



A PHILOSOPHY FOR THE SCIENCE OF ANIMAL CONSCIOUSNESS

WALTER VEIT

ROUTLEDGE


A PHILOSOPHY FOR THE SCIENCE OF ANIMAL CONSCIOUSNESS

This book attempts to advance Donald Griffin's vision of the "final, crowning chapter of the Darwinian revolution" by developing a philosophy for the science of animal consciousness. It advocates a Darwinian bottom-up approach that treats consciousness as a complex, evolved, and multidimensional phenomenon in nature rather than a mysterious all-or-nothing property immune to the tools of science and restricted to a single species.

The so-called emergence of a science of consciousness in the 1990s has at best been a science of human consciousness. This book aims to advance a true Darwinian science of consciousness in which its evolutionary origin, function, and phylogenetic diversity are moved from the field's periphery to its very centre, thus enabling us to integrate consciousness into an evolutionary view of life. Accordingly, this book has two objectives: (i) to argue for the need and possibility of an evolutionary bottom-up approach that addresses the problem of consciousness in terms of the evolutionary origins of a new ecological lifestyle that made consciousness worth having and (ii) to articulate a thesis and beginnings of a theory of the place of consciousness as a complex evolved phenomenon in nature that can help us to answer the question of what it is like to be a bat, an octopus, or a crow.

A Philosophy for the Science of Animal Consciousness will appeal to researchers and advanced students interested in advancing our understanding of animal minds as well as anyone with a keen interest in how we can develop a science of animal consciousness.

Walter Veit is a postdoctoral research associate at the University of Bristol. His interests stretch widely across science and philosophy, but they are primarily located at the intersection of the biological, social, and mind sciences in addition to empirically informed philosophy and ethics.

In *A Philosophy for the Science of Animal Consciousness*, Walter Veit argues for a more thoroughly Darwinian approach to understanding how consciousness has come into existence, and in which beings it is to be found. By shifting the focus away from human consciousness, he helps us to understand the diversity of forms of consciousness that exist in other animals.

Peter Singer, *Ira W. DeCamp Professor of Bioethics, Princeton University*

The a priori position that human consciousness differs from that in other animals has become hard to defend. In an eye-opening account, Walter Veit explains why. As a true philosopher, he delves into both the richness and ambiguity of the concept of consciousness.

Frans de Waal, *C. H. Candler Professor of Psychology, Emory University*

Walter Veit takes a deep historically- and empirically-informed look at the origins of cognitive ethology and re-centers the field on Donald Griffin's original idea that it's consciousness in animals that really matters. He tackles the question of how to fit an account of consciousness into the life histories of individual animals, using a Darwinian framework that emphasizes the variety and adaptive radiation of forms and functions of consciousness in the evolutionary tree.

Colin Allen, *Distinguished Professor, University of Pittsburgh*

Some think that explaining consciousness is beyond the scope of evolutionary theory. Undeterred, Walter Veit rolls up his sleeves and gets on with the task. Drawing on the latest work in evolutionary biology, cognitive ethology, and neuroeconomics, he reverse engineers consciousness, distinguishing its different dimensions and components and identifying its roots in an ancient evaluative system which evolved to manage the complex action-selection problems faced by early forms of animal life. This is a pioneering and important book, which is informed throughout by an awareness of the rich diversity of animal life and experience. It will challenge your view of consciousness and transform your attitude to your fellow creatures.

Keith Frankish, *Honorary Professor, Department of Philosophy, University of Sheffield*

Walter Veit has written a very thoughtful and thought-provoking philosophical exploration of the evolutionary origins of consciousness. He aims to bring us closer to a true biological science of animal consciousness, what Donald R. Griffin, the founder of the field of Cognitive Ethology, termed the "crowning chapter of the Darwinian revolution." That chapter is to be written by studying the mental experiences of animals in their daily lives and natural worlds.

Veit's work exhibits the fruitfulness of the growing collaborations between philosophers and scientists of animal behavior to the clear benefit of both. He gives serious consideration to the problem of consciousness and the evolution of forms of consciousness, integrating the work of many disciplines and delineating the likely functional significance of consciousness and its varieties in different species.

Veit offers persuasive arguments and examples that evaluative consciousness lies at the core of the phenomenon of consciousness, though leaving enough to argue about and discuss fruitfully as to other characteristics that may be strong contenders for that role.

His work is a significant contribution to the field and well worth delving into.

Carolyn A. Ristau

A PHILOSOPHY FOR THE SCIENCE OF ANIMAL CONSCIOUSNESS

Walter Veit

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I dedicate this book to my parents Ieva and Werner.



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PREFACE

In Search of the Place of Mind in Nature

The target phenomenon of this monograph is one that could hardly constitute a greater challenge to a paleobiologist. It is a phenomenon that is said to leave no fossil trace and has repeatedly been described as the hardest problem of biology: consciousness. In nature, we seem to find a striking difference between systems without any sort of conscious experience, like Australian bush fires, the plants that succumb to them, robots, bacteria, our planet, other stars, and the universe as a whole, and those systems, like humans, for which there is something it is like to be them – or so most take for granted. When we ask whether there is something it is like to be a bat, or any other living organism for that matter, we are asking both whether they have subjective experiences (of any kind) and what these experiences consist in. Yet, how could we possibly learn about the nature of this elusive phenomenon?

The problems of consciousness have for a long time puzzled both scientists and philosophers, even deemed exceedingly difficult if not impossible to answer: What is consciousness and why does it exist at all? Could consciousness come in degrees and different variations or is it like a light switch that is either “on” or “off”? Finally, which animals are conscious and do they differ in their subjective experiences? Are humans the only conscious beings on our planet? Or should we include all mammals? Birds as well? Or all the animals? Why not say that all life is sentient? This view is sometimes called *biopsychism* and though it will strike many as surely too strong, that does not mean that it lacks defenders.¹

The German biologist, philosopher, and artist Ernst Haeckel (1892) – who is sometimes described as the “German Darwin” for his devout defence and development of Darwin’s theoretical framework in Germany² – was the one who coined the term “biopsychism”. But he eventually went on to defend an even broader view called *panpsychism*: the view that “[a]ll matter is ensouled” and that feeling should be conceived of as “a universal world-principle” (1892, p. 483). Contemporary panpsychists think that our fundamental scientific image of physics needs to be radically updated to include an aspect or degree of mentality in all matter, such as electrons, in order to make sense of the presence of minds, a view that even its proponents admit is readily rejected by most philosophers and non-philosophers alike as – to put it bluntly – absurd (Goff et al., 2020). Yet, the view has very prominent defenders such as Thomas Nagel and David Chalmers, who have been incredibly influential in the shaping of the philosophical and scientific discourse around consciousness and

urge us to take this radical option seriously. They hold that the problems of panpsychism are no more serious than those for any other view, though Nagel (1986) also admits that the view has “the faintly sickening odor of something put together in the metaphysical laboratory” (p. 49). But while it appears easy enough to dismiss such radical views as going too far, it is also apparent that there is little agreement on how we could even *possibly* settle the question.

A Wild Sweep of Alternatives

Disagreement about the possibility of pain in fish or invertebrates such as insects sometimes appears no less contested than the metaphysical view that consciousness pervades the universe. Largely, this is due to a worry the British biologist Thomas Huxley – also known as *Darwin’s bulldog* – once famously expressed:

[W]hat consciousness is, we know not; and how it is that anything so remarkable as a state of consciousness comes about as the result of irritating nervous tissue, is just as unaccountable as the appearance of the Djinn when Aladdin rubbed his lamp in the story, or as any other ultimate fact of nature.

