

Book reviews

THE MOST PERFECT THING: INSIDE (AND OUTSIDE) A BIRD'S EGG

By Tim Birkhead

2016. Published by Bloomsbury Publishing, New York.

288 pp., colour photographs, text illustrations. Hardcover,

AUS\$35, ISBN: 9781408851265.

Bird eggs are amazing biological structures. For some, they are religiously revered as symbols of fertility and birth; for most, they are simply regarded as breakfast. However, eggs are vital to the reproduction of every single bird species worldwide and their primary job is to protect and nourish the developing embryo. *The Most Perfect Thing: Inside (and Outside) a Bird's Egg* takes the reader on a biological and historical journey through the world of bird eggs. With Tim Birkhead as your guide, the journey has many stops and provides a plethora of interesting scientific facts that help unravel the mysteries of how bird eggs are made and why (through natural selection) they look the way they do. For example, did you know that an egg contains 'no fewer than four different types of albumin' or egg-white (p. 131) or that embryonic development requires bird eggs to be fertilised by multiple sperm (p. 176)? *The Most Perfect Thing* is an anthology of egg-related information presented in an accessible format.

The book is divided into nine chapters, each focusing on a different aspect of an egg's biology or on the study of eggs more broadly. The book starts with a history lesson on the collection of Common Guillemot (*Uria aalge*) eggs by 'climbers' in the late 1500s (Chapter 1). It details the extraordinary risks taken by these 'climbers' to procure Guillemot eggs from narrow cliff edges and the unimaginable numbers at which the eggs were taken for public consumption or hobbyist egg collection. Guillemot eggs were taken at such large volumes from some areas, such as easily accessible low-lying North American islands, that it caused local extinction. The book then changes tack to discuss various aspects of egg biology, starting from the hard exterior shell and moving inwards, while still maintaining a historical viewpoint. Discussion includes how eggshells are formed and why they are their characteristic shapes (Chapters 2 and 3), how and why they are coloured (Chapters 4 and 5), the function of albumin and how eggs fend off microbial infection (Chapter 6), the function of yolk and how eggs are fertilised (Chapter 7), how eggs are laid and incubated, and what happens during hatching (Chapter 8). The book finishes with more history on egg collectors and an overview of the direction in which egg research is heading, including Birkhead's own work and his struggle to find research funding (Chapter 9). Simple drawings illustrate different biological aspects, such as the internal morphology of bird eggs (p. 130) and the bird's reproductive system (p. 173), and colour plates with photographs showcase the beautiful and diverse eggs of a variety of species.

The Most Perfect Thing reads like something between a storybook, a biography, an opinion piece and a science textbook. It is a collection of information gathered over the

last few decades of oological research by a variety of different researchers, including Birkhead himself. The book is not a comprehensive outline of everything we know about eggs, but rather a collection of those facts that Birkhead finds most fascinating. Much of the presented material should pique the interest of readers curious about birds. The book introduces several historical figures, including George Lupton and Major John Colebrook-Robjent, two avid egg collectors whose collections are helping scientific progress long after their deaths. Although focused on the biology of eggs and highlighting the concept of adaptation through natural selection, the book is not science-heavy and is written from a personal perspective. When used, jargon is explained and there is a glossary of scientific terms and concepts. The book also includes a list of all bird species mentioned in the text, and an index listing the page numbers for the various topics discussed and mentions of historical figures.

The writing style is tailored to a non-academic audience and it can be tedious, but not impossible, to locate the original sources of presented information. There are no references present within the main text, but the mentioned studies are presented in a bibliography at the end of the book. These references are organised alphabetically and without division by chapter, making it somewhat difficult to pinpoint exactly which references correspond to which chapter or statement. Instead, the book includes numerous notes (included in the main text as subscript numbers) and each note refers to a published study, an additional explanation or Birkhead's opinion of the discussed material. The note section is divided by chapter, but the reader is required to flip between the note section and the bibliography to find full citations of referenced studies. Not all mentioned findings and facts are clearly referenced with these notes, but most appear to be.

