Book Reviews

Atlas of Microscopic Structures of Fur Skins Vol.1

Anton Blažej *et al.*
Elsevier Amsterdam and SNTL, Prague, 1989
378 pages
Price: US$144,75; Dfl.275,00

All disciplines develop their own modus operandi and unique approaches to solving problems. More often than not, students of hair identification opt for comparison of microscopic features of hair demonstrated by electron microscopy and electron micrographs. In adopting this approach Anton Blažej and his four co-authors have produced, in this first volume, an impressive survey of morphological features of skin surface, follicles and hair structure as well as descriptions of individual fur skins from 51 species. Much of the somewhat daunting price must certainly be in the excellent blocks of some 502 micrographs which demonstrate, with exceptional clarity, the various characteristics and features outlined in the text. In plumping for the coffee-table format the publishers have done justice to the micrographs.

There are three chapters each dealing with a different section. The first, smaller section is a brief overview of morphology and histological structure of animal fur skin, with notes on optical microscopy and conventional and scanning electron microscopy. Whilst one salutes the authors' brevity, I must admit I would have felt more comfortable had they acquainted themselves with more recent literature on hair studies. And, indeed, the approach and findings in the subsequent two chapters are likewise tempered by the fact that little or no cognizance seems to have been taken of recent work in this field.

In the second chapter a classification and nomenclature of morphological features of hair, follicles and skin surface, are convincingly presented with micrographs clearly demonstrating each specified feature. Whilst the array of given features may seem cumbersome to work with (16 different cuticular scale patterns described encourage one to seek refuge in the conventional and more economic approach) the descriptions are clear and concise and the micrographs, some up to a magnification of 4000, demonstrate substantial technical expertise and skill. By assigning a numerical code to the various characters outlined, a system of computerized data processing can be used for identification of unknown fur. Given a little practice this method seems practical and potentially useful.

The last section of the book deals with morphological features of individual fur skins. For each of the 51 species, descriptions of the fur and hair are illustrated by superb micrographs. The species considered follow no specific taxonomic order and are listed alphabetically. Although the book would appear to be aimed primarily at the fur trade, the micrographs of the selected species provide an ample basis for both taxonomic and comparative study. Perhaps we may look forward to seeing these aspects addressed in the anticipated second volume of this work.

This book undoubtedly reflects technical skill in the field of scanning electron microscopy and for those engaged in the study of hair or fur, it forms an exciting array of micrographs on the subject. But I would like to appeal, for good measure, for a picture of the creature itself on those photographic pages. Some of us may need to be reminded of that Burunduk.

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Ornithology for Africa

Gordon L. Maclean
University of Natal Press, 1990
270 pages

A few years ago I had the opportunity to review O.S. Pettingill's *Ornithology in laboratory and field*, a large volume fundamentally similar in content to that reviewed here. In my review of Pettingill's book I commented several times on the bias towards Northern Hemisphere and, in pariticular, North American birds and the resulting inapplicability of a large proportion of the book to students of ornithology in southern Africa. Gordon Maclean's book to some extent redresses Pettingill's omissions, being described on the jacket as 'the first book on ornithology to focus on the Southern Hemisphere using African examples'.

The first of the nine chapters covers basic classification and ancestry of birds. It also explains how DNA-DNA hybridization can be used to assess relationships between species and provides several examples of how the technique has been used to support or modify previous classifications based on the more traditional use of morphology and zoogeography.

A relatively lengthy but simple section introduces the chapter on flight and is followed by discussion on soaring, gliding and flapping flight and take off and landing.

The chapter on food and feeding begins with a brief description of bill and gut morphology and then proceeds to describe food and feeding techniques and adaptations of birds, based broadly on food type (fish-eaters, meat-eaters, insectivores, frugivores etc.). I found this chapter quite informative with numerous interesting snippets of information such as how mistletoe is propagated by frugivores. However, I was disappointed by the lack of explanation in places. For example, the author points out the need for surface-fishing birds to correct for differences in the refractive indices of air and water when catching prey but does not explain how they do this. Similarly, he states that snake-eagles take both non-poisonous and poisonous snakes indiscriminately but does not say how they go about the potentially hazardous task of dealing with poisonous species. A suprising omission from the list of birds that feed on molluscs is kelp gulls, which drop mussels from a height onto hard surfaces to break them open.

