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BOOK REVIEW. . .

The Biology of Disease Vectors, B. J. Beaty and W. C. Marquardt, editors, Published by the University Press of Colorado, P.O. Box 849, Niwot, Colorado 80544, USA. 1996. 632 pp., $70.00 U.S.

In light of the disseminated development of resistance in vector species to pesticides and in pathogenic microbes to antibiotics, the next level of vector and disease control appears to be rapidly rising from the ranks of molecular biology and technology. To this end, in The Biology of Disease Vectors Beaty and Marquardt (editors) are at the beginning of a worthwhile journey to accomplish their declared objectives (q.v., Preface pg. XIV) of "introducing molecular biologists to medical entomology, to give experience to medical entomologists in molecular concepts and methods, and to develop a worldwide network of vector ecologists."

Forty-five professional contributors (including both editors) from various disciplines combined their respective specialties into this 632 page composition separated into five major topics: I. Introduction to Arthropods as Vectors (12 chapters), II. Molecular Biology of Vectors (3 chapters), III. Biology, Physiology, and Development of Vectors (8 chapters), IV. Population Genetics and Molecular Systematics (3 chapters), and V. Surveillance and Control of Vectors (9 chapters).

Although this volume has a consistent general format of organization and presentation, each chapter has been written independent of one another. The few exceptions of continuity may be seen when a contributor is author or co-author of more than one chapter, or makes a general reference to other authors' chapters. Thus, there is a certain amount of repetitiveness and to a certain degree some inconsistencies. However, these small discrepancies, are greatly overshadowed for the most part by the direction and focus of the information. In general, each chapter fulfilled its title's promise and was well done.

The following is a brief critique of each chapter. This is intended to be constructive and helpful for possible modifications, corrections, and/or adjustments for probable future editions of this work.

Chapter 1 provides, as its title indicates, introductory information on arthropods including vector species. This chapter presents the introductory information well. A note of possible change for future revisions includes the expansion of the section on Zoological Classification that contains a definition of the term "species" (q.v., page 440) and the recommendation that all contributing authors include the most recent taxonomic and systematic placement (complete with authors and cited references) of the species discussed in their chapter. Whether molecularly and/or morphologically determined, the species still remains the basic reference point in the discussion of biological systems.

Also, in this chapter, and many of the others as well, errors of commission and omission were noted that at times detracted from the professional presentation or understanding of the intended points of fact and/or concept. Future endeavors should include more stringent editing reviews by the authors and the editors. In this chapter observed lapses included:

(1) Page 15, Order Ixodida. The genus Ixodes, a taxon containing many important vector species was excluded from the list.
(2) Page 16, Life Cycle of a Chigger. The causative agent for scrub typhus is *Rickettsia tsutsugamushi*, not *R. akamushi*.
(3) Page 17, Argasid Ticks. African swine fever is caused by a virus (ungrouped) not by *Borellia recurrentis*, a relapsing fever spirochete.
(4) Page 18, Figure 1.13. The term "chigger" in the figure heading should be replaced with the terms "trombiculid mite" because "chigger" refers only to the larval stage of this acarine family.

Chapter 2 covers the problems that arthropod vectors commonly share during and after host location and blood-feeding. This review was clearly presented and the only critical comment of minor note would be the suggestion to include more cited references after paragraphs of cogent material. In passing, the following miscues were recorded:

(1) Page 28, 2nd column, 14th line from top. The generic name *Leishmania* should be replaced by *Lutzomyia*.
(2) Page 29, 1st column, 2nd line from bottom. *Ornithodorus* should read *Ornithodoros*.
(3) Page 29, 2nd column, 23rd line from top. To which species of *Rhodnius* is the author referring?

Chapter 3 on vector behavior represents an excellent overview of behavior in insect vectors, particularly in vector mosquito species. Upcoming revisionists of this work may consider incorporating sections on behavior of other vector insect groups and acarines.

Chapter 4 deals with the natural cycling of pathogens between vectors and vertebrate res-

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ervoirs. The text is generously augmented with excellent diagrammatic figures. More cited references would prove of additional instructional value.