At times, reading the note section is compulsory to follow Birkhead's thought process and thus avoid drawing incorrect conclusions. A good example of this is Birkhead's argument that the conspicuous appearance of tinamou eggs may signal their unpalatability (pp. 78–79). Tinamous form an ancestral avian order. Their spectacularly glossy and colourful eggs are often considered to be the most beautiful eggs in the world (Hauber 2014; Igic *et al.* 2014), yet the fitness benefit that their appearance provides remains unknown. Having himself studied tinamous, Birkhead is probably aware that their nest predation rates can be at the higher end of the spectrum for birds (e.g. 75% of great tinamou nests were reported as being depredated in one study; Brennan 2010); therefore, their eggs are clearly palatable. Birkhead only uses this unpalatability hypothesis as a straw-man argument 'to make the point about different ways of looking at a biological problem' (p. 229), but this is only clear if one bothers to read the note section, where this is explained. Furthermore, while only a minor error, the book erroneously implies that all tinamou species are forest-dwelling and are found in Central America (p. 78). In fact, the 47 different tinamou species can be found throughout Central and South America and may inhabit forest, arid grassland, and scrubland habitats (Cabot *et al.* 1992).

The text is supplemented with examples from a variety of different bird species, but focuses mostly on the unusual eggs

of the Common Guillemot, a species that Birkhead has studied since the early 1970s. As explained in the prologue, Birkhead's inspiration for writing this book was sparked after seeing a presenter on a wildlife television program misinform the public that the reason for the unusual pyriform shape of Common Guillemot eggs was to prevent them from rolling off narrow cliff edges. Birkhead suggests that the Guillemot egg's unusual shape has more likely evolved to protect the egg's pores (canals in the eggshell that allow the embryo to breathe) from being clogged by dirt and faeces that are common in their nest environment. Many of the chapters have some connection to Guillemots, and I have learnt much about this intriguing species from reading the book.

In addition to presenting interesting facts, Birkhead provides his personal views and opinions on most material covered. This in turn provides the reader with a critical view on scientific findings and experiments, but also at times reveals the humorous, and perhaps eccentric side of Birkhead, such as his thoughts on the sensuality of a bird egg's shape (p. 15). Sometimes Birkhead is restrained in expressing his opinion of others' work, which may leave a reader intrigued. An example of this is his use of 'Hmmm' following his explanation of the 'blackmail hypothesis' (p. 106); one is left wondering what exactly he means by this interjection. At other times, he makes awkward and perhaps slightly offensive statements, such as in his description of Royce Colebrook-Robjent's appearance (p. 109). Despite some quirks and the rare cringeworthy statement, the personal narrative is welcome and helps illustrate the critical (and often subjective) nature of scientific progress.

BIRD MINDS: COGNITION AND BEHAVIOUR OF AUSTRALIAN NATIVE BIRDS

By Gisela Kaplan

2015. Published by CSIRO Publishing, Clayton South, Australia. 280 pp., black and white photographs and illustrations. Paperback, AU\$45.00, ISBN: 9781486300181.

Cognition research on birds, and in particular birds in the wild, is a field that has been very under-represented in Australia historically. This is despite a wealth of fascinating bird species that are easy to observe due both to their outlandish behaviour, garish colours and raucous noise; and their somewhat intriguing lack of fear of humans on the whole. So it was with much eagerness that I opened this book. Kaplan writes in an engaging, easy-to-read style that will appeal to the non-specialist, the bird-lover and the researcher. She starts by pointing out that Australia has an abundance of captivating, 'unusual' and interesting bird species that are excellent candidates for research into cognition and general behaviour. I could not be more in agreement with her on this point; both the behaviour and diversity of birdlife in Australia is fascinating.

I was impressed by the extensive research that must have occurred to put this book together. Accounts given by Kaplan do not rely heavily on published journal articles, but instead often

The book is an enjoyable read and should appeal to anyone with an interest in birds and the natural world. The writing style is mostly suited to those outside academia, but even those that study eggs for a living may find something of value. I have studied eggs over the past 7 years but have learnt numerous things from reading the book. Birkhead's interest and passion for the study of eggs is prevalent throughout and his enthusiasm should prove inspirational to readers.

