

domestication by the Romans and their spread into France and England in Norman times, to their present - almost worldwide - status. It also plots the varied roles of the rabbit - as food, sport, clothing, fancy, scientific model, pet and pest. It makes one realize just how important this often-underrated animal has been in our history.

The second chapter demonstrates, with excellent colour photographs, the large number of breeds and varieties now available. The third chapter explains the structure of modern rabbit fancy which has largely created these breeds, both for exhibition and commercial purposes.

A chapter is then devoted to pet and companion rabbits, which are increasingly kept these days as an alternative to the more traditional cats and dogs. The author points out that rabbits are easy to house-train and are remarkably responsive to handling and affection.

Handling, sexing, general management (including humane killing), housing and nutrition are all covered in great detail from the pet to the commercial situation. Two chapters are devoted to breeding and genetic management, and I found the frequently confusing area of genetics very well written and explained. There is a short but fascinating chapter on the many and varied uses of the rabbit to man, followed by one explaining the rabbit industry both in the UK and abroad. The author always explains the historical events that have created the current situation, and is refreshingly honest about the negative as well as the positive aspects.

A new chapter on welfare and maintenance of health has been added to this fifth edition, advocating what are now commonly known as the 'five freedoms', but I found the description of castration without any form of anaesthetic, in chapter five, slightly at odds with this. However, the chapter concentrates mainly on good stockmanship and prevention of disease, and is a welcome addition, providing sound advice. It will do much to enhance rabbit welfare generally. An appendix on diseases of rabbits concludes the book, which is useful for both veterinarians and lay people. The author also provides a list of references and further reading.

Overall, this book is excellent and I cannot recommend it too highly to anyone with an interest in this species, be they pet-owner, breeder, farmer or veterinarian. No other text provides such comprehensive coverage of all aspects of rabbit keeping. The author's wealth of experience, historical knowledge and genuine love of his subject is always evident, and the book is packed from cover to cover with solid, unsentimental advice and information.

*Anna Meredith*

*Royal (Dick) School of Veterinary Studies*

*University of Edinburgh, UK*

***The Well-being of Animals in Zoo and Aquarium Sponsored Research***

Edited by G M Burghardt, J T Bielitzki, J R Boyce and D O Schaeffer (1996). Scientists Center for Animal Welfare: Maryland. 137pp. Paperback. Obtainable from the publishers, Golden Triangle Building One, 7833 Walker Drive, Suite 340, Greenbelt, MD 20770, USA (Library of Congress Catalog Number 96-71678). Price US\$50.00.

The hearing of elephants extends below the range of human hearing and elephants can emit sounds at these low frequencies. This knowledge resulted from a study carried out with the collaboration of a zoological park and represents one example of the value of research

carried out in this setting. Better understanding of the role of such sounds in elephant social behaviour may result in improved captive management. In 1995, a meeting was held in the United States to discuss the well-being of animals involved in zoo-based research. The published proceedings consists of 20 articles by 22 American authors and is divided into five sections, entitled as follows: 'How are research concerns different in zoos and aquariums?' 'Ethical considerations for conservation research'; 'Trends in environmental enrichment in zoos and aquariums'; 'The role of the Institutional Animal Care and Use Committee in zoos and aquariums'; and 'The veterinarian's role in protocol review at zoos and aquariums'. Many intriguing topics are covered but unfortunately there is considerable repetition of themes owing to overlap in the subjects covered by the authors.

The general feeling conveyed by the volume is that despite the drawbacks of research in zoos, such as low sample sizes and the difficulty of manipulating animals, applied quasi-experimental studies can contribute significantly to our knowledge in a whole range of subject areas – from animal behaviour to genetics and veterinary medicine. Indeed, Dr Devra Kleiman states in her paper that research in zoos increases knowledge of basic biology, contributes to the conservation of biodiversity and improves animal welfare.

On the subject of ethical concerns raised by zoo-based research, a most interesting paper addresses the well-being of captive-bred animals in reintroduction programmes. Dr Benjamin Beck rightly points out that reintroduction is likely to detract from the welfare of individual animals. His analysis of 145 reintroduction projects found that 50-80 per cent of reintroduced animals (other than fish) died prematurely. The aim of reintroduction is to establish or reinforce a self-sustaining wild population but the overall effect may be a reduction in welfare. Beck muses on whether zoo personnel should expose animals destined for reintroduction to the risks and discomfort they are likely to have to contend with in the wild; should their food be made scarce, should branches be made slippery so that arboreal animals fall from realistic heights and should natural predators be introduced and allowed to kill?

