Life and Mind: An Introduction

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Abstract The spectrum that bridges the distance between the philosophy of biology and the philosophy of cognitive sciences is paved with shared concepts such as cognition, evolution, genetics and teleology, among many others. The existence of such shared areas of interest indicates the suitability and significance of volumes like the one presented here. But while the abovementioned concepts are becoming increasingly prominent in researchers' agendas, there is a lack of a cohesive view that brings together these topics in a single compilation. It is for this reason that *Life and Mind* aims to provide a shared platform where both of these disciplines are intertwined and related, fostering new perspectives for thinking philosophically about life and its various aspects in a comprehensive manner.

Keywords Cognition · Evolution · Genetics · Teleology · Philosophy of biology · Philosophy of cognitive sciences

1 Life and Mind: An introduction

The relationship between life and cognition is a multifaceted and constantly evolving subject. However, it can be accepted without controversy that cognition is a feature that emerged in the course of evolution to help organisms survive and reproduce, and specifically, to deal with complex environments, enabling such organisms to navigate and adapt to them (Godfrey-Smith 1998). The evolution of cognition has enabled living entities to perceive, learn (Ginsburg and Jablonka 2019), evolve, communicate and respond to their surroundings. This strong correlation between life and the origins of cognition is undeniable (Barbaras 1999; Margulis 2001; Veit 2022). Though the precise nature of the type of imbrication they maintain remains a point of debate, it is clear that the mind and life are intimately interconnected and essential to our understanding of the living world.

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The authors contributing to this collective work share a similar perspective to the one just described. This is perhaps the central leitmotif of the present volume, one which provides it with a certain structure and coherence: the belief that it is possible to cease relegating the concepts of life and mind to separate sub-specializations and to begin to consider them together, as integral parts of a comprehensive perspective. In particular, four ideas or concepts will serve as examples of this joint vision: human and animal cognition, evolution, genetics, and teleology. These issues are recurrently discussed throughout the volume, with each of the papers that address them offering a distinct viewpoint. We consider this to be a strength of the book: the diversity of its chapters reflects the diversity of current research perspectives on these topics.

Life and Mind is divided into four parts. Each part revolves around a central concept that serves as a common point of reference, and each chapter sheds light on a different aspect of this concept. This gives the book versatility, allowing it to be read in different ways. We would suggest following the order of presentation, starting with the first chapter and concluding with the last. However, the book can also be read selectively, leaving the reader free to jump to specific parts that align with their interests. In what follows, we summarize each of the chapters that will appear next.

2 Introduction to Part I: Embodiment, Perception and Cognition

In his analysis of the ongoing debate on animal understanding, **Peter Woodford** aims to shed light on the type of understanding that holds significance in discussions surrounding self-awareness. Woodford argues in his article **'Animal Understanding and Animal Self-Awareness'** that by examining the nature of animal understanding, it is possible to identify a justifiable concept, which makes the idea of non-human self-understanding more viable. Woodford's argumentation proceeds in a number of steps. First, he analyzes the nature of animal understanding by drawing on recent discussions in epistemology. These discussions define understanding in terms of a grasp of causal patterns that hold in the world. Using examples from research on animal cognition and behavior, he defends a concept of animal self-understanding as a grasp of causal patterns that hold between an animal's own actions and the effects of its actions in the world. He then shows that recently developed concepts of animal bodily and social self-awareness, which have highlighted the importance of various forms of agency in the concept of animal self-awareness, can inform and further develop the plausibility of animal self-understanding. The chapter concludes by showing how the concept of self-understanding defended by Woodford fits into recently articulated evolutionary views of the emergence of sentience and self-awareness.