Chapter 5 discusses anopheline mosquitoes and the agents they transmit. Overall, this chapter is informative although the taxonomic status of *Anopheles gambiae* (pages 75–76) is not clear (q.v., pages 440–441). An editorial note is inserted here for this chapter and is extended to other chapters as well. Beginning a sentence with an abbreviation (e.g., An. = *Anopheles*) is usually avoided.

Chapter 6 is centered around the culicine mosquito species and the disease agents that are transmitted by them. There is a good discussion about RFV, YF, DEN, and JE. There needs to be similar textual consideration for VEE, EEE, WEE, LAC, and other arboviruses. Expansion of the information for these viruses should improve an already well written chapter.

Correction:
1) Page 90, 1st column, 15th line from bottom; page 91, TABLE 6.3. *Wucheria* should read *Wuchereria.*

Chapter 7 evaluates black flies and the viral, protozoal, and filarial nematode pathogens that they transmit to humans and other animals. The information is presented in a very readable fashion.

Chapter 8 provides a good deal of general information regarding biting midges (Ceratopogonidae) and the organisms transmitted by them. A section outlining blue tongue virus vectors, hosts, and transmission cycles would have given a nice model illustrating the vector/pathogens relationships of this insect family.

Chapter 9 addresses the topic of sand flies (Psychodidae: Phlebotominae) and their role as vectors of a variety of pathogens that includes protozoans (*Leishmania* spp.), a bacterium (*Bartonella bacilliformis*), and bunyavirid viruses.

Chapter 10 appraises hemipterans, lice, and cyclorraphan flies as vectors. Emphasis was placed on triatomines and Chagas disease, sucking lice and several disease agents (including *Rickettsia prowazecki*), and several fly families, in particular Glossinidae (the tsetse species). Overall this chapter covers in general the topic title. More references would broaden the scope and educational value.

Chapter 11 illustrates the importance of fleas as efficient vectors of several pathogens with major emphasis on plague (*Yersinia pestis*). The flow of information of this chapter was smooth and understandable reflecting the presentation skill of the author.

Chapter 12 covers aspects of tick and mite disease agent transmission relationships. Tick- and mite-borne rickettsiae (e.g., scrub typhus and ehrlichiosis) and bacteria (tularemia and Lyme disease), viruses (tick-borne encephalitis and Colorado tick fever), and protozoa (babesiosis) are discussed. This chapter is well organized and written. Two minor errors were noticed and are mentioned here:

(1) Page 160, 1st column, 4th line from bottom. The term "gnathostoma" should read "gnathosoma."
(2) Page 165, 2nd column, under the "Ehrlichia" section. "*Ehrlichia chafeensis*" should read "*Ehrlichia chaffeensis.*"

Chapter 13 entails a review of genomic organization of vector species and nicely presents basic data regarding arthropods and highlights current karyological knowledge of mosquito species. Detailed information regarding linkage map genetics is given for *Aedes aegypti* and *Anopheles gambiae.* Transposable elements are identified, characterized and profferred as major factors in future (near) vector and disease control programs. A seemingly prodigious task of base-pair primary sequence determinations in other vector species as well as mosquitoes lies ahead. The authors of this chapter also provide to their credit an extensive list of relevant references.

Chapter 14 is a continuation of Chapter 13 and focuses on actual and proposed techniques of genetic manipulation at the molecular level for possible interruption of pathogen development or transmission in or by the arthropod vector. One particularly intriguing suggested mechanism involves the molecular interference of an arboviral development pathway in the vector resulting in an infected but noninfective vector.

Chapter 15 emphasizes "molecular approaches that have been used to facilitate analysis of gene structure and expression in vector arthropods." Although the gene expression technology is based primarily on studies of *Drosophila* spp. the authors extrapolate from these studies to vector species with augmentation of what has already been done with a number of vectors (e.g., insecticide resistance genetic studies of *Culex quinquefasciatus* and *Anopheles stephensi*).

Chapter 16 gives a general overview of insect embryogenesis and outlines specific details for representative vector species. The authors, again relying on *Drosophila* spp.-derived knowledge, do a commendable job, but it is very clear that little work has been done on embryological investigations of vector species, in particular the acarines.

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Chapter 17 presents an interesting overview of the physiology of mosquitoes. As the author mentions at the outset, "studies of the physiology of vectors are incomplete." His *caveat* also must be heeded that references from other insect models must be made with care.

