finfish are covered, along with detailed descriptions of the techniques for stunning, stun/killing, killing without stunning and depopulation. Too often, fish are the forgotten livestock, but the advice and recommendations presented in this chapter should help those employed in the industry to improve the welfare of their animals.

The book would have benefited from better copy-editing and proof-reading, as errors throughout the book give it a rather rushed and unfinished feel. Some pictures have been included to help the reader, however not all are referred to in the text, making it difficult to decipher what the picture is intended to show. In some instances, the picture and description do not match, as when the wrong species is referred to in the photograph legend. There are also misspellings of names in the cited material. Better copy-editing would also have improved the quality of English, which is variable.

A couple of pages of definitions, placed at either the front or the back of the book, would have been easier to access than definitions within the texts of chapters. The clarity of definitions also varies. Definitions that are suitable for use with biologists or academics familiar with the area are not always appropriate for the intended, industry-based audience.

To be useful to an FBO, AWO or other industry worker it is helpful to have conclusions that show them how the information is relevant to their daily work. Some authors clearly translate academic findings into workable practical advice, but others do not. Similarly, some chapters offer good advice, enabling the reader to rectify situations which he/she may face in their plants, while other chapters only state what should not be done. For some authors a greater focus on the identities and needs of their target audience would have been useful.

This book provides a comprehensive account of the welfare of numerous species during slaughter and contains very useful information. However, it may be best suited for academics who wish to learn more about this interesting and complex topic.

Reference

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Olfaction in Animal Behaviour and Welfare

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Perhaps because our sense of smell is relatively unimportant, we underestimate the importance of smell in the lives of other species around us. Humans who live or interact with animals, then, need to understand how odours shape almost every facet of their lives, whether they be exotic creatures in zoological gardens or domestic livestock, animals in the laboratory or pets at home. It was to address this need, coupled with a sense that the information that is available is often not easily accessible to those who might use it, that this book was conceived. As described in the preface, the book represents a fuller treatment of an argument presented in a short opinion piece by the editor and many of the contributing authors. According to this argument, consideration of olfaction is absent in most studies of animal behaviour but addressing this absence could reap enormous benefits. In a nutshell: "By using the right (or removing the wrong) odors at the right time in the housing and handling of farm, zoo, lab, and companion species, we may be able to improve various aspects of animal behavior, reproduction, and health, and create animal environments that are more suitable, more productive, as well as welfare enhancing" (Nielsen *et al* 2015).

The book is comprised of three sections. First, there is an introduction to some basics. Five chapters set the scene for the rest of the book, dealing with the fundamentals of olfaction and odour perception, the role of learning in odour perception, communication, behavioural testing, and odour valence. A second section provides an overview of the role of olfaction in specific aspects of animal life, namely feeding and foraging, mate selection and reproductive behaviour, maternal care and offspring survival, disease detection and prevention, stress and fear, and animal housing and enrichment. Finally, a focused section contains four chapters on olfactory behaviour of animals in specific settings: farm animals, zoo animals, laboratory animals, and companion animals.

There is a lot to like here. The broad scope of the first section provides for a solid, basic understanding of how smells are perceived and how associated behaviours develop and can be measured. The second section tackles the main 'uses' of smell, the kinds of functional benefit that make it so essential in regulating behaviour. The final section provides relevant practical issues that an under-

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standing of olfaction in farm, zoo and laboratory animals might be used to address, with numerous examples. In general, the editor has done an excellent job of ensuring that chapters complement each other and follow a consistent style and presentation, so they tie together well. Chapters are short (most are 10–12 pages, plus their associated reference list) and the material is accessible: numerous subtitles help navigate the text, and this is accompanied by graphs, diagrams and photographs in almost every chapter. I also appreciated how, in many of the figures, one or more panels of graphs were contextualised by the addition of a photograph illustrating the species in question; this was a nice touch and seemed to have been done relatively consistently across the chapters.

That said, like a rodent having become habituated to these positive aspects (see Chapter 4, 'Behavioural tests'), I became suddenly dishabituated by some curious oddities that bear mention. On a trivial level, the standard monochrome format for most graphs was interrupted for one glorious chapter (on zoo animals) in which four different colour formats decorated five graphs. Slightly more important, while the vast majority of the book was written in a style that would be accessible to a relatively non-specialist readership, occasional sections were dense and over-detailed, quite out of balance with the rest of the book. A particular example was Chapter 14, on 'Behaviour of laboratory animals', and especially the second half of this chapter. At one point, almost a full page is dedicated to one study of a neurobiological procedure carried out in laboratory mice, complete with the fullest possible details of methodology and even of the dilution steps used. For me, at least, extracting useful take-home practical applications of this chapter was much more difficult than for others.

Stepping further back to consider the chapters as a whole, I was less convinced by the need for some than others. For example, Chapter 5, 'Is there such a thing as a bad smell?' seemed especially incongruous. While interesting, a chapter that uses 70% of its content to include Alain Corbin's analysis of innovations in public sanitation in nineteenth century France, efforts to use psychophysics to efficiently characterise odour perception, ethnographic accounts of the cultural significance of odours to peoples across the world, variation in olfactory exposure among workers of particular occupations, and the chemistry of human (specifically human, ie not animal) body odours, seems to belong in a different book. At the end, I was not sure I had learned anything of much relevance to animal behaviour and welfare, other than that unpleasant odours would be used to avoid unhealthy individuals.

Which leads us to Chapter 9, 'The role of olfaction in disease detection and prevention'. Here, presumably, we would learn more about how smell co-ordinates avoidance of unhealthy individuals in various species. Well, nearly. Only one very short section (about one-third of a page) deals with 'Recognition of disease in conspecifics' (in fact, this particular issue is dealt with more fully — a whole page — in Chapter 7, 'Role of smell in mate selection'). Instead, Chapter 9 deals more with human diseases: either those detectable by a human nose (one page) or recognition of human diseases by animals (almost five pages). Again, one wonders whether this is what the audience expects to get in a book of this title, fascinating as it may be.

So, who will read this book, and will they get what they want from it? Judging from the title, the back-cover, and the preface, the target audience seems very clearly to be 'applied ethologists' working on animals in farms, labs or zoos, or those interested in the behaviour of companion animals. Of course, readers may be tempted by some of the material in the first two sections, where they can engage with some of the underlying behavioural processes involved in animal olfaction. As an introduction to the role of smell in animal behaviour, these chapters are useful and clearly written, although for a more complete picture and more solid theoretical framing, serious researchers will wish to build on this knowledge by further reading (eg Wyatt 2014).

But my fear is that many will be interested in only a small portion of the book: on opening the contents page, they will be immediately drawn to Section 3, which actually forms about a quarter of the book. Very likely, they will then be drawn to only one-quarter of this: the chapter most pertinent to their situation (eg zoo, rather than lab or farm animals). It is true that, among these chapters, they will find some genuinely useful and fascinating material. With the possible exception of the companion animal chapter, which seemed too descriptive about how different species use smell, these chapters are focused on the core practical issues relevant to the setting — exactly the kinds of issue outlined in the quote in the opening paragraph. For example, in the zoo setting, subsections deal with the use of odours to introduce novelty into the environment, to expand behavioural repertoires, encourage reluctant breeders, manipulate mate choice and overcome incompatibility, the removal of stress-inducing odours from predators housed nearby and training for wild release re-introductions. Perhaps the problem is that all of this is crammed into the standard 10–12-page chapter structure; I could imagine some of these core chapters being much, much longer to reflect their likely relative importance to the readership. Ultimately, I think this weakens the appeal of an otherwise excellent book.

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