The key word that defines this book, one considered directly by most authors, is 'enhancement.' Since the procedures used to achieve enhancement are always defined and applied by humans, it follows that the nature of enhancement is nearly always designed for our benefit, whether defined by commerce (farm animals) human health (lab animals) or cosmetic appearance (designer dogs and cats). The question posed by May and others is 'What has been the effect of the enhancement designed, at least primarily, for our benefit on the animal? Has it been beneficial?' There are some good examples of this, especially our increasing success in the use of genetic techniques to confer resistance to specific diseases. One can also include expensive surgical procedures designed to restore quality of life in crippled dogs. Has it been harmful? Increased prevalence of lameness in dairy cows and broiler chickens, increased prevalence of respiratory disorders in brachycephalic dogs are conspicuous examples of this. Has the effect on physiology and behaviour been negligible? (so far as we can see). On ethical grounds I would argue that these procedures are only of concern if harmful to the animal. However, I write as one whose professional concern is restricted to the welfare of the animals. Whether or not the decision to spend several thousand dollars to clone a favourite cat (or to cash in to the tune of several thousand dollars to carry out the procedure for a client) is beyond my brief. The more difficult problems arise when it is necessary to make borderline decisions regarding the harm:benefit analysis (harms to the animals vs benefits to society or individuals). These are critical issues in public and private ethics that call for informed decisions on a case-by-case basis. There is much in this book that can lead us to these informed decisions.

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Understanding Animal Behaviour

R Putman (2018). Published by Whittles Publishing, Dunbeath, Caithness KW6 6EG, UK. 192 pages Paperback (ISBN: 978-1-84995-330-6). Price £18.99/US$24.95.

Professor Rory Putman's book *Understanding Animal Behaviour* is aimed as an accessible introduction to the fascinating world of animal behaviour for non-academics. As an emeritus chair in Behavioural and Environmental Biology (Manchester Metropolitan University) and visiting Professor at University of Glasgow and Utrecht he is well qualified for this endeavour. His passion and enthusiasm for the subject comes across from the outset, together with his ability to relate topics to the reader. Given his experience as an educator, it is no surprise to learn that the material for this book has evolved from his lectures and teaching on the topic. With non-academics as the target audience, I therefore aimed to read it from the perspective of an interested lay person. This was an enjoyable task. Reviewing the book over a Christmas holiday, I found it transported me back to my initial introduction to the study of animal behaviour as a student who had discovered this captivating subject. It was great to revisit classic examples conveyed in a way that was easy to understand. Another highlight that further brings the book to life are the beautiful illustrations (over 80 drawings) produced by Rory's wife, Catherine Putman, a wildlife artist.

The book is split into two broad parts, the first considering the 'how' of animal behaviour in terms of mechanisms, while the second considers the 'why' in terms of adaptive significance. As ethologists well-schooled in Tinbergen's four questions the structure used makes good sense. There is a logical flow with part 1 containing manageable, well-written, concise chapters on what is meant by animal behaviour, behavioural reflexes, linking responses to co-ordinate more complex behaviour, receiving stimuli and analysing the incoming information, motivation, 'unpredictable' behaviour, learning, and behaviour genetics. Part 2 discusses the adaptiveness of behaviour and optimising returns, social organisation and social behaviour, reproductive behaviour and strategies, mate behaviour and mate choice, co-operative breeding and altruism, territoriality and aggression, and animal navigation. Reflecting on this section, I could see how the animal navigation chapter could also fit nicely into the 'how' of proximate mechanisms, as this occupies a lot of the chapter contents.

The book culminates in an excellent question and answer chapter, 'If we could talk to the animals.' Reading these questions made me smile, as I routinely receive similar ones during lectures. The author provides thoughtful comprehensive answers, including to some very difficult and challenged topics (eg animal emotion) to which there are no clear and succinct answers! Adding to his thoughts on animal emotions, I would also have introduced the reader to cognitive bias testing and its growing influence in both fundamental and applied ethology.

An additional asset of this book, and an important one to learn when studying behaviour, is that there is typically no single explanation for the occurrence of a particular behaviour. This can be challenging for students more familiar with other scientific disciplines, and the structure and examples chosen throughout this book nicely illustrate the multiple layers of explanation. Importantly, although aimed at educating an interested lay audience, the author does a very good job of conveying how behaviour is studied using a rigorous scientific approach. By outlining examples with clear hypotheses, manipulated explanatory variables and measured behavioural response variables, the author clearly dispels perceptions that ethology is about simply observing animal behaviour and making speculative inferences. By providing readers with a firm foundation for understanding animal behaviour, the book also has important implications for applied ethology and welfare. For example, the chapters on motivation and 'unpredictable' behaviours, including redirected and displacement activities, are excellent, introducing ideas including motivational conflict and frustration. This sets the scene for readers to understand how environmental conditions and contexts could result in the development of behaviour (eg stereotypy) indicative of a welfare problem.

