologists with good, comprehensive data sets that can — thanks to technical advances in data processing — be rapidly and more exactly analysed. Not surprisingly, there is a new enthusiasm for work on primate vocalizations.

The current volume — *Primate Vocal Communication* — is an expression of this enthusiasm. It has the typically broad span of most conference proceedings, providing chapters as it does on field studies, social contexts, physiological substrates and conceptual frameworks. As with other conference proceedings some chapters prove

to be of more interest than others.

Peter Marler and John Mitani *(Vocal communication in primates and birds: parallels and contrasts)* provide an overview of the field that is characteristically clear and which serves as an unofficial introduction to the book itself. Not unexpectedly, they stress, using birds by way of comparison, the need for more work on the ties between vocal communication, cognition and social relationships.

Of the papers that concentrated on these issues, I found those by Todt *(Serial calling as a mediator of interactional processes: crying in primates)* and Snowdon *(Communications as social interaction: its importance in ontogeny and adult behavior)* to be the most engaging. What is emphasized by their results is the need to understand the development of signals using fine-grained analyses, and then to integrate this with functional explanations. Sociobiologists are usually only too eager to come up with the latter without comprehending the explanatory importance of the former. Knowing how ontogenetic processes shape and constrain a particular vocal signal draws attention to the social milieu in which a signal works and emphasizes the importance of individual learning.

Given my own interests, I found two of the field studies to be particularly useful in their presentation of methods. Gautier *(Vocal quavering: a basis for recognition in forest guenons)* demonstrates the use of correspondence analysis in separating out calls of different species (although it could as easily be different individuals) that are structurally very similar. As we move into an era when slight individual differences are likely to be increasingly important we will need to become much more comfortable with multivariate techniques. Papers such as Gautier's serve as convenient models on which to base and extend our own analyses.

Similarly, Brown and Waser *(Environmental influences on the structure of primate vocalizations)* present a range of methods in their essential, if preliminary, attempt to understand vocalizations in the context of the physical environments that presumably shaped their evolution. Using blue monkey *(Cercopitheous mitis)* vocalizations they argue that habitat acoustics (background noise, absorption characteristics) must lie behind the structure of calls and, therewith, the perceptual capabilities of recipients. It would be interesting to see, given the radiation of the blue monkey into a number of diverse habitat types, both tropically and subtropically, how environmental shifts affect the efficiency of call transmission and reception.

As befits a Springer-Verlag production, the book is well produced and therefore very expensive. Nevertheless, it is a good source of information and I would recommend it for university library purchase.

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The Honey Bee

J.L. Gould and C. G. Gould
Scientific American Library, W.H.Freeman, New York
239 pp.
Price: US $14.95

This book is very easy to summarize. It is absolutely superb! Written by two professional scientists, the first an academician, the second a free-lance science writer, the book couples the expert subject knowledge of the one and the brilliant verbal and pictorial packaging of the other. And, a hard-back edition with exquisitely clear drawings accompanied by colour plates every few pages or so on the market for US $14.95 is worth having for nostalgia's sake.

The book is written for the university-educated person, not necessarily the professional scientist much less the fanatical apiculturist. The book begins with a curious prefatorial exegesis on why the spelling 'honey bee' is preferable to the correct way, 'honeybee'. Be that as it may, we quickly move with Liebich's maiden into the quaint world of beekeeping. This section covers man's quest for sweetness and light from rock paintings in the Drakensberg, through the wicker veils and straw skeps of the middle ages to the modern movable frame hive of today's commercial beekeeping.

The origin of honeybees, their mode of life and the colony cycle are succinctly illustrated and discussed as are the intricate tasks of the worker bees as they pass through the division of their labours in their short lives. Those who fondly speak of the 'busy bee' will be shocked to learn that bees spend an extraordinary amount of time doing nothing, and this is called resting. Food begging and colony defense, foraging and other activities are mentioned as are major differences amongst the races of bees.

All of this biology is dependent upon the sensory abilities of bees, J.L. Gould's own area of major contribution to honeybee biology. Thus we are shown how a patch of zinnias is transformed into a mosaic picture in the bee's eye, the graininess of which we would find unacceptable in our television sets today. By the same token, the boredom of a primrose for us is psychedelic to them.

Communication in honeybees is largely based on pheromones and olfaction and the exposition of these chemicals, how they are used and what messages they convey are clearly explained. And, although modern textbooks still tell us that honeybees are deaf, the Goulds nicely summarize the three principal hearing organs and what they hear (as far as we know). The meat of this book is really about the dance language which gave rise to one Nobel prize and one major scientific controversy. The surprise winner, Karl von Frisch, served as the basis for the controversy, on whose stage Gould played, and played well indeed. The history of the controversy — whether newly recruited bees indeed used the trigonometric information contained in their

dances back home in the nest or primarily depended upon odour cues — is both expertly, fairly and exceptionally clearly retold.

