Historical-Analytical Studies on Nature, Mind and Action 2

Miguel García-Valdecasas
José Ignacio Murillo
Nathaniel F. Barrett *Editors*

Biology and Subjectivity

Philosophical Contributions to Non-reductive Neuroscience

Springer

Historical-Analytical Studies on Nature, Mind and Action

Volume 2

Historical-Analytical Studies on Nature, Mind and Action provides a forum for integrative, multidisciplinary, analytic studies in the areas of philosophy of nature, philosophical anthropology, and the philosophy of mind and action in their social setting. Tackling these subject areas from both a historical and contemporary systematic perspective, this approach allows for various "paradigm-straddlers" to come together under a common umbrella. Digging down to the conceptual-historical roots of contemporary problems, one will inevitably find common strands which have since branched out into isolated disciplines. This series seeks to fill the void for studies that reach beyond their own strictly defined boundaries not only synchronically (reaching out to contemporary disciplines), but also diachronically, by investigating the unquestioned contemporary presumptions of their own discipline by taking a look at the historical development of those presumptions and the key concepts they involve. This series, providing a common forum for this sort of research in a wide range of disciplines, is designed to work against the well-known phenomenon of disciplinary isolation by seeking answers to our fundamental questions of the human condition: What is there? -- What can we know about it? -- What should we do about it? – indicated by the three key-words in the series title: Nature, Mind and Action. This series will publish monographs, edited volumes, revised doctoral theses and translations.

More information about this series at http://www.springer.com/series/11934

Miguel García-Valdecasas • José Ignacio Murillo
Nathaniel F. Barrett
Editors

Biology and Subjectivity

Philosophical Contributions to Non-reductive Neuroscience

Springer

Editors
Miguel García-Valdecasas
Mind-Brain Group, Institute for Culture and Society (ICS)
University of Navarra
Pamplona, Spain

José Ignacio Murillo
Mind-Brain Group, Institute for Culture and Society (ICS)
University of Navarra
Pamplona, Spain

Nathaniel F. Barrett
Mind-Brain Group, Institute for Culture and Society (ICS)
University of Navarra
Pamplona, Spain

ISSN 2509-4793 ISSN 2509-4807 (electronic)
Historical-Analytical Studies on Nature, Mind and Action
ISBN 978-3-319-30501-1 ISBN 978-3-319-30502-8 (eBook)
DOI 10.1007/978-3-319-30502-8

Library of Congress Control Number: 2016949065

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG Switzerland

This book was completed with the help and support of the Institute for Culture and Society of the University of Navarra (Spain)

ics
Universidad
de Navarra

Contents

Chapter 1
Biology and Subjectivity: Philosophical Contributions to a Non-reductive Neuroscience

José Ignacio Murillo, Miguel García-Valdecasas, and Nathaniel F. Barrett

In the middle of the twentieth century, Wittgenstein warned that "the method of reducing the explanation of natural phenomena to the smallest possible number of primitive natural laws…leads…into complete darkness" (1958, p. 18). At the time, few philosophers and even fewer scientists were prepared to heed his warning. A half-century later, however, the reductive method of science—the method famously defined by Descartes, brilliantly exemplified by Newtonian physics, and long upheld as the gold standard of scientific explanation—seems to have finally lost its luster. While reduction is still widely defended, in the last decades alternative views have gained credibility, to the extent that a "non-reductive science" is no longer dismissed as an oxymoron.

This change is partly due to failures of reductive science. Most prominent of these is the failure of physics to produce a "grand unifying theory" that explains all natural phenomena using a few mathematical formulae. In response, a number of prominent physicists have called for a new approach with different explanatory standards and goals (Wolfram 2002; Laughlin 2005; Smolin 2006). Similarly, despite the "neuro-hype" of recent decades, a leading neuroscientist has recently claimed that "we currently have plenty of knowledge about the 'how' of the brain but still lack an answer to the 'what' of the brain. We thus remain blind to its main and overarching purpose" (Northoff 2013, p. xi). More positively, however, the success of innovative approaches in biology and various fields devoted to the study of mind indicates the promise of non-reductive science: witness the notable examples of Paul Weiss (1973), Robert Rosen (1991), Francisco Varela (2000), and Stuart Kauffman (2000) in biology; and J.A. Scott Kelso (1995), Walter Freeman (1999),

