chapter on the physical environment during handling and transport was a bit out of place here, although this is, of course, an important topic. Social conditions are addressed in chapter 14, by Galindo, Newberry and Mendl. Here, I particularly liked the part on solutions to social problems and enhancing differences between group members, but this also has to do with my personal research interests. Chapter 15 by Hemsworth and Boivin stresses the importance of positive contact between animals and humans. The message that positive handling also positively affects production remains a very important message to the industry! Chapter 16 by Hocking, D'Eath and Kjaer focuses on genetic selection in relation to animal welfare. I liked this chapter because it had illustrative tables and figures, it was accessible and interesting to read and it included many relevant examples.

Part V, implementation, starts with a chapter on economics by Bennett and Thomson. This chapter provides a nice background in economics for the lay-person and teaches me that economics is not about money, but about preferences. This is followed by chapter 18 on incentives and enforcement by Knierim, Pajor, Jackson and Steiger. Here, the reader gets an overview of organisations that have an impact on worldwide welfare standards, such as OIE, OECD and the Council of Europe. The chapter also offers insights into the role of legislation, incentives and voluntary measures and stresses the need for harmonisation of welfare legislation between countries. The final chapter on international issues by Appleby and Huertas is one of the two new chapters, compared to the first edition. It places animal welfare in the international context and shows that international trade can have a levelling-up effect on welfare. The chapter includes nice, old quotes on animal transport. The book finishes with an index based on keywords.

The book aims to provide a broad introduction to the key topics in animal welfare to veterinary surgeons and students, animal scientists and those working with or studying animals. To a large extent, the authors succeed in that aim, providing a valuable introduction on animal welfare. I feel that the main strength of the book is also its main weakness: the fact that 46 authors contributed to the book ensure that it is indeed a broad introduction to animal welfare, with many different approaches and viewpoints described in its chapters. This results in chapters that provide excellent overviews of specific topics in animal welfare research. However, with such a broad authorship it is much more challenging to bring all the chapters together and to make the chapters 'fit together'. That being said, I think Animal Welfare provides many valuable chapters for those studying or working in animal sciences or in the livestock industry. I would like to compliment the editors for bringing together all this knowledge on animal welfare.

Bas Rodenburg
Animal Breeding & Genomics Centre, Wageningen University, The Netherlands

Animal Tool Behaviour. The Use and Manufacture of Tools by Animals

RW Schumaker, KR Walkup and BB Beck (2011). Published by The Johns Hopkins University Press, 2715 North Charles Street, Baltimore, Maryland 21218-4363, USA. 282 pp Paperback (ISBN 978-0-8018-9853-2). Price £34.00.

Although more than thirty years had elapsed from its publication in 1980, Benjamin Beck's book on tool use was still cited by most articles on this topic in 2010. However, in the last three decades the growing interest in animal tool use has produced so many discoveries that a new review within a coherent framework was certainly needed. *Animal Tool Behaviour. The Use and Manufacture of Tools by Animals*, written by Robert W Schumaker, Cristina R Walkup, and Benjamin B Beck fills this gap. This book is an impressive update of the previous volume.

The first introductory chapter discusses the pros and cons of the definitions of tool use and tool manufacture provided by many other authors. On this basis, Shumaker and colleagues propose that tool use is "the external employment of an unattached *or manipulable attached* environmental object to alter more efficiently the form, position, or condition of another object, another organism, or the user itself. When the user holds *and directly manipulates* the tool during *or prior* to use and is responsible for the proper and effective orientation of the tool" (p 5). Whereas "tool manufacture is simply any *structural* modification of an object or an existing tool so that the object serves, or serves more effectively, as a tool" (p 11). Surprisingly, these definitions are almost the same as those formulated by B Beck in 1980 (note that only the words in italics were added to the original definition). This is a clear demonstration of the valuable contribution to the study of tool use given by this researcher. However, Shumaker et al's functional definition is meant only to distinguish tool use from other categories of action. But, identifying an action as tool use does not help to evaluate the relative complexity of the action; thus, it does not help to establish whether or why some forms of tool use are more challenging than others.

Chapter 1 introduces a taxonomy based on the actions employed by the user (and their relative functions and definitions) of the instances of tool use and tool manufacture observed in the animal kingdom. This framework is used throughout the chapters that follow to organise them. Further, to avoid confusions among terms that may, or may not, have the same meaning the authors provide a systematic review of the labels and definitions of tool use and tool manufacture involving more than one tool used previously in this field of research. In short, this chapter provides the reader with the necessary 'tools' to understand and enjoy the rest of the book!

Chapters 2–6 are scrupulous descriptions of published articles concerning tool use and tool manufacture by Invertebrates (Chapter 2), Fish, Amphibians, Reptiles and Birds (Chapter 3), Non-Primate Mammals (Chapter 4), Prosimians and Monkeys (Chapter 5), and Apes (Chapter 6). As Gordon M Bughardt writes in the foreword, there are

https://doi.org/10.1017/S096272860000381X Published online by Cambridge University Press

now three times as many examples of tool use than in 1980 and they refer to a much wider variety of species. Clearly non-human primates still occupy a vast part of the book because of the large number of instances of tool use and tool manufacture reported in this animal group and of the extensive experimental work carried out on non-human primate species for more than one century.