Chapter 18 covers in general the structure and function of the arthropod alimentary system and includes discussions on peritrophic matrices and blood meal processing.

Two minor typographical errors are noted:
(1) Page 308, Figure 18.9. MT = Malpighian tubule.
(2) Page 313, 1st column, 19th row from bottom. *Ornithodorus* should read *Ornithodoros*.

Chapter 19 authors present a fascinating discourse on the types (PM1 and PM2) of peritrophic matrices (=membranes) found in vector (hematophagous) insect species. A brief mention of the solid PM1 of the tick *Ixodes scapularis* illustrates the great dearth of knowledge in this area in hard ticks in particular and other species of Acari in general. The section on the peritrophic matrix as a barrier to pathogen invasion is of particular interest.

Chapter 20 describes the structure of the salivary glands of hematophagous arthropod vectors in blood-feeding and disease agent transmission. The authors also outline, in their conclusionary remarks, the application of gene engineering and manipulation to control disease agents (e.g., viruses, malarial protozoa, filirarial worms) in the cells of the salivary glands.

Chapter 21 is a short chapter projecting facts and concepts about fat bodies and hemolymph derived from models of nonvector species into the realm of vector arthropods. It appears that many more studies are required in this area of insect and acarine vector morphology and physiology.

Chapter 22 provides a summary of biochemical pathways in arthropods. Perhaps the title of the chapter should read "Energy of Metabolism" since energy is released or absorbed during the breakdown or buildup (respectively) of biochemicals which is the basic definition of the term "metabolism". The dynamics of energy flow during these anabolic and catabolic reactions are components of the process of metabolism, but energy, *per se*, is not metabolized. As with a number of other chapters, out of necessity the bulk of the topical knowledge is extracted from nonvector species studies. The section dealing with proline metabolism during flight of *Glossina* spp. (tsetse) is of special interest.

An editorial correction:
1) Page 369, 2nd column. The last entry, Van Handel, E. and A. O. Lea. 1970., should precede the previous entry.

Chapter 23 is a very good review of immune response mechanisms in insect species. The authors also provide a *caveat* in their chapter alerting the reader to the danger of applying "data derived from immune studies with lepidopteran larvae or pupae to adult hematophagous dipterans or from holometabolous to hemimetabolous insects." In any regard, the information provided about primary barriers to infection (cuticle and peritrophic matrix), hemocytes, and humoral components is still of value. Few data are presented for immunological studies of acarines.

Editorial comment:
1) Page 373, Table 23.1. Rowley and Ratcliffe 1981 and Gupta 1986 not included in References section.

Chapter 24 emphasizes the application of mathematical models of population biology factors to the studies of vector-borne diseases. Of particular interest was the section on the Reed-Frost Equation (with excellent textual and figure descriptions and explanations) that segued into a discussion of vectorial capacity.

Chapter 25 introduces basic population genetic concepts that may be applied to vector species. The authors centralize most of their discussion around the idealized Castle-Hardy-Weinberg Equilibrium Law ($p^2 + 2pq + q^2 = 1$) with discussion of gene and genotypic frequency outcomes when populations experience non-random mating, small population size, differential migration, mutation, and/or selection.

An editorial correction:
(1) Page 428, 1st column, top line: "AS homozygotes" should read "AS heterozygotes."

Chapter 26 evaluates the application of the concepts of molecular taxonomy and systematics to the study of vector species. The authors emphasize the critical need for the correct identification of species during the suppression of disease outbreaks. It may be further stated that it is important that correct species identifications be determined, morphologically and/or molecularly, to provide a firm basis for all biological investigations. A concept that is not addressed and is key to the determination of species, subspecies, etc., is one that describes a test for reproductive isolation which is fundamental to the definition of a biological species. This chapter provides detailed protocols for electrophoretic, DNA isolation, DNA hybridization, DNA probes, and PCR techniques.

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Suggested amendments:
(1) Page 450, Table 26.4.
5. Incubate on ice . . . should read, 5. Cool on ice . . .
(2) Page 464, 2nd column, 15th line from the top. Trombiculid mites are not hematophagous arthropods.

A generous list of references cited also is included.

Chapter 27 provides an excellent review of the materials, designs, and methods for collecting vector species for surveillance studies.