Woodford's chapter makes clear that cognition cannot be understood as a mere intracranial form of information processing; rather, the environment and the agent's

actions within it must also be taken into account. Setting aside distinctions between animal and human self-awareness, the second chapter delves further into enactivism, where **Mark-Oliver Casper** and **Giuseppe Flavio Artese** find an attractive alternative to mainstream paradigms in the cognitive sciences. In their chapter '**A Methodological Response to the Motley Crew Argument. Explaining Cognitive Phenomena through Enactivism and Ethology',** they claim that ethological investigations provide a solid methodical grounding for enactivism, and offer important insights into the phenomena that situated cognition researchers would not hesitate to define as cognitive. Casper and Artese provide a solid defense against what they regard as one of the main objections to the enactive theory of cognition: the 'Motley-Crew Argument', the idea that the vast number of entities that enactivism identifies as relevant for studying cognitive phenomena seem to be ultimately unamenable to rigorous scientific scrutiny. In their chapter, they maintain that such challenges can be addressed by the enactive approach to cognition, by paving the way for implementing a suitable methodology that comes from another but theoretically adjacent field, i.e. the methods applied in the field of biological ethology. As they noticeably show by appealing to the concepts of action-readiness and dynamically emerging interaction patterns, as well as case studies such as flight initiation distance in gregarious birds, enactivism and ethology have strong commonalities and very often overlap in their usage of concepts. If this is accepted, Casper and Artese claim, a path opens up for enactivists to answer the Motley-Crew argument.

In addition to enactivism, another topic of long-term and continued relevance is the nature of mental properties. Working on empirical evidence concerning the electrochemical mechanisms that underlie the workings of neurons, **Giacomo Zanotti** takes the baton with his chapter **'Causal Closure, Synaptic Transmission, and Emergent Mental Properties'**, in order to threaten the physicalist's reliance on the so-called Causal Closure principle (i.e. the idea that if a physical event has a sufficient cause, then it has an immediate sufficient physical cause). Even though the more neuroscientists and psychologists succeed in uncovering physical causes that might give rise to mental properties, the less room is left for the exercise of the causal powers *of sui generis* mental properties, Zanotti claims that physicalists still need to assume that the behavior of the nervous system is compositionally determined by the behavior of its working units. In other words, the physicalist has to presuppose that the causal power of the nervous system is nothing but the sum of the causal powers of its organized components, which are neurotransmission mechanisms; and justifying this assumption, according to Zanotti, is not possible at present.

Whether they are physical, epiphenomenal or otherwise, we all have color experiences. In the fourth chapter, **Tiina Rosenqvist** keeps coloring our volume with '**Color and Competence: A New View of Color Perception'.** Here she sketches a new view of color perception that centers on the notion that color vision is 'competence-embedded'. Rosenqvist's novel position entails two main claims. First, she believes that the overarching function of color vision is to enable and enhance the manifestation of relevant species-specific competences (these being competences, in the case of humans, to enable and enhance figure-ground segregation, object identification and re-identification, and property identification).

Secondly, Rosenqvist's view also implies that color experiences are correct when they result from processing that directly and non-accidentally subserves the manifestation of such competences. With a keen eye, Rosenqvist applies her perspective in order to demonstrate its ability to incorporate and explain a broad range of color perception phenomena, including many challenging cases. She differentiates between ideal and non-ideal cases of color perception. In ideal cases (such as seeing a ripe tomato as red), the demands imposed by the relevant competences line up, and the color visual system can simultaneously fulfill its enhancement function concerning all of them. In non-ideal cases (such as color illusions), in contrast, the demands of the relevant competences diverge and clash. Using Akiyoshi's optical illusions as an example, Rosenqvist shows that the apparent strangeness of such cases is a consequence of stimulus properties that pit the demands of the competences against one another. In the last part of her chapter, she convincingly argues that her view not only comes with a lot of explanatory purchase, but also allows us to uphold the powerful intuition that color visual systems are generally well-functioning systems that nevertheless sometimes fail.