Thomas Henry Huxley in Huxley and Youmans (1868, p. 178)

Huxley did not perceive how we could possibly explain consciousness as a causally efficacious materialist phenomenon, which led him to endorse epiphenomenalism, i.e. the dualist view that subjective experience is only the effect, never the cause of the physical processes of the brain.³ His concerns were later better articulated by Joseph Levine (1983), who expressed the mind-body problem in terms of what he called “the explanatory gap” between the mental and the physical – an epistemological rather than ontological gap he thought could only be bridged by eliminating the mental.⁴ That would be a radical non-dualist answer to the mind-body problem that many would consider to be too “hard-headed”, reductive materialism gone too far. How could we possibly eliminate the most cherished and directly experienced aspect of our mental lives? The framing now more commonly used in debates about consciousness is Chalmers’s (1995) description of this explanatory gap as the so-called hard problem of consciousness. Chalmers maintained that while we can readily make progress on the “easy problems of consciousness”, i.e. the functional, computational, and mechanistic side of the mind, using the standard tools and methods of cognitive science, none of this appears to address the hard problem of how it generates a first-person phenomenological feel of mental phenomena:

What makes the hard problem hard and almost unique is that it goes *beyond* problems about the performance of functions. To see this, note that even when we have explained the performance of all the cognitive and behavioral functions in the vicinity of experience – perceptual discrimination, categorization, internal access, verbal report – there may still remain a further unanswered question: *Why is the performance of these functions accompanied by experience?* A simple explanation of the functions leaves this question open.

David Chalmers (1995, p. 202) [emphasis in original]

This framing of the problem of consciousness makes it appear as if science could never address the qualitative feel, i.e. the “qualia”, of subjective experience. Following Nagel’s (1974) famous essay “What Is It Like to Be a Bat?”, in which he set out to argue that while bats are likely conscious we could never know what their subjective experience was like, phenomenological properties or qualia are now typically treated as something like a second-order property of what it is like or what it feels like to have a mental state, as opposed to a first-order property of the

state itself (Sytsma & Machery, 2010, p. 299). Thanks to Chalmers' and Nagel's influence on the philosophy of mind, it is now typical to consider the problem of consciousness as identical to the problem of qualia rather than of a particularly rich cognitive phenomenon with qualitative aspects that may be unique to humans, as it was in the literature of the philosophy of mind in the 1980s (Godfrey-Smith, 2016a, 2016c, 2017a). Could this combination of two formerly distinct problems have given rise to the increasing conviction among many philosophers and scientists that there is something like a hard problem that cannot be solved?

An even more radical rejection of the idea that science could provide a materialist account of consciousness can be found in the form of *idealism*, i.e. the romanticist notion that everything is mental. What are we to make of this, what Godfrey-Smith (2020b) candidly called a “wild sweep of these alternative views of the universe” (p. 14)? In thinking about the place of mind in nature, there almost appears to be a dreadful possibility that *anything goes* and this is not restricted to “mere” philosophical discussions about the very nature of mind. If we ask about the presence of other minds in non-humans, it appears that we are faced with just as much uncertainty as with the big-picture view about the relationship between matter and mind, at least two senses in which we can ask for the place of mind in nature.

How are we to respond to a biopsychist who points to the autonomy, sophisticated sensory feedback, and decision-making of single-celled organisms? To assert that all of the actions of an animal could be explained by mere mechanics without the presence of mind is a tactic frequently used in discussions over all kinds of possible boundaries, including fish, insects, and mammals. Why is someone wrong who denies pain in octopuses or crabs? How could we possibly settle these debates about where to draw the line? Many answers to this question of the place of mind in nature have been proposed, such as the eliminativist or illusionist view that *no one* has consciousness in the sense of possessing qualia (Dennett, 1991; Frankish, 2017; Levine, 1983), the exclusive attribution of consciousness to humans (Macphail, 1998), only to the great apes (Bermond, 2001), only to mammals and birds (Edelman & Tononi, 2000), to all mammals, birds, and non-avian reptiles (Cabanac et al., 2009), to all vertebrates (Mashour & Alkire, 2013), to all vertebrates as well as some invertebrate groups such as cephalopods, crustaceans, and insects (Barron & Klein, 2016; Bronfman et al., 2016; Ginsburg & Jablonka, 2010; Tye, 2016); to plants as well (Gagliano, 2017; Trewavas et al., 2020), to all living organisms including single-celled ones (Margulis, 2001; Reber, 2019), and to all entities in the universe (Goff et al., 2020).⁵ Views on the presence of consciousness range from none to all.

We are faced with such a diversity of alternative models of consciousness that it almost seems like we have what has in similar contexts of abundance been called an “embarrassment of riches” (Veit, 2021d). Without a *standard* for thinking about these problems of the mind, it almost looks like, as Godfrey-Smith (2020b) put it, “[p]eople can say whatever they like” (p. 15). This view of philosophy as a state of indefinite arbitrariness is to be strongly resisted. Following a long tradition of naturalist thinkers, this book firmly rejects the view common in some areas of philosophy that our profession is primarily engaged in a game of mere conceptual exploration; that philosophy is merely concerned with expanding the space of *possible* views.⁶ The following chapters constitute an exercise in naturalistic philosophy to make sense of the place of consciousness in nature by providing the science of consciousness with a much needed *standard* that is unfortunately still lacking.

A Darwinian Standard

As other Darwinian thinkers have argued, this standard should not be the cherished insight derived from human first-person experience, but the modern twenty-first century theory of

evolutionary biology, the one theory that a biological approach to consciousness should not be neutral towards. It is only by investigating the evolutionary origins of consciousness and the ecological lifestyles of these first conscious entities that we will truly understand the place of consciousness in nature without being misled by the particularities, idiosyncrasies, and complexities of the human mind. The shared ancestry of all life on Earth provides us with a rich set of theoretical tools and constraints with which to understand the origins of biological phenomena. And of course, consciousness is just that, an evolved biological phenomenon – something that is now widely accepted among both philosophers and scientists writing about consciousness.

So one would be led to believe, as the neuroscientist Simona Ginsburg and evolutionary biologist Eva Jablonka note in their recent 2019 book *The Evolution of the Sensitive Soul*, that philosophers and scientists alike had firmly integrated evolutionary theory into “the framework of consciousness studies, both as a yardstick for measuring the validity of new theories and as a source of insights” (p. x). Indeed, Darwin himself had already realized 21 years prior to the publication of *The Origin of Species*, in a little private notebook,⁷ a view of life in terms of shared ancestry would radically transform our view of nature and our place within it. As he put it: “Origins of Man now proved. – Metaphysics must flourish. – He who understands baboon would do more towards metaphysics than Locke” (Darwin, 1838, p. 84e). But, despite the efforts of many Darwinian thinkers, there has been no biological revolution in our thinking about consciousness. Evolutionary and ecological thinking about the role of consciousness in nature has so far only played a surprisingly small role in the study of consciousness. Ginsburg and Jablonka describe this lack of Darwinian thinking within a supposedly naturalistic study of consciousness highly critically: “until very recently there has been a strange lacuna in the field. Although most scientists and philosophers who write about consciousness are now convinced that it is a biological process that is a product of evolution, its evolutionary origins are rarely central to their discussions” (2019, p. x).

Undoubtedly, this can be explained through the perceived difficulty and speculative nature of adaptationist reverse-engineering approaches to the mind – especially the human mind – which have been sneered at as “just-so stories”: plausibly sounding explanations that aren’t empirically testable (Gould & Lewontin, 1979). While there have been innumerable attempts at a functionalist approach to consciousness, due to its status as a standard objection to epiphenomenalist views that make its evolution a mystery,⁸ such thinking has unfortunately often avoided an investigation of its evolutionary origins in other animals, instead focusing on humans and humans alone.

Yet, it is no surprise that such evolutionary explanations would be avoided in a scientific investigation that was already seen as deeply suspect due to the lingering after-effects of the behaviourist project that banished consciousness from science. But this neglect of Darwinian thinking is unfortunate because evolutionary theory provides us with both a rich theoretical framework for thinking about consciousness and an important set of constraints that any theory of consciousness should account for. If we can build a theory of consciousness that doesn’t leave its evolutionary origins a mystery, one that can explain the dawn of qualia, then we will no longer be in a position where people could say that no view is better than any other and all cards should be left on the table as equal contenders. A theory that can explain the evolution of consciousness in a gradual fashion through small incremental steps is to be preferred over any theory that demands a dualist carving of nature at its joints, a big jump or a sudden explosion of mindedness. Instead, we would end up with a historical explanation of the place of consciousness as a complex phenomenon in nature that at least substantially narrows the explanatory gap between matter and mind. As Ginsburg and Jablonka put it:

Evolutionary theory is [...] the most general framework for understanding the biological world. It is a conceptual bottleneck through which any theory of life and mind must pass.