Zoogeography is covered in Chapter 4 under the broad headings of the six geographical regions. The pattern of this chapter is to discuss the geographical origins and points of separation of extant families of birds. Although for the most part a straightforward chapter, I found the author's use of formal scientifc names in the text detracted from the general flow because I had continually to refer to tables for the common English names. Although familiar with numerous bird families, I, and I'm sure most of the author's intended readers, would

find it easier to recognize gnatcatchers and bowerbirds than Conopophagidae and Ptilonorhynchidae.

Chapter 5, on adaptations of birds to their environments was, for me, the most disappointing chapter. Apart from a description of the structure and function of salt glands of marine birds and some brief mention of resistance to desiccation and the efficient kidneys of birds from arid regions, it had very little to do with adaptations to environment. Rather it comprised a description of different types of habitat, their productivity, and the diversity and biomass of birds they support. Although not adaptations in the morphological or physiological sense, there is some discussion on thermoregulatory behaviour of birds in arid regions and a brief mention of some breeding adaptations. Nevertheless, some very basic errors left me with the impression that this was a field with which the author was relatively unfamilier. For example, birds face into the wind to increase heat loss by convection, not by conduction.

Chapter 6 on migration and orientation provides a very straightforward account of why birds migrate and discusses several sometimes contentious theories on how they orientate and navigate. The inclusion of some descriptions of early experiments which have helped elucidate some aspects of bird orientation made this chapter all the more interesting.

Bird behaviour is discussed in Chapter 7 by categories of behaviour. These include the more obvious maintenance, feeding, sexual, and social behaviours but some less commonly observed behaviours such as sunbathing, anting and sleeping also get a mention, albeit a brief one. Overall, this chapter provides a very general account and some aspects are covered in greater detail in other chapters (e.g. feeding behaviour).

The final two chapters cover breeding biology focusing, repectively, on pre-parental preparations and subsequent parental care. The former chapter provides a brief description of reproductive organs and the process of egg formation before presenting in greater detail factors that initiate breeding, mating systems, courtship, nest building and eggs. The various arguments and theories about factors determining clutch size in precocial and altricial species are presented quite simply considering the volume of literature the topic has generated.

The chapter on parental care begins with short sections on age at first breeding and parental roles and is followed by a large section on various aspects of incubation and incubation behaviour of the parents. Post-hatching activities are discussed under the headings brooding, defence of young, feeding and nest sanitation. The chapter is concluded with the role of helpers in co-operative breeders, brood parasitism and breeding success. The rather detailed section on brood parasitism in particular provides a fascinating account of the problems faced by both parasite and host. How, for example, do species that parasitize several different discriminating hosts match their egg colour to that of their hosts? Although interesting, both chapters on breeding biology use unnecessarily complicated terminology.

Each chapter is followed by a list of references, most of which are well up to date. A glossary, an index of authors cited and a general index complete the book. The book is also well illustrated with a profusion of line drawings. However, the 16 pages of colour plates are unfortunately lumped at the beginning of the book and one has to page back every time they are referred to in the text. Furthermore, several of the plates are of poor quality and some plates of histological sections of salt glands, testes and ovary will be totally meaningless to most readers, the more so because they are unlabelled. I picked up relatively few typographical errors in the book. The caption for Figure 5.9 a and b has orientation of larks' nests in summer and winter the wrong way around and, presumably, the conclusion that lovebirds and larger parrots are not closely related is based on one group scratching indirectly and the other directly, not because both scratch indirectly, as stated. Finally, although many readers referring to the maps in Figures 6.1 to 6.8 will presumably be able to work out that stippled areas represent breeding grounds and hatched areas non-breeding grounds, there is no key to confirm this, which may prove misleading to some readers.

