

organisational structure and philosophy, employee recruitment, training and retention, and marketing and development. The authors recognise that zoos are not only conservation organisations, but also vibrant and intricate businesses, and they conclude: “A new generation of zoo managers must take a more holistic approach, while at the same time never losing sight of their primary objectives”.

If there is a weakness in this excellent volume of the *International Zoo Yearbook*, it is perhaps that it discusses zoos from only one standpoint — that of zoos. All of the authors are either still working in zoos or come from a zoo background. While this certainly provides for informed and knowledgeable articles, it also means that we are only getting a zoo perspective on their role today and how they should be tackling the future. As M Hutchins writes in his article “Zoo and aquarium animal management and conservation: current trends and future challenges”: “To meet the challenges of the future and address the concerns of their critics, zoos and aquariums must get better at doing what they claim to do.” It would be interesting to hear what these zoo critics really feel about what zoos are doing now, and how they would like to see them develop into the future.

Nevertheless, this is a book that I would recommend to anyone interested in zoos — their history, development, aims and objectives, and their role and relevance into the future. It makes a valuable addition to our knowledge and understanding of just what we should expect from today’s zoos.

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***Pain and Practical Pain Therapy. Proceedings from the AVERT and ANZCAART Conference, 14–16 May 2001, Melbourne, Australia***

Edited by M Bate (2002). Obtainable from M Bate, c/o Research Office, The University of Newcastle, University Drive, Callaghan, NSW 2308, Australia (email: [Mary.Bate@newcastle.edu.au](mailto:Mary.Bate@newcastle.edu.au)). 140 pp. Paperback. Price Aus\$22.00.

This book is a collection of papers derived from a conference held in Melbourne in May 2001. The conference was organised jointly by the Australian Veterinarians in Ethics, Research and Teaching (AVERT) and the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCAART). There are 22 papers, grouped into five sections, with an introductory paper on human responsibilities and animal pain. This paper asks the reader to consider in a challenging manner what is the nature of pain, what is the function of pain, and what is the place of pain in our physical and mental life.

Three papers are grouped under the theme ‘Understanding pain’. The first is an informative overview of the Australian Code of Practice for the Care and Use of Animals for Scientific purposes. It is relevant to conducting research on animals in Australia. This is followed by two papers on the mechanisms of pain. Both papers provide the reader with a

good résumé of our current understanding of the pathophysiology and the causes of pain. Readers at all levels of knowledge will gain a useful understanding of the basis of pain.

The next section comprises four papers focussing primarily on the recognition and assessment of pain in animals. This is a challenging field of animal pain, and the authors have summarised much of the literature concerning pain assessment and have incorporated personal observations. There are summaries of possible pain-induced behavioural alterations in many domestic species and a review of the currently used pain assessment ‘tools’. The final paper deals with the selection of an analgesic for use in various pain scales in dogs and cats. There are useful tables of drug dose rates for the management of acute and ongoing pain. This paper leads into a section on pain therapy, which includes papers on analgesics as anaesthetics and a useful paper on nursing animals in pain. There is a summary of complementary therapies in pain management and a paper on considerations for pain management in experimental animals.

The section on ‘Clinical analgesic practice’, which contains an overview of practical techniques for pain management in small animals, is comprehensive; ‘pocket pets’, ruminants, birds and wildlife are also considered. The section on pain management in ruminants covers castration in calves, dehorning in cattle and velvetting in deer.

Overall, this is an informative book for the general or species-specialist practitioner. As is inevitable in a collection of papers from a conference, there is overlap in some areas (in particular, recognition and management of pain in small animals) while there are some notable omissions (eg little consideration of horses or pigs). However, it is a useful addition to the growing literature on animal pain, and it is recommended to general readers and to undergraduate veterinary students.

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***Animal Social Complexity: Intelligence, Culture, and Individualized Societies***

Edited by FBM de Waal and PL Tyack (2003). Published by Harvard University Press, Fitzroy House, 11 Chenies Street, London WC1E 7EY, UK; <http://www.hup.harvard.edu>. 640 pp. Hardback (ISBN 0 674 00929 0). Price £33.50.