Finally, the last chapter discusses seven myths that have permeated the study of tool use. These include the notions that tool use is intelligent and unique when compared to other behaviours, that a few species are much better than others in using skills for a variety of purposes, and that humans are unique in this respect. The authors argue that these myths are only partly supported by evidence since sampling effort distribution and methodological differences across taxonomic categories are not taken into account, and because there is still so much to discover. In many cases, these myths are misleading and hinder our chances of understanding the tool-use phenomenon.

In this volume there are so many new findings that it is difficult to choose what to pick. The defensive tool use performed by the veined octopus (*Amphioctopus marginatus*; Finn *et al* 2009) is so intriguing to make it to the illustration on the book cover. Individuals of this octopus species frequently carry coconut-shell halves and assemble them into a shelter, when threatened. The coconut-shell carrying behaviour is likely to have started when clean and light coconut-shell halves became available due to coastal factories discarding them in the ocean and has probably evolved from the use of large empty bivalve shells. While being carried these nut-shells offer no protection; in fact, they appear to be a burden as they force the octopus to use an awkward form of locomotion and this suggests that the shell is carried to hide from predators when needed.

Aquaria, zoos and research centres should take advantage of the tool-use behaviours described in the book to create conditions suited to promote innovative behaviours so to enrich the captive environment of their hosts. In addition, by continuously monitoring animals' behaviour they could study the ontogeny and diffusion of new acquisitions, two aspects difficult to document in natural conditions. Similarly, in controlled conditions, it is easier to investigate responses to new challenges. For example, by systematically varying the physical properties of objects to make them suited and unsuited as tools, it becomes possible to assess the flexibility while using tools of different animal species.

Self-anointing is a widespread behaviour across taxa, whose functions are not very clear yet. Self-anointing is a borderline behaviour that, according to the authors, can be considered tool use only when the animal holds and applies an odorous object, or substance, on its body. In birds, anting behaviour (the application of ants by the bird on its plumage) has been described in at least 200 species. Some of these birds can substitute ants (when not available) with valuable surrogates such as beetles, millipedes, mealworms, caterpillars, snails, onions, limes, sawdust, and cigarette butts(!!). In mammals, self-anointing is also very frequent and is often a defensive strategy against predators. Some squirrel and chipmunk species anoint themselves with the scent of rattlesnakes acquired from the snakes' urine or shed skin, as well as from the substrate that had been in contact with the snake. European hedgehogs self-anoint with a mixture of their own strong-smelling saliva and other odorous substance such as toad, rotten meat and urine. Also, many species of non-human primates perform self-anointing behaviour. Again, this information can be used by zoos and research centres to elicit self-anointing. In this case finding the suited material is relatively easy. For example, in our primate centre, we provide onions to capuchin monkeys. The monkeys rub them enthusiastically on their fur often as a pleasurable group activity.

This book is certainly encyclopaedic in nature and is an irreplaceable reference text. Somewhat disappointing, at least for us, is that anecdotal information and long-term studies or controlled experiments are often reported as if they should carry the same scientific weight. In this way the reader might completely miss the point that studies based on wealthy information (or with control conditions) are scientifically stronger than anecdotes or procedurally 'poor' studies. In some cases, even misinterpreted anecdotes are described in the book. For example, the stone hammering of oysters by capuchins inhabiting the Gorgona Island reported by the geographer Dampier and later erroneously cited by Buffon and many other after him. As Fragaszy *et al* (2004) pointed out, Dampier described that "the monkeys come down by the sea-tide, and catch them [periwinkles and mussels], digging them out of the shells with their claws" (Dampier 1697; p 173). In other words, according to the definition provided by Shumaker *et al*, this report is not about tool use.

Undoubtedly, tool use is a widespread phenomenon within the animal kingdom. An estimate of its diffusion could become an even larger number when scientists increase the variety of species under scrutiny and become less anthropomorphic and competitive in trying to demonstrate that "their species" outperforms other species. We would recommend this book to ethologists, animal psychologists, cognitive scientists and anyone with an interest in natural history and innovation. Those who study animal behaviour will find the reading of this book particularly beneficial. They will discover how much it can be done and how many species are still understudied, including species that are common in zoos or easy to observe in nature. Just to mention one example, if we were younger, we would start to research systematically the ontogeny of hammering mussels (on a stone placed on the belly) in sea otters and the possible absence of this behaviour in some populations. We could not accept the fact that these fascinating creatures are still studied so little.

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Elisabetta Visalberghi and Gloria Sabbatini
Istituto di Scienze e Tecnologie della Cognizione del Consiglio Nazionale delle Ricerche, Roma, Italy

https://doi.org/10.1017/S096272860000381X Published online by Cambridge University Press