Gordon Maclean has an extensive knowledge of birds and is well known among South Africa's amateur ornithologists for his revision of *Robert's birds of South Africa* and his bird identification courses, and among his more academic colleagues for his publications on desert birds in particular. Much of his personal knowledge comes across in this generally readable account but I did find several sections were covered very superficially and were often oversimplified whereas other sections had excessive detail. This bias generally reflects the author's own special interests. However, considering that the book is aimed at the informed layperson and undergraduate student, the overall balance is still acceptable.

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Biology of the Vespine Wasps

Makoto Matsuura and Seiki Yamane
Springer-Verlag, Berlin, 1990
323 pages, numerous figures, tables and photographs
ISBN 3-540-51900-9
Price: DM 198,00

The Vespinae, some members of which are commonly known as hornets and others as yellow jackets, are morphologically the most specialized of the Vespidae and have evolved social lives amongst the most highly developed in this family. The book under review is the first comprehensive account of the biology of the vespine wasps, with special emphasis on behavioural aspects. The authors, Makoto Matsuura, an ecoethologist, and Seiki Yamane, a systematist with wide experience in ecology and ethology, are based in Japan at Mie and Kagoshima Universities respectively.

It seems useful at the outset of the present review to draw attention to the fact that the book concerns itself with a group of insects not native to the Afrotropical Region, the Vespinae being essentially limited to the Northern Hemisphere. Four genera are included. *Vespula* and *Dolichovespula* occur mainly in the temperate zones of the Northern Hemisphere. Most species of *Vespa* are restricted to the temperate and subtropical to tropical zones of Asia though one species, *V. crabro*, has a distribution extending into Europe and has been introduced into the United States of America. *Provespa* is the most restricted being endemic to South-east Asia. The sole representative occurring in southern Africa is the accidentally introduced *Vespula germanica* which has established itself in the south-western Cape. Whereas the student of African social wasps will consequently not find any of his genera and species

in the present work, it must be recognized that the biological principles pertaining to the Vespinae are in the main and in a broad sense common to all the social wasps. Furthermore, the research approaches to and the detailed accounts of the nesting of the included species clearly indicate how most profitably to pursue investigations of other, non-vespine, groups of social wasps. In the southern African context these would be the species of *Polistes, Ropalidia* and *Belonogaster* belonging to the subfamily Polistinae, the sister-group of the Vespinae.

By virtue of the distribution of the Vespinae, the authors of this book, based as they are in Japan, are ideally situated geographically for the study of these wasps. That they have made the most of their opportunities is attested by their impressive lists of publications on the subject and by the fact that 70–80% of the content of the present book is based on their own published and unpublished data. With regard to *Vespula* and *Dolichovespula,* of which previously extant knowledge was most advanced, the authors have added new information obtained from Asia, mainly from Japan, and have widened the understanding of the ethology of these wasps without, however, opening any new vistas. With regard to *Vespa* and *Provespa* the position is quite different, the authors having made major original contributions. For *Vespa,* previous knowledge of which was largely based on *V. crabro,* studies of seven species, all of which occur in Japan (including the Ryukyu Islands), are presented. Concerning *Provespa,* about which almost nothing had previously been recorded, life history studies of two species, recently studied by Matsuura in Sumatra, are given.

The first two of the total of thirteen chapters present the preliminary material necessary to grasp the basic features of the life cycle of Vespinae and their behaviour as social insects. Topics that are briefly touched upon in those chapters are discussed at greater length in subsequent chapters. These chapters deal with nesting habits, social structure and behaviour, foraging behaviour, population dynamics, life of wasps in the tropics, social parasitism, natural enemies, phylogeny and classification, distribution and phylogeny, vespines and Man, and the identification with the aid of keys of the sixteen Japanese species.

One aspect that has not been dealt with in the book is that regarding the latest sociobiological theories and ideas. Possibly the authors are of the opinion that studies of the Vespinae are not yet sufficiently advanced for such discussion. Shoichi Sakagami, the writer of the foreword to the book, has commented that ironically the book may be expected to have quite a long life because of this 'fault'.