This controversy, despite the usual recriminations and bruised scientific egos, served as a major stimulus in an intense re-examination of the experimental evidence for the dance language generated in the first place. This base arose as the products of about 50 years of Von Frisch's work and another 150 to 200 man-year's of Ph.D. dissertations. The excitement of experiment and counter-experiment is re-lived and the final solution to the problem depended upon the experimenter's ability to make a dancing worker 'tell lies' about where she had been. For the experimentalist the solution was as elegantly simple as scientifically important. This story is more than one of bees. It is an account of how precisely scientists think, which means, how do they assess evidence and accord proof to the results of experiments.

In spring and summer, many kinds of flowers bloom simultaneously, presenting foraging bees with a carnival-rich display of colourful nectar-fronts from which to choose. There are flowers and flowers. In the northern hemisphere concentrated nectar is really only available in spring so that to survive, temperate bees must maximize their efforts to magazine next winter's stores well in advance. The choices and the means by which 'optimal flowers' are both recognized and this information shared are delivered with an ease that would satisfy any head of household struggling with a budget as well as any free market economist.

The evolution of the honeybee dance is traced in theoretical arguments but based on real world facts derived from two species which must translate information obtained in the horizontal mode (during flight) into one presented in vertical form (on the face of a comb in a nest) and two others which perceive horizontally and dance accordingly on the upper surface of the open-air nests in the tropics. The linguistician will find full accounts of why the dance language meets the full criteria of language (abstract representations) and also learn details of the eight racial dialects that have been described thus far. The basic language as well as the dialects depend on the honeybee's navigational skills which were finely honed long before we managed to make a clock accurate enough for measuring longitude and latitude! All of the work thus far described pertains to the physiological versatility and evolutionary 'cleverness' of bees. But the Goulds do not stop here. The whole work is really a comprehensive essay that treats the reasons why bees learn the kinds of flowers, the mechanisms by which this is done and parlays the lot into a single instance of the more general phenomenon of programmed learning. The treatment is as adept with owls, gulls and doves as it is with racoons and bees.

Programmed learning is an academic thought approach that provides abundantly fresh food for thoughts into the natures of animal insight and intelligence. The title of this book is, by the way, most unfortunate. The book does not cover *the* honeybee. It covers only the points which I raised, concerning honeybees. Nonetheless, this book will be a small classic in the same way that Lindaner's little blue book has come to be. I am so pleased to have had the chance to read both.

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Insect Development Photoperiodic and Temperature Control

Victor A. Zaslavski
Springer-Verlag, Berlin
187 pp.

Publications in foreign languages, no matter how important, often tend to be ignored because of the difficulty in obtaining translations. This monograph is therefore valuable because it reviews a considerable body of research that has been published in Russian on photoperiodic and temperature control in insects. Papers by Western researchers are also considered but in not as much detail as those in Russian. However, being a translation from Russian, the English in this book tends to be unnecessarily convoluted and makes a complicated subject even more complicated.

The book is almost entirely about patterns of diapause in insects under different combinations of photoperiods and temperatures. The first chapter is on reactions and processes controlling the seasonal development of insects and presents an overview of the classification of responses to photoperiods and temperature. The second chapter considers the mechanism of photoperiodic and temperature control indirectly by examining the overt responses of insects to various combinations of photoperiod and temperature. In the third and last chapter the author presents an elaborate model of a physiological mechanism that would produce the responses considered in the first two chapters. I am afraid I did not understand the details of this model but I got the general feeling that with the paucity of information on the physiology of the mechanism, it is a shot in the dark.

There are an unusually high number of typographical errors in this book, suggesting sloppy editing. I found the graphs difficult to comprehend quickly because the labelling of the coordinates is given in the figure caption rather than on the graph itself.

This book is important to anyone doing research on the responses of animals to photoperiod and temperature. The first chapter might be useful to the more general reader who wants an overview of how the different types of responses are classified. However, it is not a very readable book because of the complicated English and badly labelled graphs.

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Organelles

Mark Carroll
Macmillan 1989
202 pp.

Macmillan have recently introduced a series of books covering aspects of molecular biology. The series editor gives the aims of these books as 'to provide authoritative texts of a manageable size suitable for advanced undergraduate and postgraduate courses'. The book entitled *Organelles* is one of the most recent in this series. I found the title somewhat misleading as the author restricts himself to an examination of seven membrane-bound organelles only (see below). The rationale for this was that the terms of reference for the book were to concentrate on membrane-bound organalles. The book is divided into 10 chapters and each chapter is in turn divided into subsections ending with a summary, study questions and further reading.

Chapter I introduces the ultrastructure of the eukaryotic cell and explains how and why membranes compartmentalize cells. Also covered is the structure of cell membranes and how molecules move across membranes. The second chapter briefly deals with the way in which cells are studied, both morphologically and experimentally. Thus the principles and uses of the various forms of microscopy, biochemical and immunochemical techniques, centrifugation, electrophoresis, chromatography and recombinant DNA techniques are all introduced. Because the book is meant to be about the molecular biology of organelles, and was written for more senior students in mind, I thought that a chapter devoted to such a brief coverage of techniques was not necessary. Readers could have simply been referred to authoritative texts.