Chapter 28 brings to bear upon responsible governments, agencies, and individuals the recognition of ever increasing human population influences and the need to manage vector control programs with minimal environmental impact. Logical and efficient manipulation practices of environmental factors are encouraged and exemplified by some historical cases.

Chapter 29 outlines the classification, modes of action, formulations, and examples of vector control efficacy of pesticides used since the early years of this century. Even though biomolecular enterprises are underway to establish novel vector control protocols, the traditional use of pesticides (e.g., organophosphates, carbamates, microbials, IGRs) will probably continue for many decades to come.

Chapter 30 gives an overview of detecting, genetically characterizing, mechanism identifying, and population biology relating insecticide resistance. Resistance management strategies are explored, new areas of research are evaluated, and the status of resistance in arthropod vectors is discussed. The author foresees increasing insecticide resistance problems in the coming years. Nevertheless, insecticides will still play a part in comprehensive control programs in which other control options play more increasingly important roles.

Minor editorial observations:
(1) Page 527, 2nd column, bottom line: resistance. Genome [Vol. ?]: 361–367.
(2) Page 528, 2nd column, 11th line from bottom: Aedes *aegypti* should read *Aedes aegypti*.

Chapter 31 defines the fundamentals of the biological control of mosquitoes. Also discussed are the predators and pathogens of mosquito larvae including insects, mosquitofish, viruses, protists, fungi, and nematodes.

Chapter 32 expands the discussion of microbial control agents from chapter 31 and emphasizes the use of *Bacillus thuringiensis israelensis* (Bti) with excellent examples of Bti application to mosquito problems in Germany.

Chapter 33 summarizes genetic control mechanisms in vector mosquito species. Information on other vector insects and acarine vectors is wanting.

Chapter 34 advances a very extensive discussion of immunological control of tick vector species with some information on mosquitoes and other blood-feeding insects. The concept of anti-arthropod vaccines as a means for vector control is exciting and may play a significant role in integrated vector management programs.

Chapter 35, working with mosquitoes as the example vector group, presents a clearly outlined guide to rearing and containment methods for vectors. Figure 35.4 and supportive textual information provides the plan and programs of an existing functional insectary housed at the AIDL. A discussion of Biosafety Level (BL-1, -2, -3, -4) facilities and practices also is included.

An editorial observation:
(1) Page 600, Figure 25.2, top right and top left photos are reversed.

The following is a list of suggested editorial corrections, additions, changes, etc. in the Index:

(1) Page 607, 1st column. Aedes stimulans should read *Aedes stimulans*.
(2) Page 608, 1st column. Anopheles darlingi should read *Anopheles darlingi*.
(3) Page 608, 2nd column. Anopheles maculatus should read *Anopheles maculatus*.
(4) Page 608, 2nd column. *Anopheles quadriannulatus* Theobald, 1911 is a junior synonym of *Anopheles gambiae* Giles, 1902.
(5) Page 612, 2nd column. *Coelmomycidium* should read *Coelomomycidium*.
(6) Page 614, 2nd column. *Dermatophagoides pteronyssus* should read *Dermatophagoides pteronyssinus*.
(7) Page 615, 2nd column. *Ehrlichia chafeensis* should read *Ehrlichia chaffeensis*.
(8) Page 615, 2nd column. *Ehrlichia ewingiit* should read *Ehrlichia ewingii*.
(9) Page 621, 2nd column. Life cycle of tsete fly . . . should read Life cycle of tsetse fly . . .
(10) Page 624, 1st column. *Ornithodoros moubat* should read *Ornithodoros moubata*.
(11) Page 626, 1st column. Both Prosimulium imposter and Prosimilium nigripes should be italicized.
(12) Page 630, 2nd column. Tsete fly should read Tsetse fly.

It is clear after reading and evaluating this work that it has much value and will serve as a worthwhile text and reference book for medical entomologists who are staying current in their field and incorporating the overlapping con-

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cepts and ideas emanating from medical technology and molecular biology. There also is value in this book as a didactic tool for molecular biologists who are expanding their horizons into the more traditional elements of biology. Perhaps to assist in achieving this merging of two, often quite esoteric, disciplines a chapter dedicated to the concepts of traditional alpha taxonomy and molecular taxonomy and how these two may be used together. There should be some continuity between the two since each is based upon phenotypic observations which may be macro, micro, and/or molecular in nature. Other suggested additional chapters includes one that provides detailed information on technical methods and materials (e.g., ELISA, RT-PCR, electrophoresis, slide preparation, and staining), and discussion of related concepts, theory, and problems. A glossary of terms would also help connect together these various subdisciplines of biology.