If a biological (or psychological, or sociological) theory fails to pass through this bottleneck, it is likely there is something seriously wrong with it.

Simona Ginsburg and Eva Jablonka (2019, pp. ix–x)

Like most scientists studying consciousness, this book will treat consciousness as a complex evolved biological phenomenon related to the brain and nervous system of animals; something that was *built* over aeons of evolutionary time. But if consciousness is a biological phenomenon, then it ought to be treated as such. Whereas some prominent figures such as Nagel (2012) see the problems of consciousness as a fundamental flaw in evolutionary theory, their views have shown a striking lack of knowledge and underutilization of the theoretical toolkit modern evolutionary biology has to offer.

If we are interested in the place of mind in nature, we must place the question of its origin, function, and phylogenetic diversity across the tree of life at the very heart of a true biological science of consciousness. It is only by asking the functionalist question of what consciousness in all of its varieties and gradations does *for* healthy sentient agents within their normal ecological lifestyles and the natural environments they have evolved in that we can transition towards a true biological study of consciousness. This naturalist endeavour is fundamentally what *A Philosophy for the Science of Animal Consciousness* will attempt to accomplish.

While there have been numerous attempts to address the problems of consciousness through a functionalist/evolutionary approach (many of which I will draw on throughout), my approach will stand out by offering a new strategy for making progress on these problems through an emphasis of animal life histories in addition to focusing on the healthy and pathological varieties and gradations of consciousness as a complex phenomenon in nature. Naturally, my specific proposals and theoretical sketches may turn out to be wrong, but it is only in attempting to integrate evolutionary and ecological thinking with the science of consciousness that we can truly move towards a study of consciousness as a widespread natural rather than merely human phenomenon. And to provide such a possibility proof for a bottom-up approach and evolutionary framework that can help us to think about the *raison d'être* consciousness has for organisms within their natural lives is the goal of this book.

Notes

- 1 Consider, for instance, Herbert S. Jennings (1904), Henri Bergson (1920), Maxine Sheets-Johnstone (1999), Lynn Margulis (2001), and Arthur Reber (2019).
- 2 See Aveling (1886) and Kutschera et al. (2019).
- 3 See Huxley (2011) and Campbell (2001) for a deeper discussion of Huxley's views.
- 4 Godfrey-Smith (2020b) contests whether Huxley expressed an early version of the explanatory gap. Yet, the parallels are quite striking. Whereas Huxley found himself led towards epiphenomenalism, Levine suggested that the only way to close the gap was to become an eliminative materialist in regard to the qualitative side of the mind, though admitting that it has so far remained stubbornly “resistant to philosophical attempts” at elimination (Levine, 1983, p. 361). They, nevertheless, both saw the mental side as a deeply problematic explanatory challenge without any intuitively attractive solutions.
- 5 This list is not meant to be exhaustive. See Liljenström and Århem (2008) for a collection of essays and Griffin (2001), Ginsburg and Jablonka (2010, 2019), and Dawkins (2021) for other expositions of alternative views on the phylogenetic distribution of consciousness that my list draws on.
- 6 I thank Kim Sterelny for raising this point against the panpsychist literature at a bonfire at the *Philosophy of Biology at Dolphin Beach* (PBDB) workshop in 2020.
- 7 See Notebook M (Darwin, 1838).
- 8 See the target article of Dawkins (1990) and the commentaries to it for an excellent discussion of epiphenomenalism and the causal role of subjective feelings.

ORIGINS OF THE CHAPTERS

Parts of this book contain previously published material. [Chapter 1](#) is an extended version of “Veit, W. (2023b). Health, Consciousness, and the Evolution of Subjects. *Synthese*”. [Chapter 3](#) is a longer and more extensive version of “Veit, W. (2022c). The Origins of Consciousness or the War of the Five Dimensions. *Biological Theory*”. [Section 2.6](#) also reuses some material from this article. [Chapter 4](#) is an expanded and improved version of “Veit, W. (2022a). Complexity and the Evolution of Consciousness. *Biological Theory*”. [Sections 1.1.](#), [1.3](#), [6.3](#), and [6.4](#) also reuse some of the material from this article. [Chapter 5](#) is an improved and expanded version of “Veit, W. (2022e). Towards a Comparative Study of Animal Consciousness. *Biological Theory*”, with added discussions of octopuses, fish, reptiles, and birds. [Section 1.1](#) also uses some of the content from this article. Finally, [Section 3.2.2](#) also includes material from “Veit, W. (2022b). Consciousness, Complexity, and Evolution. *Behavioral and Brain Sciences*, 45, e61” and [Section 5.4](#) uses some of the material from “Veit, W. (2021b). The Evolution of Knowledge during the Cambrian Explosion. *Behavioral and Brain Sciences*, 44, e47”, both reproduced with permission from Cambridge University Press.

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This book is the result of several years of thinking about consciousness and its evolution in Sydney, London, Munich, Cambridge, Oxford, and finally Bristol. While philosophy is often described as an ivory tower activity, this could be no further from the truth for naturalistic philosophy, and I have benefited greatly from the advice and feedback from scientists and philosophers alike. During this time, I have been in contact with more people than I could mention here, so I pre-emptively ask forgiveness from anyone I have forgotten to mention.

Since this book originated from my dissertation, I would like to thank all of my doctoral advisors for their help and consistently constructive criticisms. Firstly, my primary supervisor Paul Griffiths, who helped the development of my dissertation immensely with his wide range of expertise, humour, and ultimately funding from his ambitious “A Philosophy of Medicine for the 21st century” project that supported my PhD (for which I acknowledge funding from the Australian Research Council’s Discovery Projects funding scheme [project number FL170100160]). Secondly, Peter Godfrey-Smith, whose work inspired me to write a dissertation on animal consciousness and whose feedback and extensive knowledge of the field have been incredibly helpful. Thirdly, I would like to thank Marian Dawkins, Professor of Animal Behaviour at the University of Oxford, who kindly agreed to serve as an external advisor for roughly the last half of the duration of my PhD. While we eventually gave up on formalizing this status due to excessive paperwork, she nevertheless deserves mention here for her role as an informal advisor and her helpful feedback on my dissertation.

Turning a dissertation into a book is far from an easy endeavour, and I have benefited greatly from exchanges with members of the University of Sydney. Being part of Griffiths’ wonderful interdisciplinary Theory and Method in Biosciences group at the Charles Perkins Centre – one of Australia’s leading medical research institutes – enabled me to present my work multiple times to an entire group of philosophers of biology and to grow into an interdisciplinary researcher with a firm understanding of evolution. Indeed, this book very much reflects the mission of this “philosophy lab” to employ the integrative power of biological theory and especially evolutionary biology to remove “conceptual and methodological roadblocks to the advancement of science”.

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I have also presented ideas of this book to audiences at meetings of the Association for the Scientific Study of Consciousness, the International Network for Economic Method, the International Society for the History, Philosophy, and Social Studies of Biology, the Australasian Association of Philosophy, the Joint Brazilian Annual Ethological/Latin American Ethological Conference, and the Power of Scents workshop Sokoine organized by APOPO at the University of Agriculture in Tanzania, which was followed by a Safari in the Mikumi National Park – the perfect place to think about the evolutionary function of consciousness. Furthermore, I also would like to thank audiences at a keynote I gave at the 16th Universities Federation for Animal Welfare (UFAW) Student Conference and research seminars at the Ludwig Maximilian University of Munich and the University of Bayreuth.

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Lastly, I would like to thank my fiancée and frequent collaborator Heather Browning for her unending love, brilliant feedback, and thorough proofreading and copyediting. This book has greatly benefited from innumerable discussions with a philosopher of her calibre.

FOREWORD

This book is a fascinating read for anyone who is interested in questions about consciousness from a biological and psychological perspective. It is also of great appeal to a much broader audience, e.g. those who are interested in the interdisciplinary nature of cognition and consciousness, those who adhere to the importance of philosophy in addressing scientific issues, and those who promote other interdisciplinary endeavours such as the integration of science, arts, and the humanities to address big picture questions about the awareness of being, the questioning of realities, the subjective experience of seeing, feeling, doing, and thinking.