A notable feature of the book is that the text is supplemented by no fewer than ninety black and white photographs of relevance and of consistently outstanding quality. These illustrate nest form, a wide range of activities at the nests and on the combs, interactions between colony members as well as activities such as food gathering away from the nest.

Whereas, as has already been indicated, the book is based very largely upon the authors' own work, full cognizance has been taken of the work of other vespine researchers. Reference is made to some four hundred papers constituting almost all of the important publications up to 1983, the date of completion of the manuscript for the original Japanese edition. As a review of the knowledge of the biology of the Vespinae the book is therefore unrivalled.

The translation from the original Japanese text into English is unusually good, being not only grammatically sound and intelligible but being in a style which makes for easy and indeed enjoyable reading.

In summary this is an outstanding book which should be read by all seriously interested in the biology of social wasps. I am delighted to have it on my bookshelf.

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Horns, Pronghorns, and Antlers

Edited by G.A. Bubenik and A.B. Bubenik

Springer-Verlag, New York
ISBN 0-387-97176-9
562 pp.

Since I have a special interest in signalling systems and sexual selection I was very interested in the ideas on the significance of horns and antlers offered by Anthony Bubenik when he visited our country a few years ago. I was therefore excited to review a book, dedicated to the topic of horns and antlers and edited by him and his son. The book comprises 19 chapters written by authors that have published extensively on the topic. Several aspects of horn and antler biology are covered, including palaeontology, genetics, neurology, angiography, endocrinology and ethology.

The biggest disappointment was the first chapter by Anthony Bubenik. He uses some terms in unusual ways, e.g. architectural *ritualisation* of antlers (p. 66) and *functions* of *exaptations* (p. 21). On pp. 11–13 he presents some arguments which I interpret as explicitly Lamarckian: external stimuli emanating from the cranium would activate 'dormant' DNA and thus result in antler formation. Bubenik offers many novel ideas about antler characteristics, e.g: the species-specific morphology of antlers, the effect of habitat on antler structure, the relationship between antler size and other body markings as well as the role of antlers in scent-marking. However, none of these discussions are based upon or explicitly refer to quantitative analyses of these relationships. The same applies to Groves and Grubb's Chapter 3 on muntjac taxonomy which does not include a molecular, cladistic or phenetic analysis, as do not Grubb's Chapter 4 on the Cervidae of south-east Asia and Alan Gentry's Chapter 6 on the evolution and dispersal of African Bovidae.

The book includes an extensive argument about the ontogeny of antlers. George Bubenik (Chapter 8) summarizes existing knowledge on the neuroendocrine regulation of the antler cycle. A number of hormones play an important role in antlerization. Insulin-like growth factor (IGF-1) appears to be vital for bone proliferation during the growth phase whereas testosterone is intimately involved in pedicle development, hardening of the antler and antler casting.

In Chapter 11, the same author outlines the role of the nervous system in antler growth. Deer have precise tactile sensation on the antlers while these are covered with velvet. In addition, they have 'memory' in which the locations of injuries to the antler are remembered. If an antler is injured it often gives rise to ossification and a new branch at the injury site. Moreover, after the injured antler has been casted, antlers grown in subsequent years have similar additional branches as developed at the site of original injury, sometimes even on the uninjured side as well. Bubenik supports his father in suggesting the existence of antler growth centres which contain genetically determined factors regulating species-specific antler

growth and which control most aspects of antlerogenesis. James Suttie (Chapter 12) also presents evidence that the CNS is intimately involved in antlerogenesis. Relatively complete antler growth has only been successfully stimulated in areas of the head innervated by the branches of the trigeminal nerves that innervate the pedicles. Suttie and Peter Fennessy (Chapter 10) used axial tomography (CAT-scan) and angiography to elucidate the bone structure and venation of the pedicle and antler. They conclude that the basic blood vessels that feed each branch of the antler are already present in the pedicle before antler growth and speculate that these blood vesels may play an important role in bringing about the shape of the antler.