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References

- Brennan, P. L. R. (2010). Clutch predation in great tinamous *Tinamus major* and implications for the evolution of egg color. *Journal of Avian Biology* **41**, 419–426. doi:10.1111/j.1600-048X.2010.04999.x
- Cabot, J., Carboneras, C., Folch, A., de Juanca, E., Llimona, F., and Matheu, E. (1992). Tinamiformes. In 'Handbook of the Birds of the World. Vol. 1: Ostrich to Ducks'. (Eds J. del Hoyo, A. Elliott and J. Sargatal) pp. 112–138 (Lynx Edicions: Barcelona, Spain)
- Hauber, M. E. (2014). 'The Book of Eggs: A Life-Size Guide to the Eggs of Six Hundred of the World's Bird Species' (Eds J. Bates and B. Becker). (University of Chicago Press: Chicago, IL.)
- Igic, B., Fechey-Lippens, D., Xiao, M., Chan, A., Hanley, D., Brennan, P. R. L., Grim, T., Waterhouse, G. I. N., Hauber, M. E., and Shawkey, M. D. (2014). A nanostructural basis for gloss of avian eggshells. *Journal of the Royal Society, Interface* **12**(103), 20141210. doi:10.1098/rsif.2014.1210

include library archives, ornithologists' notes and even accounts from the general public. This has resulted in the mention of many bird species that usually fly under the radar. Indeed, despite my own experience in this field, Kaplan's book made me realise how many Australian species make great candidates for cognition research. While drawing extensively on historical research and observational notes, Kaplan also covers very recent research in the field, leaving me with the impression that the book is well rounded in its coverage. She mentions studies that are still in progress, such as the fascinating Palm Cockatoo research, showing that she is up-to-date with the work of current researchers in Australia.

While there is mention of some behaviours that may or may not be considered as evidence for particular cognitive capacities, I think it important that these anecdotes were included, even though I disagree with the interpretation of a few of them. It will be a point of controversy for some readers, who may feel that these behaviours should not be mentioned unless rigorously proven, but a pragmatic view is that such anecdotal accounts can act as a starting point and perhaps a motivational cue for more in-depth research. Kaplan does not ignore important overseas studies that have made important advances in this field, but she focuses on Australian studies, which I particularly enjoyed.

The book covers several broad themes, in my opinion quite rightly making the point that the ways birds forage, build their nests and attract their mates are complex and should

be considered cognitively demanding behaviours. This is a great starting point for the book; too often these common behaviours are overlooked in cognitive research, with more overt behaviours, such as sequential tool use, self-recognition and teaching receiving far more media attention.

The latter part of the book focuses on cognition that requires arguably more complex experimentation to prove, including intentionality, deception, emotion and state of mind. These topics are the cornerstones of historical cognition research, and step into the realm of experiments often conducted in controlled laboratory situations on humans, primates and other mammals. Much of the research in this area works at the interface between traditional methods adopted by psychologists and new methods adopted by biologists for animals in captivity, and more recently, animals in the wild. Kaplan does a good job of covering the limited research on bird species for these areas of cognition science.

Perhaps the topic I enjoyed the least was that of emotion. While ethically it is important to recognise emotion in animals, I have difficulty in seeing how this can be accurately quantified. I appreciate Kaplan's efforts to show how the study of emotion may be achieved via the measurement of cortisol levels, or physiological responses to certain stimuli, for example, but I remain unconvinced that we can conclude what particular emotions an animal feels using these measurements, or how

we can relate this to cognition. However, Kaplan is aware of the controversy that surrounds research on animal cognition and does not shy away from these issues. Repeatedly throughout the book she recognises the arguments that people may have against the interpretations she makes, or the methods used in many of the studies and examples she uses, and she addresses these concerns directly. She justifies clearly the reasons why she thinks certain behaviours constitute evidence for cognitive capacities, and for this she should be given considerable credit.

Overall, this book is a welcome addition to the animal cognition library. Kaplan provides a valuable overview of interesting behaviours observed in Australia's avifauna thus far. She gives a comprehensive initial description of cognition, behaviour and research techniques, before delving into more complex cognitive research in the latter part of the book. Her writing style, which is clear and warm, will appeal to many; it is obvious that this is a topic close to her heart. *Bird Minds* is certainly not an onerous academic read, and I applaud Kaplan for both her extensive research and bringing Australia's colourful and enchanting avifauna to life on the pages of her book.

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