Bringing back the 4E cognition framework, **Ainhoa Rodriguez-Muguruza** explores applying the idea of desynchronization to disrupted interactions between menstruating bodies and their environment, and reclaiming its adequate understanding as a way towards re-synchronization, in **'Menstrual Cycles as Key to Embodied Synchronisation'.** Here she presents menstrual rhythms as an essential constitutive aspect of the embodied experience of menstruating female bodies, crucial for philosophical explorations of embodiment and of its consequences for somatic and mental health. She aims to underline its infradian nature and to analyze whether failing to acknowledge this biological rhythm could trigger further pathologies. Here she deems phenomenological accounts of cognition and the paradigm of 4E cognition to be crucial for discussions about intersubjectivity and embodied interaction, and in particular for showing how social and environmental factors can disrupt the harmonious interactions behind menstrual functions, leading to the individual's desynchronization not only with their reproductive clock, but also with other organismic processes. By the end of the chapter, Rodriguez-Muguruza also explores the potential link between these disruptions and mental pathologies whose prevalence has increased within women with menstrual disorders.

3 Introduction to Part II: Evolution, Language and Culture

The second part of the volume, dedicated to a wide range of topics related to evolution, opens with '**Is Cultural Selection Creative?'** by **Malena León,** where an innovative way of accounting for creative processes that incorporates factors beyond the individual's cognitive abilities (with a special emphasis on evolutionary-cultural processes) is proposed. Creativity, traditionally regarded as a subproduct of a brilliant mind, is in fact the result of the 'collaboration' of innumerable people who may not even know each other or completely understand the processes to which they

contribute. This conceded, there is a need to delve further into the implications that arise from theories of cultural evolution for a theoretical approach to creativity, so as to strengthen the explanatory links between theories of cultural evolution and theories of creativity. For that purpose, León draws on a dispute that has taken place in evolutionary biology and the philosophy of biology: the debate on whether natural selection is a creative force. To argue that cultural selection can be creative, she analyzes the arguments that have been used in the literature, extrapolating into the field of culture those criteria that are used in evolutionary biology. Finally, she tests these criteria by analyzing real-world examples to show that cultural selection behaves, at least sometimes, in a creative way.

Just as León's chapter illustrates how case studies from science can offer compelling empirical evidence to bolster philosophical discourses, **Juan Gefaell** and **Cristian Saborido** demonstrate how philosophy can help us unravel and better understand the entangled conceptual connections between different scientific theories. In this vein, **'Incommensurability in Evolutionary Biology: The Extended Evolutionary Synthesis Controversy'** revisits and criticizes Pigliucci's (2017) analysis of the relation between the Modern Synthesis (MS) and the Extended Evolutionary Synthesis (EES). Taking up Kuhn's well-known concept of incommensurability, Pigliucci argues that the MS and the EES are in fact commensurable frameworks (at the methodological, observational and semantical levels) and that their relationship is best understood in terms of the EES being a business-as-usual extension of the MS. In contrast, Gefaell and Saborido hold that Pigliucci's analysis of incommensurability is limited because he seems to assume that incommensurability is a holistic phenomenon, he overlooks the most contentious issues in the controversy between the MS and the EES, he does not provide a sound interpretation of observational incommensurability, and he contends that incommensurability always implies a paradigm shift. After highlighting Pigliucci's difficulties, Gefaell and Saborido provide an alternative interpretation of incommensurability between the MS and the EES that seeks to overcome Pigliucci's limitations. As they persuasively argue, the MS and the EES are in fact methodologically, observationally and semantically incommensurable. By the end of the chapter, Gefaell and Saborido discuss which mode of scientific change better explains the current situation in evolutionary biology, arguing that it is too soon to make any definite statement about it, but leaving the door open to alternative approaches to several philosophical problems related to the rationality of scientific change, scientific realism, and how to deal with deep disagreements within a given scientific community.