In terms of the interface between philosophy and biological sciences, questions about consciousness abound. What aspects of awareness might we share with other members of the animal kingdom? What might it be like to have thoughts without words and reflect on these metacognitive processes, such as *Mental Time Travel*, the ability to think about how our thoughts change in other times, both past and future, and *Theory of the Mind*, the ability to be aware that others may have both same and different thought processes to our own? What are the evolutionary origins and functions, or in other words how and why have these abilities developed through evolutionary time? How should we consider diverse intelligences within the framework of consciousness? Nagel famously posed the question of “what is it like to be a bat?” and many sceptics would agree that we can never know, for consciousness is a private thought, modulated by personal past experiences and emotions, and hopes and dreams about our subjective thoughts and imaginations of how the future may unfold. Recent developments in the psychology of comparative cognition, in evolutionary biology and in philosophy of mind, however, add important insights and significant progress in this field, and these are the issues which Walter Veit discusses so elegantly and accurately in this book. For example, recent work in comparative cognition over the past couple of decades has provided persuasive evidence that some non-human animals are capable of Mental Time Travel – from corvids (members of the crow family), including the raven pictured on the front cover of the book, to cephalopods (cuttlefish, octopus, and squid). Work in evolutionary biology, in combination with neuroscience and philosophy, has also made a significant impact such as the *Cambridge Declaration on Consciousness* in 2012 and the formation of the first interdisciplinary journal of non-human consciousness *Animal Sentience* in 2015. One should also note the recent work on animal welfare and cognition, and its significance for developing a new UK Animal Welfare (Sentience) Act in 2022, based on the impact of recent developments in animal welfare and cognition, situated within a philosophical framework of the dimensions of animal consciousness.

In the preface, Walter Veit clearly states the book's objective, namely to formulate and develop a biological science of consciousness that focuses on the evolutionary origins, function, and phylogenetic diversity of consciousness and catapult such a framework from the sidelines to the very centre of considerations about the science of consciousness. Walter Veit is exceptionally well placed to achieve this goal, and to integrate these disparate fields, given his background in philosophy and his experience in also working with experts in biology and psychology. The book also provides a historical approach to the field, with its origins, e.g., in the seminal writings of Donald Griffin as to why biologists should be interested in questions of consciousness in non-human animals, not to mention the importance of philosophers such as Dan Dennett, Jonathan Birch, and Peter Godfrey-Smith; evolutionary biologists such as Charles Darwin and Eva Jablonka; and animal behaviourists such as Marian Dawkins and myself, to name just a few of the influences.

Like most scientists studying consciousness, Walter Veit's approach is to treat consciousness as a complex biological phenomenon that has been developed over the vast history of evolutionary time. That said, his approach is novel and exciting because he offers an intriguing strategy, namely to consider animal life histories as well as focusing on the healthy and pathological varieties and gradations of consciousness as a complex phenomenon in nature. The argument is that one should deploy an evolutionary inspired bottom-up approach to investigate whether non-human animals have different dimensions of consciousness and to what degree, as opposed to a top-down investigation of whether evidence of non-human animal awareness meets the criteria for human consciousness. He argues that animals may have subjective awareness at various levels of perception of vision and touch, as well as the evaluation of the hedonic value of experience, and the way in which they may be able to integrate these experiences and explore the motivational trade-offs in decisions now and in the future, and what that might mean for their understanding of the subjective nature of the projection of the self in time. In doing so, he truly integrates the philosophical with the biological and psychological. Why philosophical? Suffice it to say, this is all set within a framework of phenomenological and pathological complexity and how this results in the "Final Crowning Chapter of the Darwinian Revolution".

I shall reveal no more: it's up to the reader to discover and decipher. What I would say is that this is a beautifully written book full of surprising insights, marvellous metaphors, and wonderful titles that inspire and intrigue. I recommend this book in the highest possible terms.

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1

A DARWINIAN PHILOSOPHY FOR THE SCIENCE OF CONSCIOUSNESS

1.1 Introduction

This monograph is a philosophical contribution to the emerging science of animal consciousness. It is a science that the prominent American ethologist Donald Griffin tried to establish in the 1970s when he called for a “cognitive ethology” that applies Darwin’s lessons to consciousness:

Most of Darwin’s basic ideas about evolution are now generally accepted by scientists, but the notion that there has been evolutionary continuity with respect to conscious experiences is still strongly resisted. Overcoming this resistance may be the final, crowning chapter of the Darwinian revolution.

Donald Redfield Griffin (1998, p. 14)

But even a decade after his death, with the “Cambridge Declaration on Consciousness” in 2012 and the formation of the first interdisciplinary journal of non-human consciousness in 2015, aptly titled “Animal Sentience”, we remain far from achieving a Darwinian study of the mind. The goal of this book is thus to advance Griffin’s vision of the *final, crowning chapter of the Darwinian revolution* by helping the burgeoning field of consciousness research to cast off the chains of a pre-Darwinian view of the mind in both philosophy and science. This will allow us to transition towards a true Darwinian science of consciousness in which the evolutionary origin, function, and phylogenetic diversity of consciousness are moved from the field’s periphery to its very centre and enable us to endogenize consciousness into an evolutionary view of life.

In the preface, I have emphasized that there are two senses in which we can ask about the place of consciousness in nature: one concerns the presence and contents of minds in nature and the other the relationship between matter and mind. The former has been called the *problem of other minds*,¹ the latter is the familiar *mind-body problem*; two problems to which answers vary so incredibly widely that many are under the impression that there is no standard according to which we could even begin to sort out which views are likely going to be wrong. It is in this context that one may be forgiven for thinking that the historical question of how consciousness evolved constitutes anything but an additional problem that only further complicates the picture. Yet, it is precisely in the modern twenty-first century theory of evolutionary biology that we find the much-needed standard that the science of consciousness was so desperately lacking.

2 A Darwinian Philosophy for the Science of Consciousness

In order to develop a true biological science of consciousness, we must attend to the (cognitive) ethologist's demand to address the *functionalist question* of what consciousness, in all of its diversity and gradations, does for healthy agents within their normal ecological lifestyles and the natural environments they have evolved in. Accordingly, this book has two objectives: (i) to argue for the need for and possibility of an evolutionary bottom-up approach that addresses the problem of consciousness in terms of the evolutionary origins of a new ecological lifestyle that made consciousness worth having and (ii) to articulate a thesis and beginnings of a theory of the place of consciousness as a complex evolved phenomenon in nature. This thesis can be succinctly summarized as follows.

The Pathological Complexity Thesis:

The function of consciousness is to enable the agent to respond to pathological complexity.

Inspired by Godfrey-Smith's (1996a) *environmental complexity thesis* that sought to establish a link between environmental complexity and the evolution of cognitive complexity, "The function of cognition is to enable the agent to deal with environmental complexity" (p. 3), the pathological complexity thesis is grounded in the idea that health and consciousness are two closely related natural phenomena.² Not only will I argue that the origin and function of consciousness lie in the capacity to help complex but vulnerable animals deal with their species-specific health challenge to seek out the beneficial and avoid the pathological, but also that a naturalist understanding of this "biological normativity" requires the development of a Darwinian theory of the organism that will in turn allow us to make sense of organisms as active *agents* and *subjects* including their subjective experience as an integral part of our biological understanding of what makes a bat a bat, a snake a snake, and a healthy bee a healthy bee.³

1.1.1 Pathological and Phenomenological Complexity

The pathological complexity thesis is intended as a functionalist alternative to the false dilemma between the two dominant traditions in the philosophy of mind and the science of *human* consciousness, i.e. between strongly externalist representationalist theories of consciousness that overemphasize sensory experience and strongly internalist ones that overemphasize self-awareness as the models for all of the experience.⁴ Instead, the pathological complexity thesis seeks to develop an alternative model of consciousness based on a model of *animal sentience*.