Two chapters deal with factors causing variation in antler morphology. Robert Brown (Chapter 16) describes how both food quantity and quality can strongly affect antler growth. The total amount of calcium needed for antlerogenesis is somewhat less than that required by females for lactation. Scribner and Smith (Chapter 18) discuss genetic variability and antler development. They conclude that average heterozygosity has a marked effect on antler size as well as on the proportion of stags with simple spiked antlers. This is a hotly contested issue and Bubenik (Chapter 1) cites authors with different points of view.

When one deals with the evolutionary significance of head appendages, at least three possible functions need to be considered: (i) armament against predators, (ii) structures that enable male/male interaction during the rut and (iii) organs enabling male/female signalling during the breeding season. Little discussion bears on the importance of the first alternative. The second alternative is covered in Bartos' Chapter 17 on social status and antler development in red deer and O'Gara's Chapter 7 on pronghorn. There is no doubt that antlers form an integral part of male/male interactions in virtually all Cervidae. Less is known about the importance of the third alternative. Three factors would influence male/female signalling. First, the majority of chapters refer to the species-specific character of antlers. However, no one gives a thorough analysis of this thesis. Antlers show wide intraspecific variation in both size and shape: which features are intraspecifically conserved and which vary? Second, antler morphology is affected by vegetation: forest-living species have antlers that are swept back whereas the antlers of plains-dwelling deer species are more protuding (Chapter 1). Third, antler size is complemented by body markings used in sexual displays. Bubenik (Chapter 1) cites moose as a cervid with large antlers and few body markings. The other extreme is exemplified by roe deer which have prominent caudal marking and small antlers. A range of intermediate species exist. The sexual behaviour of pronghorn (a species with small antlers, Chapter 7) includes displays incorporating facial marks that emphasize their antlers. Supporters of the Recognition Concept of species would state that these phenomena fit perfectly with their approach. In contrast, Clutton-Brock *et al.'s* 1982 book on red deer indicates vividly that many biologists prefer to interpret these phenomena in terms of sexual selection and not in terms of mate recognition. Antlers are obviously useful for deer in a number of ways but the question arises: which evolutionary force caused antlers to arise? Charles Churcher (Chapter 5: Cranial appendages of Giraffoidea) suggests that the ossicones in extinct giraffes showed a huge amount of variation akin to that of extant deer, that the ossicones evolved for male/female recognition and that secondary uses of the horns evolved afterwards. Christine Janis (Chapter 2) suggests that cranial appendages in deer and bovids evolved after their forest-dwelling ancestors became adapted to the open habitats that arose during the Miocene and which (via adaptations in diet in this new environment) adopted a different social system which enabled sexual selection to take place.

I found the book fascinating in that it provided a look at antler formation from so many perspectives: physiological, genetical, anatomical and ecological. The palaeontological data presented by A. Bubenik and Janis puts a very interesting historical perspective to the antler phenomenon. The chapters written by authors without a direct interest in behavioural ecology also indicate that antlerogenesis should not only be interpreted within the context of sexual selection but that alternative hypotheses are available. The reviews of the ways in which sensory stimuli arising from antlers can have long term effects on antler morphology is also a mainstay. The book would be of interest to physiologists, mammalian systematists and behavioural ecologists.

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Ecophysiology of Desert Arthropods and Reptiles

J.L. Cloudsley-Thompson
Springer-Verlag, 1991
203 pages
Price: DM 168,00

This is the second book of a Springer series on the adaptations of desert organisms (the first was R.T. Wilson's *Ecophysiology of the Camelidae and Desert Ruminants* in 1989).

It is entirely appropriate to deal with arthropods and reptiles together: both are in a sense pre-adapted to desert living because they possess relatively waterproof integuments, excrete insoluble nitrogenous waste, are ectotherms with low metabolic rates, and are small enough to escape from environmental extremes. Both groups are highly successful in deserts throughout the world, and desert lizards in particular have had a major influence on the discipline of ecophysiology.

