

Preface

Our desire to edit a volume on how nature and nurture affect behavior comes largely from frustration, which may not be the best motivation. As we outline in Chapter 1, we simply got bored with hearing (reading) the false dichotomy – it's either nature or nurture – and wanted to highlight the much more subtle but easy to understand interplay between the two and to discuss some of the fascinating findings that have emerged in the study of behavior. And to ensure we did not have to deal with the equally boring 'humans are fundamentally different', we also invited authors to contribute specific chapters that focus on our species and on traits that are often seen as especially important to us, like our highly developed cognitive abilities. How well we have covered all these interesting bases we leave to the reader, but we hope some of the excitement of behavioural genetics (in the broadest sense) comes through in the chapters that follow.

The book starts with some general concepts, that after our introductory chapter on the demise of the nature versus nurture dichotomy is headed by a typically provocative chapter by Sasha Dall, John McNamara and Alastair Wilson, who explore whether we need to identify genes to understand behaviour and then dissect the difference between the phenotypic gambit and quantitative genetics approach to studying behaviour, all in the context of Tinbergen's '4 whys'. This is sure to clarify some issues and generate considerable debate. Tom Currie then explores the relationships between culture, genes and behaviour in humans. In many ways, this outlines the importance of social environments, an issue that permeates many of the chapters that follow. Interestingly, Tom suggests that thinking of culture as a distinct inheritance system can facilitate our understanding of behavioural evolution. This is followed by John Hunt and co-authors who explore similar issues through the lens of quantitative genetics to review how indirect genetic effects affect the evolution of behaviour. Here, they distinguish between trait-based and variance partitioning approaches and the chapter nicely contrasts with the two that precede it. Chapter 5 is a pragmatic contribution by Chelsea Weitekamp and Laurent Keller that embraces much of what the preceding chapters discuss. They review effects of single genes on complex behaviours, including many textbook examples like the *foraging* gene, while also noting that most traits, including behaviour, are underpinned by many genes of small effect. Their discussion should dispel any vestiges of doubt that genes affecting behaviour are either non-existent or impossible to identify.

The next cluster of chapters largely focuses on gene-by-environment interactions for specific behaviours. It starts with a chapter by David Hosken and co-authors on

Drosophila sexual interactions. *Drosophila* have been a workhorse for behavioural genetics and the depth and breadth of information that has accumulated are revealed in this contribution that moves from single genes of large effect to many genes of small effect and how they interact with the environment to produce statistical gene-by-environment interactions. It particularly focuses on social environments and reiterates an overall theme: establishing the genotype-phenotype link remains a holy grail of modern biology but one that will be greatly complicated by interactions. Nick Royle and Allen Moore follow with a review of gene and environmental effects in parental care. This includes discussion of genotype-by-family environmental effects and how social environments can be transmitted across generations, meaning that two elements determining phenotypes can be heritable. This group of chapters ends with a contribution by Nina Wedell reviewing the effects of non-self genes on self-behaviour. This includes recent work on microbiomes and 'selfish genes', and makes the obvious point (given the chapter subject matter) that not only do our own genes directly influence our behaviour, but the genes of other organisms that share our bodies can also have profound effects, which expands the realm of environment-gene impacts on focal genes.

Next follow two chapters focused on comparative cognition and human evolutionary psychology. The first is by Alex Thornton and Neeltje Boogert and explores how knowledge is acquired and how intelligence evolves, from both a biological and psychological perspective. They make the point that this approach may have applied implications because understanding what they term the 'cognitive reaction norm' can inform us about animal welfare, including humans. Louise Barrett and Gert Stulp then focus on human behaviour and how evolutionary thinking has shaped understanding of our own behaviour. They note that for humans, genes and environment (biology and culture) also includes the socio-economic environment, and make the interesting point that our attempts at improving our health and well-being have generated a whole new set of problems to address. Adopting an approach informed by evolutionary principles may offer new insight into how to solve the issues they raise. This is followed by Simone Immler's review of modern techniques that can be employed to uncover genes affecting behaviour and their limitations, as well as discussion of a few case studies of what and how. We (Wedell, Hunt and Hosken) close the book by pondering what we have learnt in the preceding chapters and what excites researchers interested in behavioural genetics. We discuss what we (think we) know, what we need to know, and what we should do next. We note here that the book largely ignores more mechanistic elements of nature-nurture and thus we did not include chapters on behavioural circuits, regulation and neurology, for example, except for small sections here and there.

We would like to thank all the contributors for their excellent chapters, for their generous reviews, and for their (mostly!) timely responses. Sorry it took much longer than we anticipated. We would also like to thank wonderful colleagues, who are not authors, for their generosity in offering reviews that were insightful, collegial and super helpful: in no particular order, Matt Dean, Hanna Kokko, Rebecca Kilner, Alex Mesoudi, Judith Mank, Nathan Bailey, Barbara Taborsky, Marla Sokolowski, Stuart Wigby, Luc Bussiere, Erik Potsma, and Ben Longdon – without your collective help the book would be less clear and probably less interesting too. We would also very much like to thank all the wonderful colleagues and friends who have helped shape how we view these matters

through endless discussion over the years. Finally we thank the publishing team for their patience and help.

July 2018

*David J. Hosken
John Hunt
Nina Wedell*