Because of the associations of the term "consciousness" with the complexity of the human mind, the term "sentience" – coming from the Latin verb *sentire*, i.e. "to feel" – is often preferred among those with a primary interest in animal consciousness.⁵ The term has not received universal endorsement, however, because it is often used ambiguously as (i) a deliberately broad and inclusive concept to refer to all kinds of subjective experiences, (ii) a reference to the most minimal kind of subjective experience found at the evolutionary origins of consciousness, or (iii) the hedonic capacity to feel pleasure or pain. Here, we can avoid these ambiguities because this book will combine all three interpretations. The origins and *raison d'être* of minimal consciousness or "qualia" lie in hedonic evaluation as "valence" (rating experiences as good, neutral, or bad). Sentience in this evaluative sense is an inherently "interactionist" – or perhaps better, "dynamic" – dimension of consciousness.

Pathological complexity is neither an internalist nor an externalist measure but emerges dynamically from the interaction of organisms and their environments as a measure of the complexity of an organism's life-history strategy and will hence vary with the different "lifestyles"

of different animals. It can be understood as the computational complexity of the Darwinian trade-off problem faced by all biological agents as they deal with challenges and opportunities throughout their life histories in order to maximize their fitness. As I shall argue in this book, consciousness evolved during the Cambrian explosion 540 million years ago alongside a new evaluative animal *lifestyle* characteristic of large parts of the metazoan branch of life, as an adaptive response to a computational explosion in just this kind of pathological complexity that made sentience worth having.

Importantly, I use the term “pathological complexity” instead of the equally adequate and perhaps less confusing terms “teleonomic complexity” and “life-history complexity”, not because I want to make the argument that organisms with greater life-history complexity are unhealthy, but because I want to emphasize that it is only in understanding life-history trade-offs that we can distinguish healthy from pathological trait variations of traits and that includes variations of consciousness both within and across species, i.e. what I shall term “phenomenological complexity”.

Unlike other theories of consciousness that struggle to make testable predictions, the pathological complexity thesis offers us a conjectural empirical framework for the relationship between mind and life by linking properties of phenomenological complexity – such as sensory experience, self-awareness, hedonic feelings, points of view, and mental-time travel – to properties of pathological complexity. A deeper understanding of what makes varieties of consciousness healthy and pathological will be of utmost importance for extending the Darwinian revolution towards consciousness, which is why parts of this chapter will be dedicated to explicating health as a natural phenomenon.

Operationalizing pathological complexity in terms of the number of parameters and constraints in the evolutionary optimization problem studied by state-dependent or state-based behavioural and life-history theory offers us an elegant framework to naturalize health, organisms, and the idea of different ecological lifestyles central to a Darwinian approach of life and mind. It is my hope that the thesis of this book will provide us with a fruitful hypothesis and framework to move us closer towards a comparative science of animal consciousness that can help us to make sense of the place of mind in nature.

1.1.2 Chapter Outline

This chapter is organized as follows. [Section 1.2](#) “Some Preliminary Remarks on Organisms, Health, and Philosophical Method” offers some meta-philosophical reflections about naturalist philosophy and how we can make progress, despite resistance, to understanding notions such as health and consciousness from a Darwinian point of view. [Section 1.3](#) “Lessons from the Darwinian Revolution” defends an extension of the Darwinian program towards animal consciousness by placing it in its historical, methodological, and social context. The history of the Darwinian revolution for biology and psychology will offer a number of important scientific and philosophical lessons and building blocks for the pathological complexity thesis that will accompany us throughout this monograph. [Section 1.4](#) “Carrying Darwinism to Completion” combines the foregoing lessons from the Darwinian revolution with modern state-based behavioural life-history theory to build a theory of health, organisms, and ecological lifestyles grounded in *pathological complexity* that can be used to endogenize consciousness into the Darwinian revolution. Finally, [Section 1.5](#) “Outline of the Book” concludes with an outline for the next five chapters describing how pathological complexity will allow us to make sense of the place of phenomenological complexity in nature.

1.2 Some Preliminary Remarks on Organisms, Health, and Philosophical Method

While my suggestion to link health and consciousness in terms of an association between the biologically normative properties of pathological complexity and the phenomenological complexity of organisms will be intuitive to many animal consciousness researchers focusing on sentience and evaluation, many contemporary philosophers may find it strange. Just as consciousness constitutes perhaps the core problem in the philosophy of mind, the proper definitions of health, pathology, and normal functioning constitute the fundamental problems in the philosophy of medicine. This is plausibly part of the reason why philosophers of mind have been so reluctant to seriously consider evaluation – an inherently normative notion – as the most basic form of consciousness. After all, how could one hope to address one of the biggest problems in philosophy by solving another seemingly unrelated problem in an entirely different field?

An immediate concern should be that it is one thing to aim for progress on one of the major philosophical debates, but it is quite another to undertake the task of making progress on two of its most disputed controversies. Furthermore, the idea that these vexing phenomena share an intimate, but yet, unexplored connection may strike some more traditionally inclined philosophers as a bizarre project. Philosophy in the eyes of those within the tradition of Bertrand Russell's decompositional style of analytic philosophy is engaged with the detailed and narrow, rather than with the general and broad, but this is not the vision of philosophy that I endorse here.

1.2.1 A Darwinian Philosophy of Nature

This monograph follows a particular naturalist style of doing philosophy that is common in the sphere of Australian philosophy of biology and psychology. It is advocated by Antipodean philosophers such as Kim Sterelny, Paul Griffiths, and Peter Godfrey-Smith, but also embodied by the likes of Daniel Dennett and Ruth Millikan, in which the biological sciences – and in particular modern evolutionary theory – become an instrument for the materialist philosopher: “a lens—through which we look at the natural world” (Godfrey-Smith, 2013b, p. 4). Godfrey-Smith (2013b) has called this activity “philosophy of nature” to reflect the older ambitions of the German tradition of *Naturphilosophie* to combine science and philosophy to make sense of the world and our place in it, though without excess romanticism and metaphysical speculation, which nicely describes the project of this book.

The intended task of the philosopher here is to synthesize, rather than to analyse, the products of the sciences in order to construct better theories and models – which brings it in many ways indistinguishably close to the kind of integrative work done by important scientific names, such as Darwin himself. Indeed, this book is very much motivated by the idea that we can endogenize consciousness within modern evolutionary biology by following in the footsteps of Darwin and his followers. But my ambition is not merely scientific; it also has a distinctive philosophical flavour that was once beautifully expressed by Richard Rorty who described philosophy as being in the unique position of providing the only “place in the university where a student can bring any two books from the library and ask what, if anything, they have to do with each other”.⁶ This comparative and integrative ambition is very much the spirit of this big-picture book on the connection between pathological and phenomenological complexity across the animal branch of life. But before we can even begin to instigate such an investigation, we first need some conceptual grip on the nature of our target phenomena.

1.2.1.1 What Is Health and Consciousness?

One immediate philosophical problem for any biological investigation of consciousness and health is that the terms “consciousness” and “health” are notoriously ill-defined. The cognitive ethologist Frans De Waal (2016), for instance, notes that he prefers “not to make any firm statements about something as poorly defined as consciousness. No one seems to know what it is” (p. 23). Former zookeeper and animal welfare expert turned philosopher, Heather Browning (2020b), similarly expressed scepticism that health reflects “any naturally existing state”, instead of a mere cluster of different phenomena (p. 164). If they are right, the pathological complexity thesis seems to rest on shaky ground, built to connect two phenomena that may not even exist.

But the absence of precise definitions for either should not stop us in our tracks. Both terms – as used by the public – may be vague, ambiguous, and resistant to the analytic philosopher’s ideal of a conceptual analysis that could provide us with a clear-cut definition. Indeed, if one’s goal is to provide a definition of the term that would cover its varied usages, one may be tempted to conclude that we would be better off eliminating their folk concepts altogether.⁷ But my goal is not conceptual analysis; it is *conceptual explication* (Carnap, 1950) or as I have called it elsewhere *naturalist conceptual engineering* (Veit & Browning, 2020b). We are trying to capture a phenomenon in nature, for which the neurophilosopher Patricia Churchland (2002) suggests that we should simply rely on common sense to establish “provisional agreement” on a number of “unproblematic examples of consciousness” (p. 133). There is no need to provide a philosophically satisfactory concept of consciousness or health before we can begin to investigate them, any more than we would need to define the concept of koala before we can learn about their enjoyment of eucalyptus leaves.