What do we mean by social complexity, what are its causes, and what does it tell us about an animal’s cognitive abilities? These are questions addressed by this book, but to them could be added another: why should animal welfarists be concerned about social complexity? Complexity is a relative term. Social insects, such as some hymenoptera, show considerable social complexity, but this book does not deal with the rather mechanistic lives of these organisms. Instead the editors and organisers of the conference, of which this book is the proceedings, take complexity to refer to the numbers of relationships and the variety of interactions between animals. They are concerned not only with how

animals interact, but also with how they modify their interactions with other group members as a result of past experience. Why should this be of interest? The answer lies in the link between social complexity, relative brain size and intelligence. To interact in an adaptive way in a group of any size means that an animal must be able to recognise and remember other group members, remember their past behaviour and the effect it had on the animal in question. They may even need to consider triadic or greater interactions, and a theory of mind would be useful to allow better prediction of other animals' interactions. It has been hypothesised that the need to cope and interact with other group members could exert powerful evolutionary pressure on animals to invest in large brains and, in turn, this may lead to the development of other cognitive abilities. It is therefore interesting that there does seem to be a general correlation between neocortical volume (adjusted for body size) and group size. For the animal welfarist, social complexity is of importance not only because we need to understand the complexities of animals' social structure in order to make rational decisions in animal management or husbandry, but also because the associated brain size and cognitive abilities have the potential to allow different types of suffering, such as may result from an ability to empathise with other animals or to worry about future events.

Living in groups brings disadvantages as well as benefits. One inevitable consequence is an increase in competition. Consider that an adult elephant needs to eat up to 300 lb of vegetation and drink 30–50 gallons of water per day. Increased exposure to pathogens could also be a problem, although Nunn's study in this volume shows that although promiscuity in primates increases immune markers of infection, there is no correlation with sociality itself. Despite these potential disadvantages, the fact that some animals do live in groups shows that for them the benefits must outweigh the costs. Some of the more basic reasons for living in groups are to reduce the risk of predation and to improve hunting success. However, as cognitive skills improve, the potential benefits are also increased. So the transmission of information about the environment, such as the location of waterholes, increases the elephant matriarch's inclusive fitness. Similarly, the ability of individual chimpanzees to form successful coalitions and alliances can have huge benefits. The other side of the coin is that failure can be catastrophic; the description of the wiping out of one band of chimpanzees by another is harrowing.

This book provides an unrivalled summary and comparative study of the complexities of social structure in groups as diverse as primates, proboscids, birds, bats and cetaceans. This is of particular value now that biologists have become so compartmentalised, and may serve to remind primatologists that although the great apes are certainly very different from other groups, the differences between monkeys and some of these other groups may be less extensive than they suspect. For example, in common with chimpanzees, some cetaceans show cultural transmission of behaviours such as fishing techniques and vocalisations. Similarly, both laboratory experiments and field studies reported in this volume

show that capuchins, like chimpanzees, will work together to achieve a common aim, even though this is not always an easy task. Boesch describes how, for chimpanzees, anticipating the movements of other hunters and prey is a skill that is progressively acquired over a 20-year period. Other complexity seems to be achieved more easily. Bat infants have individual contact calls to allow their mothers to return to them. In colonies of up to 1000 bats in some species, it will be apparent that the problem of finding the correct infant is a big one. It appears that the infants are born with the necessary degree of call diversity, but are also able to modify their calls as the result of experience.

The studies reported here delve into mechanisms as well as outcomes. Apparent complexity can be achieved by rules that reduce the amount of information processing. For example, categorising individuals into various classes may simplify a cognitive task, as may responding to an individual on the basis of its last response to you. The studies also provide insights into the mechanisms of learning. For example, Matsuzawa's study shows that chimpanzee infants fail to obtain a reward when cracking palm kernels until they are three-and-a-half to five years old. It is difficult to explain their persistence and ultimate success at this task using simple contingent reward learning theory.

The book does raise questions of interpretation. It is all too easy to anthropomorphise. Do whales really 'choose' to strand themselves because of a social bond? Do hyenas really choose their prey and then form appropriate hunting group sizes, or could a more parsimonious explanation be that, having formed a particular group size, they then hunt prey of the appropriate size? All too often, behaviours can be explained in cognitively simple or cognitively complex ways. We tend to choose the explanation that most closely fits our prejudice so that human behaviour is typically explained in a complex higher-order way. Fortunately, sometimes there is evidence that can help us to choose. Both sea lions and chimpanzees will intervene as third parties in aggressive interactions. While the chimp behaviour seems to be aimed at maintaining the peace within the group, male sea lions that intervene in female–female aggression are probably more motivated by the link between aggression and female sexual receptivity.

The book is full of information from researchers who have an excellent knowledge of their study animals. Chimpanzees appear to 'laugh' to themselves during play (a behaviour not seen in macaques), and one observation suggests that they may even be able to understand the concept of a joke. Bottlenose dolphins have individual signature whistles that are imitated by other dolphins. Just possibly, these calls could be used to call another dolphin by name or even be used in a referential sense. If these hypotheses turn out to be correct, we may again find that the differences between ourselves and the rest of the animal kingdom are not as great as had been thought.

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