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BOOK REVIEW . . .

***Echinococcus* and Hydatid Disease,** edited by R. C. A. Thompson and A. J. Lymbery. CAB International, Wallingford, Oxon OX10 SDE, 1995. United Kingdom. $115.00 (U.S.). 477 pp., 49 figures, 25 tables.

This extensive treatise is an excellent example of "follow-up" on information presented in "The Biology of *Echinococcus* and Hydatid Disease" published in 1986. The editors have brought together an effort of 20 prominent contributors from around the globe (Argentina, Australia, New Zealand, Peoples Republic of China, Switzerland, Trinidad/Tobago, United Kingdom and the United States of America) to write about the genus *Echinococcus*. "The overriding theme of this book is that a comprehensive understanding of the biology of *Echinococcus* is essential for the effective treatment and control of the diseases it causes" . . . taken from the Preface.

This book has 10 chapters, 49 figures and 25 tables. One could take issue with the breakdown of the subject matter into these 10 chapters. When there are 20 contributors, each dealing with their area of expertise, grouping of topics can be a difficult problem for the editor/s. Chapter One deals with Biology and Systematics of *Echinococcus*, Two—Genetic Diversity, Genetic Differentiation and Speciation, Three—Life Cycle Patterns and Geographic Distribution, Four—Biochemistry, Physiology and Molecular Biology, Five—Immunology, Six—Maintenance and Cultivation in vivo and in vitro, Seven—Epidemiology and Control, Eight—Modelling of Life Cycles, Nine—Immunological and Molecular Diagnosis, and Ten—Clinical Diagnosis and Treatment. These chapters have nearly 2,000 references. When one takes into account the repetitive use of some references, this is still an "awesome" and "thorough" literature review. The Figures and Tables are of good quality and do contribute to this literary effort. However, Figure 1.4 presents a graph on production of eggs in infected dogs that is poorly reproduced and the various colors (hatching and cross-hatching) are indistinguishable. The Index is quite complete and useful, except when one tries to look for information for a particular geographic area. This information is sometimes listed by Continent, Country or State.

I would consider this book to be the starting place; the first recommended to anyone with an interest in *Echinococcosis*, whether a neophyte or seasoned parasitologist. Another recent and wonderful work would be one of more restricted scope, the "Compendium On Cystic Echinococcosis With Special Reference to the Xinjiang Uygur Autonomous Region, The Peoples Republic of China", edited by Ferron L. Anderson, Jun-jie Chai and Fengjie Liu, Brigham University Press, 1993. Several contributors are the same. The latter book mostly deals with results of a cooperative research project conducted between 1987 and 1992. Much of the information concerning "Life Cycle Patterns and Geographic Distribution of *Echinococcus* species" by R. L. Rausch (Chapt. 3), "Modelling *Echinococcus* Life Cycles" by M. A. Gemmell and M. G. Roberts (Chapt. 8), "Epidemiology and Control of Hydatid Disease" by P. M. Schantz et al. (Chapt. 7) is repeated in Anderson's book. I do not know what the cut-off dates for submission of manuscripts were, but I will assume that these books and efforts by the above contributors were fairly simultaneous. It is too bad that these efforts could not have been coordinated and compiled together, or at least refer to the "other" work.

I found all chapters to be well organized. A cover paragraph was usually followed by a review of the literature in which each contributor usually discussed in detail a historical perspective and recent findings. Most chapters ended with conclusions in which a summary was presented; a few bothered to speculate as to where future research should be directed. I wish all contributors would have done so. Who should be better qualified to do so than these 20 authorities? Of special note, D. P. McManus and C. Bryant (Chapt. 5) make a point that "Studies of the biochemistry of the Platyhelminthes are sparse. . . ." This thought is reinforced by comparison of work done on nematodes. They lament that little has been done since the first volume in 1986. They also lament that many "new" techniques of molecular biology may be detrimental to research as when these techniques are an end in themselves, rather than tools to solve clearly defined biological problems. I agree. The chapters ranged in length from 11 to 132 pages. Most were from 30 to 50 pages. Epidemiology and Control of Hydatid Disease was the longest. Although the shortest chapter, Immunology was revisited in other chapters, i.e. Echinococcosis/Hydatidosis: Antigens, Immunological and Molecular Diagnosis and Clinical Diagnosis and Treatment of Echinococcosis in Humans.