Scientists repeatedly proceed to investigate phenomena that have so far remained elusive, proving that vagueness need not be an obstacle to scientific inquiry (Neto, 2020). In this naturalist activity, it is ultimately nature, not intuition, that will decide how we should understand consciousness, precisely because as Figdor (2018) argues, we “lack widely accepted theories and models that can organize and articulate the pre-theoretic consciousness-related concepts we are using to guide our initial investigations” (p. 10). Following Churchland (2002), we can confidently reply that we can at least initially “use the same strategy here as we use in the early stages of any science: delineate the paradigmatic cases, and then bootstrap our way up from there” (p. 133).

Paradigmatic cases of consciousness are plenty: pain, pleasure, smell, vision, taste, a sense of one’s body, and memories, alongside a whole other range of subjective experiences. Similarly, we have some intuitive grasp of health and pathology in humans and animals alike, such as diseases, broken bones, lesions, parasites, burns, poisons, maladaptive behaviour, and other “biological wrongs” – even if we have struggled to derive something like a folk theory of health. So it is perhaps unsurprising that we can also intuitively distinguish healthy subjective experiences from unhealthy ones such as major depressive disorder, anxiety disorder, aphantasia, synesthesia, autism, schizophrenia, prosopagnosia, chronic pain, and many more. Yet, many philosophers of medicine would *deny* that health is a natural phenomenon, thus perhaps providing an explanation for why philosophers have given so little attention to the search for the origins of consciousness in the normative notion of evaluation.

1.2.2 Resistance to Naturalism in the Philosophy of Medicine

Despite naturalist views being discussed by philosophers of medicine, their assessment is largely negative, and most within the field now maintain that health reflects personal evaluations or the values of society at large; a consensus that health is primarily a *normative* concept, rather than “only” an objective *biological* property of organisms.⁸

Such a view may have been the dominant one ever since the French historian of science and first modern philosopher of medicine, Georges Canguilhem (1991), argued in his influential treatise *The Normal and the Pathological* that “[t]here is no objective pathology. Structures or behaviors can be objectively described but they cannot be called [‘]pathological[’] on the strength of some purely objective criterion” (p. 226). Others like Lennart Nordenfelt (1995), who emphasize the concept of agency, have argued that health cannot be understood in a reductionist naturalist way and instead requires a more holistic conception, where it is understood as the ability to achieve one’s vital goals. Phenomenologists such as Havi Carel (2007) have similarly argued that the “experience of illness cannot be captured within a naturalistic view” (p. 95). Such strong assertions against the very *possibility* of a naturalist account are surely premature and yet can be found throughout the literature, effectively making naturalism a “boogeyman” of the field. Rarely has there been a philosophical debate in which naturalism has been so forcefully and unceremoniously dismissed.

This anti-naturalist consensus in the field can be usefully summarized as an appeal to the “irreducibility” of (i) the normativity of health and disease, (ii) the loss of agency in health and disease, and (iii) the phenomenology or subjective experience of health and disease. But who is to deny that these features can be part of a naturalist account of health and disease? Naturalist philosophers have long worked on attempts to make these notions of normativity, agency, and phenomenal experience safe for naturalism.⁹ What all of these anti-naturalists curiously share, though not necessarily all other philosophers of medicine opposed to a naturalist view of health, is an emphasis on *subjectivity*. Akin to those who view naturalist explanations of consciousness as deeply problematic, they argue that the very idea of a naturalist account of health and disease is mistaken. They hold that one cannot account for health and disease from the objective third-person perspective of science, since they are phenomena at the level of a *subject*, not an *object*, and science cannot account for the former – a view familiar from so-called naysayers who assert a scientific account of consciousness to be impossible.¹⁰

This way of thinking about naturalism, however, is highly problematic. Subjects aren’t some mysterious entities inaccessible to science: they are an evolutionary product and also include non-human animals. But the possibility of a Darwinian reconciliation between a view of health as a property of the organism as an “object” and of the organism as a “subject” has been given scant attention, precisely because *non-human health* has been less than an afterthought in this debate (see Matthewson & Griffiths, 2017).

As I will argue in this chapter, not only health and pathology are perfectly naturalistic concepts but they also play a key role in evolutionary biology and will help us to extend the Darwinian revolution to include consciousness.

1.3 Lessons from the Darwinian Revolution

The first chapter of this book is titled “A Darwinian Philosophy for the Science of Consciousness” precisely because the so-called emergence in the 1990s of a science of consciousness has at best been a science of *human* consciousness. From a naturalist perspective, we can only truly claim to have established a Darwinian science of consciousness once we study consciousness as a natural, rather than a human, phenomenon – and this must include all sentient animals. Unfortunately, consciousness appears to be one of the last biological phenomena that we have failed to integrate into the Darwinian revolution.

As I noted in the preface, this project has been burdened with unfortunate epithets such as “just-so stories”, demonstrating a resistance to the possibility of an adaptationist evolutionary process explanation of how the mind gradually came into existence. Lewontin (1998) himself,

who has been one of the fiercest opponents of adaptationist explanations in biology,¹¹ contributed to this scepticism when he argued that we know next to nothing about the evolution of the human mind and probably never will. Such a pessimistic attitude is certainly not entirely unfounded, since consciousness appears to leave no fossil trace, making it seemingly impossible to trace its phylogenetic origins and reconstruct its *raison d'être* through a historical narrative explanation.

In this, however, consciousness is not alone – sharing a fate with a wide range of other complex biological phenomena that people thought could not be explained in Darwinian terms. Most notably of these is behaviour, which has been firmly integrated into modern evolutionary biology since the ethologists endogenized it within Darwin's explanatory framework. Paying close attention to the origins of the Darwinian paradigm and its extension to behaviour will provide a number of useful lessons for a *cognitive ethology*, which likewise endogenizes consciousness in a Darwinian view of life.

1.3.1 Darwinism and Teleonomy

In trying to provide a Darwinian account of consciousness, we have to clarify what we mean by such a project. Above, I noted that the pathological complexity thesis rests on the Darwinian idea of a functionalist alternative to a false dilemma between externalist and internalist approaches to consciousness. Internalist explanations seek to explain features of a system in virtue of other features of that system – of processes, structures, organization, and development *within* it, rather than outside of it. Externalist explanations, on the other hand, aim to explain features of the system by recourse to the external, i.e. the environment – Godfrey-Smith (1996a) calls them “outside-in” explanations (p. 30). This distinction is not only relevant for categorizing different views of the mind, but also of life itself, since many treat Darwinism (mistakenly) as an externalist program.

Lewontin has stated the alleged link between Darwinism and externalism perhaps the most forcefully, arguing that the success of the Darwinian project was due to its disentangling of internal and external forces that have previously been inseparable (see also Lewontin & Levins, 1997). Darwin broke with what Lewontin called *transformational* theories of the past, such as Lamarck's (1984) theory of evolution that postulated change to individuals within their life histories arising from “subjective” or what we may want to call “internal” forces, such as will and striving. The Darwinian theory of the organism made it the “*object*, not the subject, of evolutionary forces” such as natural selection and random drift that are “autonomous and alienated from the organism as a whole” (1985, p. 85). To complete the Darwinian revolution, however, Lewontin maintained that the internal forces – the subject-side of organisms – must be reintroduced:

Darwinism cannot be carried to completion unless the organism is reintegrated with the inner and outer forces, of which it is both the subject and the object.

Richard C. Lewontin in Levins and Lewontin (1985, p. 106)

By this, Lewontin did not mean subjective experience, but rather how organisms as agents actively “participate” in their evolutionary path and “construct” their environments, as an alternative to a traditional adaptationist view of life. These notions of agency and construction have been highly influential in modern attacks on Darwinism (Ho & Saunders, 1979; Laland et al., 2014; Müller, 2017; Noble, 2015), but I am not here interested in the conceptual role of organisms as subjects for challenging the theoretical modelling of evolution. My interest lies in subjects as an evolutionary product to allow us to make sense of the evolution of subjective

experience. As Godfrey-Smith (2017c) notes in his discussion of Lewontin, not only subjects are a cause of evolutionary change, but they are also its product.