The Modern Evolutionary Synthesis and the more recent Extended Evolutionary Synthesis remain as protagonists in the next chapter of the volume. In **'Ontologies in Evolutionary Biology: The Role of the Organism in the Two Syntheses', David Cortés-García** and **Arantza Etxeberria Agiriano** examine how organisms and their role in biological phenomena have varied immensely from the onset of Darwinian thinking to the development of the aforementioned theories. Here they argue that whereas the Modern Synthesis became increasingly reductionist and monist, the Extended Synthesis is constituted by a varied array of models that are able to accommodate different ontological levels, whereby the organism stands as crucial

at the crossroads of many other significant ontological aspects, because of its flexibility and potential inclusiveness. In their meticulous examination of the evolution of the concept of an organism in the context of post-Darwinian evolutionary biology, Cortés-García and Etxebarria Agiriano conclude that the reliance on adaptation-based explanations, which assumed that organisms are nothing but a collection of adaptations, ended up excluding the organism from being considered a worthwhile notion in evolutionary biology. Yet, they claim, failure to reduce the systemic nature and ecological dynamics of the organism (including its properties of agency and organization) to the framework of the Modern Synthesis imposes some important drawbacks. The authors then examine two of the main ontological objections to the Modern Synthesis framework, in order to conclude that a strong, organizational, relational, and agential notion of an organism becomes inevitable for understanding many phenomena without which evolutionary biology is incomplete. Finally, in relation to the historical relations within evolutionary biology, Cortés-García and Etxebarria Agiriano support the idea that rather than the successive unifications or expansions of the theoretical framework that are usually presumed, it is the scientific activity of the actors involved in evolutionary explanations that displayed a varied set of research questions and gave rise to the network-like array of models and practices that eventually constituted evolutionary biology, whose epistemological aspects are importantly influenced by the ontologies that different theories may commit to.

4 Introduction to Part III: Gene and Genotype Metaphysics

The next two chapters of the volume shed new light on different philosophical considerations about genetics. Specifically, these chapters delve into the discussion of the types of entities that are referred to when concepts such as genotype, phenotype or gene are used. To begin with, **David Ricote** and **Ignacio Maeso** reformulate the meaning of 'genotype' and 'phenotype' in the framework of the type/token distinction, in their chapter entitled **'A New Perspective on Type-Token Distinction in The Genotype and Phenotype Concepts'.** Their view is original and innovative, as they evaluate the type-token relations of both concepts, proposing a new and solid conceptual background in order to differentiate genotype and phenotype by how they classify their tokens. According to their perspective, genotypes should be defined independently of genes, thus distinguishing genotype from *genetype*: genotypes should classify whole inherited structures while a genetype is a way of classifying genes. After critically reviewing the main definitions of gene and showing that they are not suitable for defining the tokens of a genotype, Ricote and Maeso suggestively propose that instead of genes, the material instances classified by genotypes—the *genotokens*—should be complete structures that are inherited in each cell reproductive cycle, the most straightforward example being the whole DNA or genome sequence of a cell. These molecular structures can be clearly distinguished as units, in clear contrast to genes, which cannot be easily

delimited as units, or equivalently as tokens. Once this has been done, Ricote and Maeso propose that genotypes could be considered to be natural kinds, because they reproduce and conserve their type-identity by self-templated replication; while in contrast, they argue, phenotypes classify tokens (*phenotokens*), depending on the intentional individuation and classifications of humans; and therefore, they argue, phenotypes do not constitute natural kinds. Precisely this topic (i.e. natural kinds in the philosophy of genetics) is discussed extensively in the subsequent chapter.

There is no denying that much ink has been spilled discussing the nature of our concepts and, in particular, those used in science: whether they describe actual facts of the world or are simply tools of conceptual clarification. The development of science provides us with new objects for reconsidering these classic questions. This is exactly what **Francesca Bellazzi** does in the following chapter, focusing on the concept of a molecular gene. In **'The Gene as a Natural Kind',** she applies Khalidi's (2013) definition of natural kinds as projectible categories and nodes in causal networks, and takes a stance on this matter, siding with the realists. In her approach, the category of 'molecular gene' used in scientific practice corresponds to a natural kind, despite the complexity of the properties that characterize it, and it captures some objective features of reality. Bellazzi's chapter has important implications. First, a better understanding and comprehension of whether something is a natural kind or not is essential, because the naturalness of a given category can provide us with a further justification for why we can make more robust inferences from it. In doing so, identifying something as a natural kind can support the justification of a theory that presents such a kind. Second, a natural kind is more than a theoretical entity whose properties are postulated for practical purposes, and this can direct research into discovering (rather than merely postulating) its features. This supports the role that they also have in the process of discovering new information about such a category. A natural kind corresponds to something objective in the world, meaning that some properties could be discovered as belonging to it, and some could not.