All aspects of this book are very professionally done. Given the immense scope of such a

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task, the editors have pulled together a remarkable scholarly work. There will always be minor problems and details that do not appeal to everyone. This book should find a place on the shelves of most academic and medical research libraries. Researchers, teachers, students and clinicians of human, wild and domestic animal diseases will find this book a useful and valuable source of information and stimulation.

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BOOK REVIEW . . .

Birds of Prey. Medicine and Management, Manfred Heidenreich Published by Blackwell Wissenschafts—Verlag, 1995. English language edition by Blackwell Science, Osney Mead, Oxford, OX2 0EL, UK, 1997. 284 pp, 334 illustrations including 295 in color. $194.95 U.S.

Interest in the health and diseases of birds of prey has never been greater. Free-living raptors are studied by scientists from diverse disciplines and the role of many species as environmental sentinels is well recognised. Hawks, falcons and eagles are kept in captivity for falconry, for exhibition and for research purposes. Maintenance of these birds under healthy conditions is an essential concomitance.

The book has 21 sections which include additional references, a glossary of falconry terms and an index. The first six chapters comprise an introduction, taxonomic classification, management, feeding, marking and identification. Chapter 7 covers clinical examination, 8 clinical therapy (spelled "therapie" in the Contents), 9 infectious diseases and 10 parasitic diseases. Nutritional deficiencies, metabolic disorders and toxicoses constitute Chapters 11–12 while 13, the longest in the book, is devoted to diseases of specific organ systems, ranging from the urinary and reproductive tracts to tendon and band (ring) injuries. Neoplasms are discussed succinctly in Chapter 14 and anesthesia in 15. Rehabilitation of birds of prey (16) occupies four pages of text and forensics (17) twenty seven. The final "chapter" (as opposed to references and glossary), is entitled "Legal issues regarding birds of prey".

Much of the text of this book is well written, scientifically sound and pertinent to either the care of raptors in captivity or the diagnosis, treatment and control of their infectious and non-infectious diseases. The author clearly attributes many of the ailments of captive birds of prey to inadequate or inappropriate management and skillfully weaves advice on accommodation, diet and the like into his discussion of diseases and their prevention. Not all of his views and theories will be acceptable to other veterinarians and raptor biologists but, as M. Heidenreich says in the Introduction, this is part of the purpose of his book, especially if it leads to debate and discussion. Eyebrows will be raised at some assertions—for example, on page 87, that "In 1978, both Harrison and Heidenreich independently developed the techniques for endoscopy in avian patients". This is a surprising claim by an author who clearly has a great sense of history and who elsewhere in his text refers to papers published in the late 1960's and early 70's—the period when laparoscopy of birds (originally pioneered by field ornithologists many years' earlier) first found its way into veterinary medicine. Here and elsewhere one gains the impression of a *selective* literature search—usually sufficient for veterinary practitioners seeking guidance over clinical cases but woefully inadequate for the reader who is interested in the evolution of raptor medicine or the research worker who wishes to develop a comprehensive bibliography.

Manfred Heidenreich's book is attractively produced. It is rightly described by the publishers as "lavishly illustrated"; the photographs, almost all by the author, are excellent. The statement on the cover that it is "The most comprehensive and authoritative work on the subject published for over 20 years", warrants more critical analysis, however, since this claim appears to disregard the Proceedings of both the International Symposium on Diseases of Birds of Prey held in London, UK in 1980 (Cooper and Greenwood, 1981) and its successor, the Second International Symposium on Raptor Biomedicine, in Minnesota, USA in 1988 (Redig *et al*, 1993). Each of these (peer-reviewed) Proceedings received excellent reviews at the time—see, for example, that of "Raptor Biomedicine" (1993) in the Journal of Wildlife Diseases (1996) 32(2), 410–411 and they still provide scientific information on raptors that is unavailable elsewhere. Interestingly, both Proceedings are referred to in the text of this new work, suggesting that, as is often the case nowadays, the author had little say in the design of the cover of his own book.