After a general chapter on deserts and their faunas, Cloudsley-Thompson deals with microclimates and the avoidance of environmental extremes (chiefly by circadian rhythms), temperature regulation (mainly behaviour), water balance (mainly physiology), seasonal activity, burrowing and avoidance of enemies, and finally interspecific relationships (chiefly dietary).

The book contains a wealth of useful information, but it is presented in very fragmented form. Each topic is illustrated by many brief examples, rather than a few discussed in detail by way of explanation. The effect can be very confusing. The text is illustrated with a large number of the author's own photographs, and very few figures are used to present actual data.

In general the writing style is not particularly coherent: there were paragraphs where I could not follow the line of thought at all, interesting topics touched on and then not followed up. The index, consisting mostly of scientific names, does not help. Recent work on evaporative cooling in desert cicadas is barely mentioned; discontinous respiration in desert ants is omitted and in fact respiratory water losses are not covered at all; foraging tactics of lizards are discussed but there is nothing on their exercise physiology. What about heat shock proteins, now

well understood at the molecular level: has any ecophysiologist looked at their role in the thermal tolerance of desert organisms?

Far from being a new analysis, the book resembles a catalogue of desert adaptations. This is especially disappointing at a time when new approaches (evolutionary, molecular) are developing in ecological physiology.

Less importantly, there is a fair sprinkling of typographical errors and some more serious ones. Two examples involving the fauna of the Namib Desert: a photograph of *Onymacris marginipennis* is labelled as *O. rugatipennis;* and on p. 97 *Lepidochora argentogriseus* (correctly *argentogrisea*, but now *discoidalis*) of the Namib Desert is described as drinking fog water condensed on its elytra.

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Practical Taxonomic Computing

Richard J. Pankhurst
Cambridge University Press
202 pages
Price: £24,95

In 1978 Richard Pankhurst published a book entitled *Biological Identification*, a large portion of which was devoted to the use of computers for identifying organisms. Computer software and hardware have advanced considerably since that time and the book under review is an updated and expanded version of the former. Although the present book is still devoted mainly to identification methods, it also deals with databases and the use of computers for classifying organisms.

Much of taxonomy is concerned with the manipulation and synthesis of large quantities of information and it therefore makes good sense to use computer databases to automate the process. The author uses his program PANDORA to explain how relational databases work and how they can be used for storing and retrieving curatorial data, distribution data, nomenclatural data, bibliographical data, and morphological data. He also mentions a number of other databases that are in use round the world including the PRECIS database in Pretoria which has over 660 000 plant records.

The chapter on classification deals with phenetic and cladistic analyses and the software packages available that use these methods. A large book could be written on this complex subject so do not expect this chapter to give you an in depth understanding of the methodology. The explanations supplied are confusingly brief but one can always look up the references cited to get more details.

Five chapters are devoted to identification methods and their titles are as follows: Conventional identification methods; Computerised identification methods; History of identification methods; Applications in computerized identification; and Expert systems. The book therefore deals with identification methods in their entirety and not just the computerized methods. I feel that too much attention has been given to the manual identification methods. For instance, punched card methods are discussed in detail and yet, with the advances in computing, these methods are on the way out; discussing them in detail makes the book more out of date than it need be. More space could have been given to the computerized methods where once again the explanations are rather brief.

Computers have the potential to revolutionize taxonomy but one would not think so reading this book. In trying to cover all the different methods that are available for classifying and identifying organisms, the author loses the overview. Most taxonomists use a computer for word processing and little more. Why is this so? It is because the computer programs available for taxonomy are still relatively unfriendly to use, they tend to be specific in their applications, and they fail to integrate all the main needs of the taxonomist. In addition, taxonomists are faced with a huge backlog of data to computerize. I would have liked the book to have provided a more critical evaluation of the current state of taxonomic computing and more details of its future. Nevertheless, it provides a useful summary of taxonomic computing, and would be of value to taxonomists who wish to use computers more in their work.

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