The next six chapters (3–9) are each devoted to a specific organelle; the Nucleus, Endoplasmic Reticulum, The Golgi Complex, The Lysosome, The Peroxisome, The Mitochondrion and finally The Chloroplast. The author has dealt with the organelles in this order 'to illustrate the flow of genetic information from the nucleus, via protein biosynthesis, to all organelles within the cell'. In each of the chapters the author examines the structure, function and biochemistry of the organelles in depth. In the final chapter Carroll highlights interactions between organelles using the process of receptor-mediated endocytosis. This process and choice of organelle interaction reflects the research interest of the author. I felt that the chapter could have benefitted from a more general coverage of organelle interactions before concentrating on the above topic.

The functional content of the book is strongly biochemical and therefore a reasonable knowledge of biochemistry is needed by the reader (the author to his credit does point this out at the beginning of the book). I found the text up to date and a good summary of some recent developments in cell biology. The general layout of the book is good and therefore it is an easy text to read. Criticisms I have of the book centre on the illustrations. I was provided with the paperback version of the book which is not printed on a good quality paper and therefore the photographs lack contrast and some appear slightly out of focus. Perhaps the publishers could have done a better job. In addition some of the diagrams are a little crude.

In summary, I believe the book to be useful and recommend it to anyone running courses on cell biology whether it be in a medical or science faculty. Wherever possible senior undergraduate students and postgraduates should have their attention drawn to it.

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Comparative Protozoology Ecology, Physiology, Life History

O. Roger Anderson
Springer-Verlag, Berlin, 1988
482 pp.
DM 118,00

Numerous books on some aspects of protozoan biology fill the shelves of libraries. Many of these merely provide basic information on aspects of the biology of protozoans, usually organized in taxonomic order. This book by O.R. Anderson provides a fresh and very welcome approach to the subject. The author is a well known and active protozoologist who has published extensively on various topics, but in particular on marine sarcodinids.

The aim of this book is clearly stated in the author's preface: 'This book is intended as a survey of broad concepts in protozoan biology with an emphasis on comparative data and with the focus on zoological aspects.' The book also includes aspects of modern as well as cellular biology and provides substantial information on the biochemistry of the protozoans.

The book is divided into three major sections, i.e. morphology and ecology, functional microanatomy and physiology and life processes. In the first section an overview of the diversity of organisms included among the protozoans is provided where the latest system of classification of the sub-kingdom Protozoa is used. Emphasis is largely on the conceptual perspective of the ecology of the unicellular organisms. More specific topics are discussed in the following sections. In most cases comparative data are presented followed by a chapter on ecological concepts. Throughout the text the book is well illustrated by examples of different protozoan groups. The section on morphology and ecology culminates in an integrative view of protozoan ecology. The parasitic protozoans are dealt with in a separate chapter with the emphasis on treatment and eradication

of these pathogens. The section on functional microanatomy, physiology and life processes is organized around major biological concepts rather than taxonomic categories, but maintains subsections for each of the major taxonomic groups. Specific topics such as respiration, osmoregulation and reproduction are dealt with in an integrated comparative format. It is, however, still possible to find information on a particular group as subsections are created within each chapter.

The book is well illustrated, consisting of figures as well as microscope and electronmicroscope micrographs. References were drawn from recent as well as classical works.

This book is certainly not intended for beginners in the field of protozoology. It is a textbook that I believe should be on the shelves of any graduate student and researcher working in this field.

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Ecotoxicology: Problems and Approaches

Edited by S.A. Levin, M.A. Harwell, J.R. Kelly and K.D. Kimball

Springer Verlag, New York
547 pp.
DM 90,00

A great deal has now been written about environmental pollution and its effects on living organisms; in fact a great deal too much has been written in terms of virtually useless information, the reporting of unrealistic experiments and unrepeatable results, as well as data from pedestrian pollution monitoring. The present volume thus comes as a breath of fresh air, a really critical presentation of nearly all aspects of ecotoxicology, including appropriate statistics and modelling, the authors keeping in mind that the ultimate aim of this subject is the *prediction* of ecotoxicological effects rather than the mere recital of established facts. This is not to say that all chapters (written by different authors) maintain a uniformly critical standard, but taken as a whole I have no doubt that this is the book to have rather than one of its competitors.

The book is divided into four parts, each consisting of several chapters. Part 1 is entitled 'Ecotoxicology: problems and approaches' while Part 2 deals with responses of ecosystems to chemical stress, the ecosystems dealt with encompassing marine, freshwater and terrestrial environments. Part 3 is concerned with methods and models, including biomonitoring systems, and Part 4 is devoted to ecotoxicological decision making, the last chapter, on 'Environmental decision making in the presence of uncertainty' providing particular food for thought.

While certainly not for the layman, the text is lucid and terms are defined as they are introduced, so that it should be accessible to anyone with a basic scientific training. The subject matter of some chapters inevitably renders them more difficult to grasp than others but even the chapters dealing with modelling and statistics are not as daunting as is usually the case. The extensive reference lists which conclude each chapter are themselves extremely valuable, for here may be found virtually all the significant works relevant to the topic.

I am delighted to possess this book and will be referring to it frequently. I can recommend it both to those working in the field of ecotoxicology and to newcomers to the topic.

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