Heidenreich's book would, the reviewer suggests, be best considered as *supplementary* to earlier Proceedings, rather than a competitor. Its emphasis and style are very different, incorporating as it does much on management of raptors and concentrating almost exclusively on diseases of captivity. True, there is a short chapter on rehabilitation but the reader will search in vain for data on the epizootiology of infectious disease or the role of micro and macroparasites in morbidity and mortality of free-living birds of prey. Such information is included in the two Proceedings referred to earlier and they will therefore probably be competition for the description of "comprehensive and authoritative" by biologists and veterinarians who are involved in the diseases of raptors as they affect population dynamics or species survival rather than their impact on the health and welfare of individual birds.

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A more general criticism of this book relates to its style. It seems bizarre to a European reviewer that a German book translated into English, published in the UK and with one section devoted to European legislation is in most other respects oriented towards a North American readership. European spellings (e.g. "colour" and "catalogue") are used on the title pages but these quickly change to their American equivalents, the only significant exception being "molt" and "moult" which sometimes appear together! No trans-Atlantic cross-referencing of words or spellings is provided, even in the Index, so the European, Australasian or African reader who may be unaware of regional differences in the English language will search in vain for such key words as "oesophagus" or "oedema". Equally, while the North American reader may feel comfortable with the text, he/she could well be misled by the cover into thinking that this is a purely European production. Such features are not, *per se*, a cause for condemnation but, when coupled with a certain amount of quaint translation, could make the book less universally acceptable and comprehensible than the author and publishers might have hoped. The translation from German is, generally, very good but Yvonne Oppenheim or the publisher would have been prudent to have consulted Anglophone colleagues, especially over words and phraseology that are ambiguous or have alternative connotations in different parts of the English-speaking world.

A unique feature of Heidenreich's book is his chapter on forensics. Here he discusses subjects that are relevant to law enforcement concerning birds of prey—among them aging, plumage, cere, leg and eye characteristics, sex determination (surprisingly, with no mention of chromosomal methods), species recognition including hybrids and mixtures of races, and eggshell identification. Much of this material has not previously been published in one volume and is therefore very welcome. What is disappointing, however, is the absence of text on other aspects of forensic avian medicine such as methods of elucidating the cause and manner of death or of determining whether a raptor has been subjected to unnecessary suffering. Forensic studies on birds have advanced substantially in recent years, on both sides of the Atlantic, and reference to some of that seminal work would have much enhanced this interesting and novel chapter.

The section on legal issues is in many respects complementary to that on forensics. The title is misleading since reference is made only to CITES, with no mention of other types of conservation law nor of the many additional legal controls that are relevant to birds of prey, such as those concerning animal health, welfare, transportation, veterinary treatment and supply and use of medicines and health and safety. Unfortunately the section on European law is already out-of-date since the EEC Regulation 3626/82 on CITES (referred to in the book as "EWG Decree Nr 3626/82" has been replaced by a new (1997) Regulation. Caution must, therefore, be exercised when referring to this chapter. The use of American spelling throughout for the English text of a European Union document will surely send a shiver down the corridors of power in Brussels and could confuse those readers who try to match the wording in the book with that in their own country's official version. The inclusion by Heidenreich of a legal chapter is to be applauded but in any future revision of the work it will need to be broadened in scope and refined in quality.

In conclusion, despite falling short of some of its own claims, "Birds of Prey. Medicine and Management" is to be welcomed. It will undoubtedly prove of great value to veterinarians and others who are concerned with the health and wellbeing of raptors in captivity. Readers of the Journal of Wildlife Diseases and others working with free-living birds of prey are likely to continue to refer to the more academic works of 1981 and 1993, but should, nevertheless, ensure that they have access to Manfred Heidenreich's tome which makes a useful and refreshing addition to the literature on the Falconiformes and their diseases.

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BOOK REVIEW . . .

Manual of Psittacine Birds, Peter H. Beynon, Neil Forbes and P. C. Lawton (editors). Published by the British Small Animal Veterinary Association, Limited, Kingsley House, Church Lane, Shurdington, Cheltenham, Gloucestershire, GL51 5TQ, 1996, 239 pages. Distributed in the USA by Iowa State University Press, Ames, Iowa, USA, $72.95 (U.S.).