The examples used throughout the book to illustrate concepts have been well chosen. Rightly, this includes research from founders of the discipline including Niko Tinbergen, Konrad Lorenz and Karl von Frisch. For example, Niko Tinbergen's studies on three-spined stickle-backs, and herring gulls are used to illustrate aspects of releasing stimuli, fixed action patterns, mating and aggression, while Konrad Lorenz's psychohydraulic model of motivation is presented in a highly accessible way, additionally referring to his work on imprinting using greylag geese. Karl von Frisch's role in understanding honey bee communication, including the waggle dance, features prominently. The author also makes excellent use of examples from his own areas of expertise with studies on deer illustrating important concepts. A particular highlight were the sections explaining links between ecology, sociality, group size dynamics and fission-fusion.

Although the book provides comprehensive coverage of the main themes in the study of animal behaviour, I was surprised that some aspects did not feature. For example, I would have expected to see more discussion of individual differences in behaviour, variably termed personality, temperament, behavioural syndromes, but this was largely overlooked. It is briefly considered in response to a question in the final chapter. However, at that point, it also implies this is only important for higher animals. Research indicates this is not the case as there is plenty of evidence demonstrating consistent inter-individual differences in a range of invertebrates. Given the study of personality has been a hot topic in recent years I think it would have been useful to have provided a solid grounding to readers, including highlighting that many unanswered questions surrounding the adaptive 'why' of animal personality remain. Another hot topic that I expected to get a mention is epigenetics, which could have been introduced even briefly as a mechanism by which genotypic expression can be influenced by experience, with implications for behavioural development. Although I enjoyed the chapter on learning, I think there was scope for consideration of additional aspects. For example, while describing imprinting, the discussion could have been expanded to include critical periods of learning development, including the role of socialisation. This would have been beneficial for the lay audience, given many will have heard something about the importance of the socialisation period in dogs but may lack any real understanding of it. Interestingly, the author does make good use of work by Scott and Fuller who studied this topic but restricts his example to breed-related (genetic) differences in behaviour. While I think the content presented is generally excellent and accurately explained to the reader, I have to take issue with parts of the chapter on territoriality and aggression. This is one of my main research areas, so my intention is only to point out a common misconception rather than critique the author. The chapter discusses and assumes animals are capable of assessing asymmetries in fighting ability between themselves and an opponent, termed mutual assessment, using this information to decide whether to engage in a contest or not. This has the selective advantage that fight costs can be minimised as the weaker can terminate the contest as soon as it assesses its inferiority. Mutual assessment has been largely assumed to apply in animal contests without testing appropriately for alternatives. A simpler alternative, known as self-assessment, is a feature of other contest theory models. With this strategy, animals cannot gather information about an opponent and more simply fight up to a particular threshold based on their own costs. The important point is that research (since 2003) has demonstrated that self-assessment rather than mutual assessment applies in many species and situations. Moving forward, it is important this knowledge gets accurately disseminated, including to a non-academic audience. Related to this discussion, the author does a great job of introducing the concept of an Evolutionarily Stable Strategy used in game theory modelling which has been a huge asset to evolutionary biology in general. Given this approach was first used by Professor John Maynard Smith to study animal contests, there would have been scope to present a simple model example, such as the Hawk-Dove game.

The above are minor critiques that should not detract from the utility of this book. Indeed, I hope in the above two paragraphs I have not fallen into the category of overly critical academic behaviourist too close to the technical detail that Rory mentions in his preface (which was a pleasure to read!) In it, he acknowledges that taking on the challenge of this book he risked it being regarded as "over-simplistic, naïve or simply out-dated." In my opinion he has done none of those things. Rather, he has distilled a comprehensive body of research into an accessible introduction to the study and understanding of animal behaviour. The book is relevant to a wide audience, providing a useful resource to inspire those with an interest in the topic. I would recommend this to others and indeed will be suggesting it as a useful starting point for the 1st year biological sciences undergraduates I teach. As highlighted above, for those with an interest in animal welfare, it also serves to provide a useful broad foundation that will facilitate deeper learning of applied ethology and welfare implications.

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Subhuman: The Moral Psychology of Human Attitudes to Animals

TJ Kasperbauer (2018). Published by Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK. 248 pages Hardback (ISBN: 978-0-19-069581-1). Price £22.99.

Anyone concerned about the welfare of animals will doubtless have pondered why we often claim to have empathy for animals but treat them in the way we do, overtly cruel in many situations, demonstrably exploitative in others. If you haven't then it is surely time to do so. This book will help to illuminate the reader on this vexatious issue.