

significant difference and Tukey's test. This chapter extends these contrasts in situations where treatments are numerically defined levels, preferably equally spaced. This sort of analysis is relatively rare, presumably because it is not built into most of the more elementary statistical software (although it can be done using SAS) so it usually has to be done longhand.

The final chapter is on the analysis of experiments where the dependent variable is discrete using logistic regression. What is not covered in any way is multivariate analysis. However, that usually requires a whole textbook for itself.

So who is this book aimed at and how should it be used? I did my PhD in one of the large land-grant universities in the Mid-west of the USA, many years ago. This is exactly the sort of statistics that I was taught when doing a major in animal husbandry with minors in statistics and genetics. Our main textbook then was by George Snedecor, but we used several others. At that time I would have been very pleased to have had a copy of this book, and reading it was a nostalgic experience. My main criticism is that although it is very strong on how to design and analyse experiments, it is a bit weak on explanations. For example, although it discusses non-parametric tests there is little discussion of when they should be used instead of a parametric test. Nor is there much discussion of outliers and what to do about them. All that is suggested is to check that they are not errors. A log-normal distribution is common when studying the concentration of a substance in a body fluid, but I could find nothing on scale transformations. They may be covered somewhere and I missed them, but they are not in the index.

In conclusion, this would be a useful textbook for, say, a one-year statistics course of three or four hours per week for somebody doing a higher degree, particularly in animal science, or for a research worker who would like to become more proficient in the subject. Unfortunately, in the UK, it might be difficult to find a course being taught at this level because, mistakenly in my view, the PhD degree involves little coursework. It is probably less suitable for teaching one's self because although it is strong on 'how' it is less strong on 'why', but it is a useful reference book likely to cover some topics more thoroughly than many of its competitors. It will certainly have an honourable place on my bookshelf.

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### **Ethics of Animal Use**

P Sandøe and S Christiansen (2008). Published by Blackwell Publishing, 9600 Garsington Road OX4 2DQ, UK. 224 pp Paperback (ISBN 978-1-4051-5120-7). Price \$US59.99.

Peter Sandøe is well known as an applied philosopher who, as well as being excellent company, is a world leader for rigorous, open-minded thinking in the field of bioethics. Stine Christiansen has a background in applied animal welfare and welfare. Between them they have produced a really excellent text that succeeds, in under 180 pages, in providing a balanced and thought-provoking introduction to the issue of the ethics of animal use.

After a fine foreword by Bernard Rollin, Sandøe and Christiansen state up-front in the introduction that they take a pluralist approach to animal ethics, something that I welcome and I suspect most new readers to the field will too. Included among these readers are those who are studying animal ethics at university level in veterinary and animal science courses, as the book is intended to serve as a textbook for such students.

The book kicks off properly with an excellent chapter on the changing face of animal ethics. While this can only provide a brief overview of the history of the discipline it manages to do so in a way that is fair; for example, it is fair in its (very brief) treatment both of biblical notions of our duties towards animals and of the reason why factory farming took off after the Second World War. As with all the chapters, this first one ends with a valuable bullet-point list of key points and a useful, short further reading list.

Chapter 2 examines what our duties to animals might be. Refreshingly, in a way I am sure many students will welcome, it asks whether it is necessary to theorise about ethics. Having, unsurprisingly, concluded that such theorisation is helpful, contractarianism, utilitarianism (including the ideas of Lockwood, with which I wasn't previously familiar but am glad now to have read), animal rights (including a powerful PETA campaign photograph), the relational view and respect for nature are carefully introduced.

The next chapter examines what is meant by 'a good life' and introduces the reader to the issue of how animal welfare might be measured. Throughout, a common feature of the book, the writing is accessible and engaging.

Chapter 4 is co-authored with Carol Morgan and should be of great value. It looks at the role of veterinarians and other animal science professionals and examines the extent to which such individuals have duties to animals, to the owners of the animals or to society in general.

The next chapter on the use of animals in food production is the longest in the book and is co-authored with Pia Haubro Andersen, Birte Broberg and Markus Vinnari. It begins with an excellent section asking whether farm animals live worse lives now than they did in the past and then asks whether farm animals today live good enough lives. In addressing this question, the authors draw, to a modest extent, on sociological data on people's views as well as on ethical reasoning.

Chapter 6 is co-authored with Henrik Caspar Wegener and examines issues that arise when infectious diseases are controlled. So, for instance, there is material on whether or not to vaccinate for foot and mouth disease and whether farmers or consumers should take the prime responsibility for dealing with *Salmonella* and similar pathogens. As one would hope, such issues are addressed in the light of the various ethical frameworks (contractarianism and so on) introduced earlier.

Chapter 7, on the use of animals in experiments, is co-authored with Axel Kornerup Hansen and Anna Olsson. The literature on this issue is huge and yet the chapter manages to present fresh material in a way that makes the reader think.

The next chapter, on companion animals, is co-authored with Annemarie T Kristensen. As well as raising general issues, such as the special status of companion animals, it is packed with interesting case studies, for instance whether it is right that dogs be put down because their owners don't have the time to look after them and whether it is right to keep cats permanently indoors. The chapter ends with a careful analysis of the implications of the limits of veterinary treatment for companion animals depending on the ethical framework(s) to which one subscribes.

Chapter 9 is written with Christian Gamborg and tackles animal breeding and biotechnology. As one might expect, it looks at the problems that can be caused by animal breeding and biotechnology and examines what the ethical limits of such breeding should be — how do we feel about featherless chickens (photographed here) for example?

The final chapter is co-authored with Bengt Holst and looks at the management and use of wild animals. It includes one of the many endearing photographs of young Knut and introduces the reader to the ideas of Paul Taylor (respect for nature) and Arne Næss (deep ecology), amongst others.

Readers of the book are encouraged to go to the website Animal Ethics Dilemma (<http://ae.imcode.com/>). I am not usually a fan of book websites but this one really is exceptionally good. See how you do on the 12 questions to determine your ethical profile!

Finally, I ought to mention my only disappointment with this book and that is the cost which seems rather high for a student book of this length with no colour photographs. That having been said, this is an outstanding textbook that I can recommend very strongly.

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