Seventeen authors, mostly from the UK, have contributed to this text covering basic information on the medicine and husbandry of psittacine birds. The first nine chapters discuss avian husbandry, examination, diagnostic, and therapeutic techniques. The remaining chapters address psittacine medical problems, loosely organized by organ system.

Psittacine medicine has advanced rapidly in the past 10 yr and the authors have condensed the core of this information into a basic text. The beginning avian practitioner will find much useful information. The basics of nursing care, radiography, cytology, anesthesia and post-mortem examination are well covered and most major medical problems are addressed. There are numerous charts, drawings and photographs to enhance the text. Recommended drug dosages are easily found in a separate chapter.

The text does have some limitations. The organization of the chapters can make it difficult to find some information without extensively consulting the index. This is a particular problem for diseases that span multiple organ systems and more extensive cross-referencing and indexing would be helpful. As with any multiple-authored text, the depth of coverage of different areas of avian medicine varies. This book is written primarily for a British audience and emphasizes avian problems, techniques, and diagnostic laboratories common to the UK. British proprietary product names are frequently used, but practitioners in other countries should be able to find an equivalent product. Basic diagnostic techniques are covered but there are no reference values to guide interpretation of hematological results and only a few reference values and limited guidance are provided for interpretation of basic biochemistry tests. As is appropriate for a basic medicine text, some advanced techniques and extensive referencing are omitted, but review articles and selected references are provided for the reader seeking more information.

This text fills a valuable niche and will be of most use to beginning avian practitioners and small animal practitioners seeing an occasional bird. The extensive use of charts, tables, and photographs makes it useful as a quick reference. It could also aid wildlife biologists seeking to learn more about avian medicine, in particular diagnostic and post-mortem techniques.

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BOOK REVIEW . . .

Manual of Raptors, Pigeons, and Waterfowl, Peter H Beynon, Neil Forbes, and Nigel H, Harcourt-Brown (editors). Published by the British Small Animal Veterinary Association, Limited, Kingsley House, Church Lane, Shurdington, Cheltenham, Gloucestershire, GL51 5TQ, 1996, 364 pages. Distributed in the USA by Iowa State University Press, Ames, Iowa 50014, USA, $89.95 (U.S.).

This is the latest in the BSAVA Manual Series on various aspects of clinical veterinary medicine. Twenty-six authors from the UK, USA and Europe have contributed to the text. The aim of this book is to provide information that will enable the veterinarian to treat basic problems in birds of prey, pigeons and waterfowl. The text is divided into four parts. The first section covers general clinical examination, diagnostic and therapeutic techniques that are common to all three groups of birds. The other three sections are devoted to specific information about each bird group. Sections devoted to the individual bird groups are composed of a chapter covering management and husbandry followed by chapters on problems loosely organized by anatomical system. The inclusion of numerous charts, drawings and color photographs improve usefulness of the text.

The authors have done a commendable job of assembling information on husbandry and the diagnosis and treatment of common problems in these groups of birds. The anatomical approach makes it easier to find information based on clinical signs, but results in some duplication when a single disease (for example lead poisoning) is discussed in several chapters. In most cases the information is adequately cross-referenced and the index is coded to guide the reader to pages with the most complete information about the problem. This is a very helpful feature. The first 11 chapters provide good coverage of basic avian medical techniques but (as expected with any multi-authored text) the coverage is uneven. For example, hematology is extensively discussed while the chapter on biochemistry tests is scant and no reference values are provided for waterfowl. Raptors receive the most complete coverage and trauma and physical problems are well covered. Among the raptors, management of falconer's birds is emphasized, although wild birds presented for rehabilitation are given adequate coverage. Sections on pigeons, and especially waterfowl, are more cursory, but the major problems are addressed. British proprietary product names are frequently used in some chapters, but practitioners in other countries should be able to find an equivalent product.

This text will be highly useful to practitioners seeing an occasional raptor, pigeon or waterfowl, and those starting to develop a specialty practice in this area. The extensive use of charts, tables, and photographs makes it useful as a quick reference. Although the emphasis is on medicine of captive birds, wildlife biologists seeking a reference for medical problems of these avian species also would find this text useful.

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