Dr Gary Varner tackles the controversial issues of the ethics of euthanasia of surplus zoo animals. Some take the view that, in a world with limited resources, the prolonged life of a surplus animal in a zoo takes away the (potential) life of another non-surplus animal. Others argue for the building of retirement facilities for surplus animals and that individual welfare is paramount over the viability of the species as a whole. Varner commences his chapter with a lively debate discussing the views of each side, but then becomes immersed in a complex and confusing argument against euthanasia which appears to hinge on the importance for animals of the expectation of activities in their future life.

There are three papers on environmental enrichment, including one by Markowitz and Gavazzi which succinctly discusses the goals of enrichment in a zoo. Burghardt, in another paper, considers enrichment an outdated term because it suggests that the last facet of zoo animal well-being is how to enrich their environment. He believes we should, 'provide animals with those aspects of nature that are critical for the most important aspects of their lives, behaviourally and psychologically, not just in terms of physical survival and health' and that, 'this must be based on knowledge of the species in nature'. Burghardt postulates that natural behaviour and a stimulating environment can promote physical health but provides no published evidence. He places the blame for physical well-being being the first goal of zoos at the door of the zoo veterinarian who, according to Burghardt, is often considered 'the real science person in US zoos' and lacking 'a supportive attitude towards

ethology and psychology, ... ultimately determines what is permissible to change in an exhibit', and rarely makes changes to encourage natural behaviour. Most controversially, Burghardt finds that failing to feed live prey to carnivorous species in captivity represents an example of how fear of poor health overrides the importance of allowing the carnivore to perform a part of its natural behavioural repertoire and he advocates more live feeding. He does not mention the welfare of the prey species.

Two papers in the proceedings concern the workings of Institutional Animal Care and Use Committees (IACUCs), which, in the United States, must be established at any institution meeting the definition of a research facility. The major activity of the IACUCs is to ensure that pain, distress or discomfort of animals involved in research is kept to a minimum. IACUCs function in a similar way to institutional ethics committees in the UK and elsewhere in the world. Zoological Parks, even those zoos which do not have a heavy research undertaking, would do well to follow the example of US zoos and form IACUC equivalents.

These proceedings will be a useful read for zoological directors, keepers, veterinarians and all those undertaking research in zoos and aquaria.

*A W Sainsbury*  
*Institute of Zoology*  
*The Zoological Society of London, UK*

***Free-range Poultry, 2nd edition***

Katie Thear (1997). Farming Press: Ipswich. 184pp. Hardback. Obtainable from the publishers, 2 Wharfedale Road, Ipswich, Suffolk IP1 4LG, UK; or in the USA and Canada, from Diamond Farm Enterprises, Box 537, Alexandria Bay, NY 13607, USA (ISBN 0852363680). Price £16.95 plus £2.50 postage and packing or US\$39.95.

This is a very well-produced and interesting book. Leonard Robinson, who is quoted in this work, said many years ago that poultry keeping was thought by many to be 'delightfully simple and simply delightful'; he then proceeded to demolish this statement by pointing out the many pitfalls of commercial poultry production. When commercial free-range poultry keeping was first practised on a large scale in the 1920's and 1930's there were indeed many problems. Nutrition was not fully understood, disease challenges were enormous and capital and labour costs were high. In addition, seasonal variations in production were almost calamitous and the environmental needs of the chicken were far from understood. Breed and strain variations also led to much disappointment and the collapse of many an enterprise.

With the advent of intensification between the 1940s and 1960s the whole picture changed. Genetic hybridization produced a uniform potential for production. Diseases were manageable with vaccines and medicines. Seasonal variations were almost eliminated and capital and labour costs reduced by very high density stocking rates and automation. All seemed well and the consumer benefitted by having cheap eggs and poultry meat, until a reaction to intensification emerged in the 1970s and has grown steadily ever since. There has been a strong and growing belief that intensive methods do not provide good welfare for the birds and the products are not as nourishing, tasty or healthy as the more naturally produced products under free-range or similar conditions.

And so poultry keeping has, to a limited extent, gone full circle by reverting to less intensive methods that allow poultry free access to pasture and housing that give full freedom