

project a detailed overview of their findings and recommendations, yet also provides those more familiar with the Welfare Quality project a fast and easily accessible source of information. With respect to the impact of the Welfare Quality project, the editors rightly point out that the findings of the project will “not simply sit on a shelf and gather dust”. This book is an excellent ‘go to’ reference and is unlikely to gather much dust on my bookshelf.

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Handbook of Laboratory Animal Management and Welfare, Fourth Edition

S Wolfensohn and M Lloyd (2013). Published by Wiley-Blackwell, 9600 Garsington Road, Oxford OX4 2DQ, UK. 392 pages Paperback (ISBN 9780470655498). Price £39.99, €51.90, US\$64.99.

The fourth edition of this popular laboratory animal science handbook, written by two prominent laboratory animal specialists (Sarah Wolfensohn and Maggie Lloyd), is an excellent reference for animal scientists that work with research animals in the laboratory setting. I commend the authors for taking a popular and useful handbook and improving upon it. The handbook has been extensively revised and reorganised from earlier editions and in my view has been significantly enhanced. It is written in a clear, succinct, easily read style that lends itself as a tool for training both novice and experienced investigators. My only disappointment with the book is the limited utility for North American and non-EU audiences due to the UK-centric references. Several of the most valuable chapters were written with the Animals Scientific Procedures Act 1986 and the UK Home Office Licensee in mind and will be of limited utility for the non-UK scientist.

The first chapter is a brief overview of education and training requirements for the UK personal license holder. It is followed by an excellent chapter that discusses the ethical considerations in using animals in research including practical reviews of the ethical review process, measuring harms and benefits, and of ways of working using the principles of the three Rs (replacement, reduction, refinement). The next chapter is a succinct overview of the regulations for research animal use within the UK. Throughout the handbook the authors do a good job in keeping the UK and EU regulatory framework in mind.

Chapter 4 reviews how to balance animal welfare with scientific considerations and provides important information for all research personnel to consider when conducting animal procedures. The authors convey an excellent approach for how to balance welfare and science in animal studies. Throughout this book the discussions of the balancing of welfare with scientific considerations is a strength that distinguishes this particular handbook from the plethora of other books that give an overview of the basic biology of laboratory animal species and techniques of using research animals.

In contrast to the excellent discussions on how to balance welfare with scientific considerations, I found the chapter on experimental design to be somewhat limited in scope. The design of animal studies is so important I felt that more attention could have been devoted to how to control variability and impart scientific quality to animal protocol development. Perhaps if there is a future revision of this excellent handbook this section could be enhanced.

As one might expect in a handbook of laboratory animal science, in the subsequent chapters the authors provide an overview of research animal handling, basic techniques of substance administration, biological sampling, laboratory animal anaesthesia and analgesia, and an introduction to surgery and surgical techniques. Similar to the earlier editions, about half the handbook is devoted to chapters that review the basic biology, handling, and husbandry of common and less routinely utilised research animal species.

In summary, I recommend this handbook enthusiastically to those both familiar and unfamiliar with earlier editions. It provides an excellent teaching tool for research and laboratory animal scientists. The handbook is written for and most valuable for a UK readership but I think my North American colleagues will agree with me that many of the chapters are excellent reading with a global appeal for those interested in the care and welfare of research animals. The melding of animal welfare issues with scientific considerations is well done.

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Wild Animals in Captivity: Principles and Techniques for Zoo Management, Second Edition

Edited by DG Kleiman, KV Thompson and CK Baer (2013). Published by The University of Chicago Press, 1427 E 60th Street, Chicago, Illinois 60637, USA. 592 pages Paperback (ISBN 978-0-226-44010-1). Price £42.00, US\$65.00.

The zoo industry has changed radically in recent years, with emphasis on animal welfare and conservation at the forefront of what used to just be menageries for public viewing. With these changes, we have seen surges in the research and husbandry that zoos are pushing and producing. This book is a good place to start for any zoo professional to become updated with the current direction. This does not mean that it is the final word on all that is out there and all the authors admit that, but I think this is what makes it a must read. One of the great points of this book is that although parts of every chapter may point out the things lacking in our knowledge of animals from their nutrition to behaviour, there is an underlying optimism and a positive push to obtaining this information. The editors state that this second edition was an overhaul of the first edition with more than 75% of the chapters and appendices changed or modified. This update does not come across as overwhelming, but rather as an uplifting demonstration as to how much research is being carried out in the

zoo arena. The work presented in this book represents 78 authors from the international zoo community. This is another sign that a more collaborative zoo world is out there. It also leads to a more cohesive flow to the seven parts of this book in which many of these chapters build on one another. Although there is an easy flow this does not mean that all the authors agree with one another, which allows the reader to make a more well-rounded decision for him or herself where the next steps in perfecting our management of zoo animals should lead. The overall focus of this book is on the management of wild mammals in the zoo world so it resonates with welfare implications in all that zoos do from nutrition to behavioural research.