In advancing a gradualist view of the evolution of consciousness, theoretically less loaded terms like “agency” and “subjectivity” are useful for thinking about organisms as being more or less subject-like; they “can realize subjectivity to a greater or lesser degree” (Godfrey-Smith, 2017c, p. 1). While subjectivity may appear similarly as elusive as consciousness, it does not similarly suffer from an overabundance of theoretical frameworks. We can, as Godfrey-Smith (2019a) argues, use Lewontin’s distinction between objects and subjects to bridge the gap between matter and mind: “[t]he history of life includes the history of subjectivity, and subjective experience is the experience of a *subject*” (p. 2). And in doing so, we may be able to carry the Darwinian revolution to its completion.

Unlike Lewontin, however, I do not see a conflict between adaptationism and an explication of the subject-side of organisms. As this book hopes to demonstrate, it is precisely with a Darwinian view of organisms that we will be able to make sense of “subjectivity”. This does not mean that we can’t recognize that evolutionary biology has been dominated by externalist modes of explanation, with features of the organism being explained in terms of their adaptive fit to their external environment (Godfrey-Smith, 1996a; Walsh, 2015). Evolutionary biologists readily admit that “[t]he suspicion of internal causes in the dominant neo-Darwinian culture ran so deep that every internalist idea, no matter how reasonable, was treated as an appeal to vitalism” (Stoltzfus, 2019, p. 46). But we should distinguish the idealization choices made by *some* modellers, from a deeper commitment to the necessity of an externalist view of adaptations. After all, there is plenty of modelling work done by evolutionary biologists that can be seen as “internalist”, such as the study of game-theoretic dynamics that emerge from the structure of a population rather than its external environment (Sterelny, 1997, p. 556). Indeed, it is a mistake to think of adaptationism and externalism as a one package deal. As I shall argue, we can straightforwardly follow Sterelny’s (1997) suggestion to decouple adaptationism from externalism and consider the two separately.

Many of the arguments against adaptationism are really arguments against its externalist versions that use a so-called lock and key model of the adaptation between organisms and their environments, a criticism that need not apply to other versions. Modern evolutionary biology recognizes plenty of feedback between organisms and the species-specific environments in which natural selection takes place, such as Brandon’s (1990) notions of “selective environments” and “ecological environments”, which can be distinguished from an organism-neutral externalist view of the environment. The external features that *matter* to the evolutionary trajectory of the organism are themselves causally dependent on the organism. No longer do modern evolutionary biologists see adaptations in the externalist design-sense of a natural theologian such as Paley (1802), who argued that animals are a proof of God’s design plan, with species being fitted to pre-existing external niches.

As with many scientific concepts, the concept of adaptation came to be redefined – or rather explicated – in a naturalistically unproblematic sense referring to whatever is produced by natural selection, even if such “design” appears inefficient and wasteful (Griffiths & Gray, 2001, p. 209). Much of the opposition from “Neo-Darwinians” to Gould’s and Lewontin’s criticism of “adaptation” was based on a mismatch between a usage of that term in its original pre-Darwinian sense and its modern explication, which already included at least some of the features of feedback between organisms and their environments that were alleged to be lacking in the modern neo-Darwinian view of life. Instead of seeing Darwinism as an externalist theory of organismal traits that replaced previous vitalist and romanticist modes of thinking that were confused between internal and external forces, we should see it as a *teleonomic* rejection of

a false dilemma between internalist theories such as Lamarck's and a strongly externalist view of organisms being designed by a benevolent God to fit their environments, by providing us with an inherently "dynamic" or "interactionist" picture of the living world.

By "teleonomic" I am employing Pittendrigh's (1958) coinage of the term, as a naturalistically unproblematic Darwinian replacement for older and mistaken teleological notions about the purposefulness, design, and normativity of life, which is why I noted above that my notion of "pathological complexity" could alternatively have been called "teleonomic complexity". By understanding organisms as goal-directed systems or Darwinian *agents* evolved to maximize their fitness, our understanding of health, just like our understanding of adaptation and design, will come to be transformed. As I shall argue in this book, we can build a theory of the organism as both an object and a *subject* with the tools of modern state-based and behavioural life-history theory, which does not – as Lewontin objected to – treat organisms as machines with mosaic-like traits, but rather as agents having to deal with integrated bundles of trade-offs in organismal design. It is precisely this teleonomic theory that will bring out the subject-side of organisms. With this, let us now turn to Darwin's own speculations about the evolution of mind.

1.3.2 Early Darwinian Views of Mind

As the approach in this monograph is inspired by Darwin, it will be hardly surprising that Darwin himself rejected a dualist view of the mind, both in a metaphysical sense and in the phylogenetic sense of a sharp dividing line between us and other animals. Following the success of his 1859 book *On the Origin of Species*, he published two further very influential books in which he sought to defend a continuity view between us and other non-human animals. In his *The Descent of Man, and Selection in Relation to Sex*, Darwin (1871) argued that "the lower animals, like man, manifestly feel pleasure and pain, happiness and misery" (p. 39) and that "there is no fundamental difference between man and the higher mammals in their mental faculties" (p. 35). And in his *The Expression of the Emotions in Man and Animals*, Darwin (1872) went on to vastly expand his hypotheses on the evolution of mind, in particular the emotions.

But while Darwin urged us to think about the mind in terms of evolutionary continuity, he deliberately avoided public speculation on the very origin of mind and life, noting: "I must premise that I have nothing to do with the origin of the primary mental powers, any more than I have with that of life itself" (1859, p. 207). Yet, it is clear that the evolution of consciousness sincerely troubled him and some of his early notes revealingly contained the questions: "How does consciousness commence?" and "Where pain & pleasure is felt where must be consciousness???", suggesting that even Darwin speculated about the origins of sentience.¹² Later, he repeated his resistance to explaining the origins of life and mind as problems that ought to concern us *now*: "In what manner the mental powers were first developed in the lowest organisms, is as hopeless an enquiry as how life itself first originated. These are problems for the distant future, if they are ever to be solved by man" (1871, p. 36). But as with the origins of life, early Darwinists were immediately spurred on to think about the origin of mind.

Indeed, the idea of thinking about the mind as a product of evolutionary forces immediately influenced important figures such as Herbert Spencer, Thomas Henry Huxley, Ernst Heinrich Philipp August Haeckel, George John Romanes, William James, Conway Lloyd Morgan, James Mark Baldwin, and John Dewey, who all substantially contributed to an early evolutionary understanding of the mind.¹³ What we saw in the decades after Darwin, Ginsburg and Jablonka (2019) note, was that "all psychologists, philosophers, and biologists who considered mental evolution and the evolutionary origins of mentality explained it in terms of natural selection" (p. 71).

Indeed, it was common at this time to think that the mysteries of the mind could be unveiled by viewing them through an evolutionary lens.

Spencer, for instance, insisted that “[i]f the doctrine of Evolution is true, the inevitable implication is that Mind can be understood only by observing how Mind is evolved” (1870, p. 291). Moreover, both Dewey and Spencer endorsed a continuity thesis between life and mind that influenced my own: the mind is seen as the natural consequence of the evolution of complexity.¹⁴ Furthermore, Romanes speculated in some detail that pleasure and pain may be the key to understanding the place of consciousness in nature:

Possibly, however—and as a mere matter of speculation, the possibility is worth stating—in whatever way the inconceivable connection between Body and Mind came to be established, the primary cause of its establishment, or of the *dawn of subjectivity*, may have been this very need of inducing organisms to avoid the deleterious, and to seek the beneficial; the *raison d’être* of Consciousness may have been that of supplying the condition to the *feeling of Pleasure and Pain*.

George John Romanes (1883, p. 111) [italics added for emphasis]

Evolutionary thinking naturally lends itself towards a view in which sentience constitutes the origin of consciousness. That organisms would evolve to value states and behaviours that increase their own fitness and avoid those that are detrimental to their health appears not at all mysterious from a Darwinian point of view.