5 Introduction to Part IV: Teleology in Biology and Cognitive Sciences

The last subject of dispute that runs through this volume brings us to a variety of philosophical concerns surrounding the relationship between teleology and natural selection. In the first of two chapters, '**Teleological Explanations and Selective Mechanisms. Biological Teleology Beyond Natural Selection**', **Javier González de Prado** and **Cristian Saborido** vindicate biological teleology from a pioneering point of view. Starting with a general definition of selection as differential reinforcement, they interpret the different types of teleological explanation, both biological and non-biological, as specific cases of selective explanations, of which evolutionary

explanations would be only a specific subset (rather than the only one). They propose, then, to take selection to be more generally a matter of differential reinforcement, in order to claim that selection involves the differential reinforcement of certain effects or traits, where this reinforcement may be a matter of being promoted, reproduced, preserved, stimulated, or intensified somehow. The notion of reinforcement that González de Prado and Saborido propose is sufficiently flexible to cover the great variety of cases of selection, including its most paradigmatic forms. It makes sense to consider natural selection to be a selective process precisely because it involves differential reinforcement, in the form of differential reproductive rates. In light of these considerations, González de Prado and Saborido go on to define a selective mechanism as a mechanism by which the behavior of a system and its relationship with its environment are modified in such a way as to reinforce the presence of certain effects or traits over other alternatives. Finally, they argue that an explanation is teleological if it appeals to the effects of a trait which explain its reinforcement through a selective process—a trait can be teleologically explained if it is structured as the result of a *selective process*—and apply their view to biological regulation as an example. All things considered, Gónzalez de Prado and Saborido's chapter persuasively argues that biological regulation should be considered a selective process, giving rise to its own form of biological teleology.

The volume closes with '**Evolutionary Causation and Teleosemantics**', by **Tiago Rama**, in which he takes up recent disputes about different interpretations of the causal structure of natural selection, in order to conclude that adopting an alternative to mainstream etiological views (i.e. non-causal, statisticalist), opens the door for two lines of thought of special relevance to teleosemantics, and sets out the biological foundations of a new teleosemantic account, which he labels as *Agential Teleosemantics*. As for the first line, Rama claims, a statisticalist reading of natural selection allows for setting different challenges for etiological teleosemantics. In this sense, rejecting the causalist reading of natural selection is tied to different challenges to the foundations of modern evolutionary theory. The second implication Rama highlights in his chapter is that his alternative approach suggests an individual-level view of the causes of evolution. According to this view, all causes that produce apt and complex living systems are individual causes. This view of natural selection is connected to different contemporary approaches in the philosophy of biology that stress the central explanatory role of organisms in biological theory.

6 Conclusion

In this introduction, the main theses and arguments of each chapter of this compilation have been presented. Now readers are in a position to verify for themselves, as warned before, the plurality of themes and approaches that it comprises. This fact has two readings. First, this volume clarifies the richness in methods, approaches, themes and issues that philosophy of biology and philosophy of cognitive sciences enjoy.

This bodes well for future research in these areas. Secondly, the idiosyncrasy of this compilation can be seen as a regulatory ideal for how to continue building knowledge in related fields. We consider, as mentioned at the start, that it is beneficial to our understanding of the natural world to share resources and spaces. It is also worth noting again that the chapters are self-contained and can therefore be read without following their numerical order. We hope that the reader enjoys each of them and returns, whenever curiosity or the desire to know demands it, to *Life and Mind*.

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