For this review I want to focus on some of the direct animal welfare parts and chapters that stood out for me, but it should be noted that almost all the chapters have at least indirect if not direct implications for welfare, so as a reader I would not skip the parts or chapters not in this review.

Part one starts with what can be the most controversial of topics 'Ethics and animal welfare standards'. Starting with Kreger and Hutchins' chapter on 'Ethics of keeping mammals in zoos and aquariums', this part is divided into three chapters that hit on the topics that drive zoo professionals as well as our guests to be concerned about animal welfare in a zoo. I think that zoos do a disservice to themselves when we don't approach this subject head on and freely address the issues that bring up welfare concerns. All the authors in this section give us pause for thought on how this is a complex moral issue and that which zoo professionals may see as ethical treatment of animals, the public may not be in agreement. Kagan and Veasey's, 'Challenges of zoo animal welfare', brings up that "the public rarely asks questions about the 'happiness' of zoo animals using a scientific framework" (p 11). As researchers, we should be taking into consideration not only our peers but also the general public when we are presenting our data on welfare. They challenge us later on in the chapter with thoughts that our "assumptions, best intentions, expertise and great affection for animals (as zoo professionals) do not necessarily mean that all individual captive animals are thriving" (p 16). This may be a hard pill to swallow for zoo professionals who have spent a career pushing for a goal of animal welfare, but I see it as the first step in our acknowledging that we need to push ourselves and build on what has come before us and not rest on our laurels.

In part four 'Exhibitory', the chapters on exhibit design force us to think of the design as an integral part of insuring good animal welfare and as a such should be 'enlivened' periodically as Hancock's (p 132) comments. Coe and Dykstra (p 205) echo this view as well as expanding on the idea that zoo animals start to have the ability, through design of their environment, to have "greater self-determination" (p 207). These points really hit home for me, I feel that we tend to assume that because an exhibit is naturalistic or immersive or 'beautiful' that it will have the same enriching qualities six months or six years from now that it does the first time animals are put out in to it. Zoo exhibits need to perform a plethora of functions and not the least of those is serving as a way for animals to exhibit natural behaviours. So we need to challenge the idea that an exhibit as 'done' when construction of it has been completed.

In part five 'Conservation and research' mixed in with the information about breeding management programmes and reintroductions there is a chapter on 'Management of 'surplus' animals' by Carter and Kagan. The authors point out that the current "surplus animal problem" (p 266) brings into question zoos' efforts in animal welfare, but they also take it one step further. If we are focusing on the welfare of animals in zoos and one of our primary goals is for successful reproduction aren't we always going to have this issue? Even with careful management, animals in the zoo industry can flip flop from being breeders to non-breeders or even considered surplus and then back to breeders in their lifetimes. And along the lines of animal welfare, if we inhibit animals from breeding via contraception or even separation from other conspecifics, all in the name of controlling surplus animals, aren't we inhibiting the welfare of those animals? Once again, the focus of many of these chapters is not only to inform the reader of what information and research is out there but also where future research should focus as well as what we should be thinking about.

Part six is a compilation of six chapters focusing on the behaviours of zoo animals in different contexts (training, breeding and social structures, to name a few) and how best to collect data that may lead us to better understanding animal welfare and how scientifically we can measure it. All of these chapters emphasise that animals' natural behaviours should be at the forefront when considering good animal welfare.

Part seven 'Reproduction', explores in part the techniques of collection of samples such as blood, urine and saliva that now are much less invasive and done without affecting the welfare of the animals. All of the chapters focus on how reproduction and how we achieve that goal in zoos, can affect the behaviour of animals. As Kleiman sums up in the introduction to this section, "Changes in reproductive status and intervening in the reproduction of zoo mammals, however it is accomplished, have an impact on individual and group behavior that can have negative effects on animal welfare..." (p 410). Like other chapters in this book, this section drives home the need for us to realise that our goals and what we think animals strive for, like reproducing, may achieve the same result in the end, but don't necessarily follow the path that animals would normally take to get there.

Overall, I found that a lot of the authors, while pointing out the lack of research in certain arenas of animal welfare, really are challenging us as researchers to focus on the holes in the literature and research and press even the non-scientific community to assist in the furthering of our knowledge. There also is an underlying push for the Zoo community to see research as multi-institutional and not focus on just one zoo's collection of animals. In the end, the wealth of information in all of these chapters should lead us down the next ten years and beyond to create zoos that are examples of superior welfare.

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