Unfortunately, discussions of consciousness and its evolution, in both humans and non-human animals, went out of fashion in the early twentieth century. This was largely as a result of the rise of the behaviourist program coming from Watson and the more radical behaviourism of Skinner, who turned *American* psychology into the study of mere behaviour, banning consciousness from science. But while their official doctrine has been all but abolished, their influence in the study of consciousness remains alive and well. In the following, we will take a closer look at the rise of behaviourism, classical ethology, and Griffin’s eventual call for a cognitive ethology in order to understand what it means to take a truly Darwinian approach to life and mind.

1.3.3 Jamesian Psychology and the Rise of Behaviourism

To understand the rise of behaviourism, one must understand the status of psychology at the beginning of the nineteenth century. One name that has perhaps influenced the science of consciousness more than any other is that of the aforementioned American philosopher and psychologist William James.

James is often credited for turning psychology into a discipline independent from philosophy with his 1890 textbook *The Principles of Psychology*, an achievement that made him the so-called father of American psychology in the eyes of many. In the early development of psychology as a science, consciousness played an important role, so it should hardly be surprising that James is also praised as the “father of modern consciousness studies” (Ginsburg & Jablonka, 2019, p. 41). Unfortunately, James had little to say about animal consciousness or its evolutionary origins, despite his interesting speculations about consciousness as the emergence of a new kind of evaluative agency and his emphasis on a functionalist view of the mind. His explanatory target was ultimately human consciousness, which he believed was undeniable, almost unique in kind, and could best be studied through the method of personal introspection.

The focus of psychology on consciousness, however, quickly came to be questioned. With the further development and success of psychological experiments, appeals to subjective states were

less and less seen as “necessary to justify the value of experimental research” (Burghardt, 1985, p. 914). The behaviourist program that tried to banish all mental concepts from psychology, and turn the science of the mind into a science of behaviour, can be seen as a natural outcome of this trend with functionalism coming to be abandoned. However, this did not mean that the behaviourists were anti-Darwinian, at least not initially. Indeed, unlike James who centred psychology around human consciousness, the behaviourists positively emphasized the importance of studying non-human animals due to their evolutionary continuity with us.

It is unfortunate that Watson, who is usually credited as being the father of the behaviourist movement, is often demonized and misdescribed. When attention is given to his early work, “presentations are usually brief and frequently contain a variety of errors” (Todd & Morris, 1986, p. 71). Rather than treating behaviour as a black box, Watson showed a keen interest in the neurophysiology of animals, dissecting them with great care and experimental detail. However, after a decade of rigorous and methodologically diverse work on animal behaviour, Watson was ultimately fed up with having to justify the value of his research, after being repeatedly faced with the sceptical question of what his work could possibly teach us about human consciousness.

This should immediately remind us of the question not uncommon in twenty-first century *human* consciousness science and the philosophy of mind, regarding what the bearing could possibly be of work on animal consciousness. Watson’s response to his detractors could hardly have been more Darwinian. In his 1913 paper “Psychology as the Behaviorist Views It” – the founding manifesto of the behaviourist tradition that was meant to put these critics to rest – Watson explicitly defended the Darwinian view that there is “no dividing line between man and brute” (p. 158). To understand behaviour as a natural, rather than a human, phenomenon, he maintained was how we could only truly advance a science of behaviour as a natural phenomenon. Those inspired by Jamesian psychology, he harshly accused of being stuck in a pre-Darwinian mindset:

[T]o make consciousness, *as the human being knows it*, the center of reference of all behavior, forces us into a situation similar to that which existed in biology in Darwin’s time.

John B. Watson (1913, p. 124) [italics added for emphasis]

To understand the phenomenon of life, biologists readily recognized that an exclusive look at humans would lead to a biased picture, if not because of its complexity then because of the appeal to thinking of the human body plan as “perfect” or “higher” than other species. What was needed to truly revolutionize our understanding of life as a natural phenomenon was an evolutionary approach based on phylogeny, the comparative method, and sound ecological thinking. Yet, early work in evolutionary biology was initially held back by its focus on the question of human descent.

This *starting point* was perhaps not surprising in a historical sense, since a sharp dividing line between humans and the rest of nature was considered to be the greatest challenge to Darwin’s theory of natural selection. An assumption of human uniqueness had to be overcome. After the continuity between humans and apes was settled, biologists were finally able to put humans in their place in nature, i.e. one among many species; man was dethroned. In trying to understand biological phenomena, biologists would henceforth use the comparative method – gathering evidence from many different species of animals and plants alike to learn general lessons about life. But from the perspective of Darwinism as a research program that placed us alongside rather than above all other life forms, this early focus on humans must have seemed strange. As Watson (1913) put it: “Man ceased to be the center of reference” (p. 125).

In arguing against psychology as the “science of the phenomenon of consciousness”, Watson provided us with Darwinian arguments that very well apply against the top-down human-centric focus of the so-called science of consciousness of today. But before we turn to Griffin’s cognitive ethology as an attempt to develop a bottom-up biological study of the mind, let us first look at the classical ethologists in order to understand how they extended the Darwinian revolution towards behaviour.

1.3.4 Ethology, Health, and the Darwinization of Behaviour

In their introduction to the philosophy of biology, Sterelny and Griffiths (1999) define ethology as “the study of animal behavior under its normal ecological conditions (as opposed to unusual laboratory conditions) and from an evolutionary perspective” (p. 385). And this is certainly how many now think about it, as a tradition that was in opposition to the lack of ecological and evolutionary thinking shown by the behaviourists, and one that has now largely been superseded by behavioural ecology. But there was a more philosophical conviction that motivated its founders, one of a teleonomic view of life, and this has largely gone unnoticed.

When one hears the term “ethology”, inevitably the names Konrad Lorenz, Nikolaas Tinbergen, and Karl von Frisch come to mind as the joint receivers of a Nobel Prize in Physiology or Medicine in 1973 for their involvement in the establishment of ethology and their discoveries of “organization and elicitation of individual and social behaviour patterns” (Nobel Prize Outreach, 2021). Famously, Lorenz studied the imprinting behaviour of greylag geese, who show an innate instinct to bond with the first moving entity they encounter, whereas von Frisch was one of the first to study the “waggle dance” used for communication by bees. Tinbergen, who is more well-known than the others primarily due to his involvement in the spread of ethology through the Anglosphere, spent much of his time studying so-called fixed action patterns such as the egg rolling of the greylag goose (see Beer, 2020). But it is not their work on instincts and other proto-cognitive capacities that is of relevance to this book. Neither am I interested in their philosophical objections to the study of subjective experience. The reason we look here at the (classical) ethologists is the same reason we looked at Watson’s motivation for the behaviourist manifesto: i.e., to emphasize a Darwinian principle that motivated the origins of their approach.

Both the ethologists and the behaviourists wanted to establish an objective science of behaviour in which we rely on a bottom-up approach that emphasizes the study of simple behaviours in order to understand more complex ones. But the ethologists hardly saw the behaviourists as Darwinians at all. This is ironic, considering that both the (early) behaviourists and ethologists used Darwin to motivate their approach. However, we can readily resolve this puzzle. Whereas the behaviourists emphasized the alleged externalist explanatory style of Darwin’s theory of natural selection, ethologists emphasized the theory itself, with its emphasis on function, survival value, and evolutionary phylogeny as sources of mechanisms to deal with the environments faced by organisms. This teleonomic perspective is nicely drawn out in a press release from the Karolinska Institute, which announced the Nobel Prize for the founders of ethology, and described their approach in a very Lorenzian manner as a Darwinian way out of a dilemma between the behaviourist’s externalism and the vitalist’s insistence on internalist forces:

During the first decades of this century research concerning animal behaviour was on its way to be stuck in a blind alley. The vitalists believed in the instincts as mystical, wise and inexplicable forces inherent in the organism, governing the behaviour of the individual. On the other hand reflexologists interpreted behaviour in an one-side mechanical way, and behaviourists were preoccupied with learning as an explanation of all behavioural

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