

Preface

It is just 100 years since the publication of the book which started the area of enquiry that has become known as Sensory Ecology. That book was *The Fundus Oculi of Birds*, written by the Canadian-born clinician, Casey Albert Wood. At the time of its publication Wood was Professor of Ophthalmology at the University of Illinois. Although he was a clinician, he had a passion for birds and he managed to combine his two interests in this book. A recent exhibition, 'The Bird Man of McGill', was promoted by the rare books and special collections section of McGill University. It presented information on Wood's life and his many interests. Wood gave his personal archive and collections to the University and now the exhibition can be readily browsed in digital form at <http://digital.library.mcgill.ca/caseywood/>.

Casey Wood employed a comparative approach to the study of birds' eyes. Using relatively simple techniques, he examined and described the eyes of a wide range of bird species held in various zoos. He viewed the eyes of live birds through a hand lens or an ophthalmoscope, and he also examined whole retinas of excised eyes using a microscope. Wood recorded in drawings, and in paintings executed by Arthur Head, some of the diversity in structures found in the retinas of birds. The book was of a large format and took as its inspiration some drawings published 20 years earlier by J.R. Slonaker in a paper titled, 'A comparative study of the areas of acute vision in vertebrates' in the *Journal of Morphology*. Remarkably illustrations from both Slonaker and Wood still have value to anyone wishing to start describing the diversity of birds' eyes and also for anyone wishing to provide a framework that accounts for this diversity in both functional and ecological terms.

Wood's final conclusion in his book was, 'In future no report upon a particular avian species can be held complete that ignores the visual apparatus'. It is very clear that this conclusion still holds. Indeed all of the detailed understanding gained in the past century on the physiology, anatomy, function, and evolution of vision in birds has reinforced many times over the wisdom of Wood's conclusion. Yet many people still ask very general questions about 'What can birds see?' They often ask this because they have a general understanding that the sensory world of birds is in some way different from ours. They often ask in the hope that there will be just a few simple differences between our vision and the vision of birds, simple facts that can be readily learnt and perhaps be of value when faced with an applied question, such as how to prevent birds flying into obstacles, or getting trapped in fishing nets.

Today, we not only know about the diversity of vision among bird species, but we also have potent ideas that can be used to account for this diversity. We are also now gaining a clearer understanding of the capacities and diversity of the other senses of birds, of the trade-offs within a particular sensory capacity, and of the trade-offs and complementarity between different sensory information in the control of particular behaviours. For example, we now have ideas for understanding how hearing can complement vision in the execution of particular tasks, or touch sensitivity can complement vision in others.

One hundred years on from Wood's book is a good time to bring together much of what is known about the senses of birds. Much of this information can now be interpreted in the broad framework of what has become known as sensory ecology. From one perspective this whole book is an argument in support of Wood's final conclusion, but we can now broaden his conclusion and state that, 'No report upon a particular avian species can be held complete that ignores its sensory systems'. This captures the fact that birds are far more than animals guided by vision, *while vision may often be the dominant sense, many senses come into play at any one instant*. Furthermore, particular behaviours may, in fact, be controlled by information which at best can be described as sparse. In some important instances, birds conduct key behaviours when their senses provide what seems to be a paucity of information.

This book initially sets some broad questions and provides a brief historical perspective on how senses in non-humans have been understood. These are followed by some general surveys of the sensory capacities of birds. In the latter half of the book, this information is used to answer questions on the information that birds have available to guide the execution of key tasks. Finally, the question of why birds are often unable to meet novel challenges posed by humans is addressed. Throughout the book, many old assumptions about the sensory worlds of birds are challenged by the research findings which have been published since Woods' seminal work. There is much here to interest anyone who has more than a passing interest in birds, in sensory systems, or in behaviour. I also hope there is much that will challenge reader's assumptions about the sensory information that they use to control their own behaviours.