J.I. Murillo • M. García-Valdecasas (✉) • N.F. Barrett
Mind-Brain Group, Institute for Culture and Society (ICS), University of Navarra, 31009 Pamplona, Spain
e-mail: jimurillo@unav.es; garciaval@unav.es; nbarrett@unav.es

M. García-Valdecasas et al. (eds.), *Biology and Subjectivity*, Historical-Analytical Studies on Nature, Mind and Action 2,
DOI 10.1007/978-3-319-30502-8_1

Maxwell Bennett (Bennett and Hacker 2003) and Georg Northoff (2014) in neuroscience.

These examples indicate that for the scientific understanding of living systems, but especially highly intelligent living systems such as ourselves, multiple levels of explanation seem to be indispensable, and not just because their complexity limits our understanding of their constituent parts. Rather, an adequate understanding of the behavior of the parts of a living system seems to depend on the dynamic organization of the system as a whole, and this organization, in turn, seems to depend on the purposeful activity of the system within its environment.

The title of this volume, "Biology and subjectivity," is intended to highlight the close connection between a more adequate, non-reductive understanding of mind with similarly non-reductive understanding of life. For the views presented here, the latter may not be sufficient for the former, but it is at least necessary. But more importantly, going in the other direction, the contributions of this volume seek to demonstrate how careful reflection on subjectivity is necessary for an adequate understanding of life in general.

Our use of the term "subjectivity" is broadly inclusive. It covers feeling, affectivity, value, intentionality, and more—in short, all of the traits of human intelligence and experience that have seemed resistant to scientific explanation and, for this reason, have so often been reduced or "explained away" by standard scientific models. A common assumption in the last century has been that the human mind presents an intractable explanatory "Hard Problem," while the rest of nature is relatively non-problematic for traditional scientific approaches. In contrast, many of this volume's essays are decidedly more optimistic about the possibility of making explanatory progress concerning human subjectivity, provided we adopt a different approach to living systems: one that incorporates subjectivity into biology.

Of course, a non-reductive approach that involves multiple levels of dynamic organization as well as purposiveness and other features of subjectivity is a theory that needs to be borne out by scientific investigation. Its development will likely involve the adoption of some of the same methods and the consideration of the same data that were developed and harvested under the auspices of more restrictive explanatory frameworks. So we should be careful not to portray non-reductive science as if it makes a clean break with "traditional" reductive science. As with all theoretical gains, the transition from reductive to non-reductive science is contingent upon showing that old data can be convincingly interpreted by new theories.

On the other hand, the transition to a non-reductive framework may require much more than the careful reinterpretation of data. Depending on the object of investigation and the questions at hand, the relationship between theory and data can become so entangled that revisions of a much more fundamental nature are required. The apparent necessity of such large-scale revisions would seem to militate against one of the most noteworthy philosophical statements of non-reductive neuroscience to date, Bennett and Hacker's *Philosophical Foundations of Neuroscience* (2003). This work introduces a rather neat and tidy division of labor between philosophy and science, corresponding to a sharp distinction between conceptual and empirical questions. That is, while philosophy addresses conceptual questions, science deals with empirical questions. Although we agree with many of Bennett and Hacker's analyses of the conceptual flaws of neuroscientific theories (e.g. the mereological fallacy), we do not share such a rigid division of labor. This volume has been assembled with the intent to explore the possibility that a genuinely non-reductive science of the mind calls for a more complex and involved relationship between philosophy and science. A relevant example will help to clarify this point.

In a recent review (2009), Mazviita Chirimuuta and Ian Gold call into question the long-standing "classical" view of the receptive field (RF) of neurons in the primary visual cortex (V1) in a manner that indirectly raises the issue of explanatory reduction. As established by the Nobel prize-winning research of Hubel and Wiesel (1959), the classical view is that neurons of the visual system have fixed RFs, such that each neuron of the V1 responds to a specific pattern of stimuli. Experimental evidence for fixed RFs—though never undisputed (see below)—has lent empirical support to one of the most influential theoretical and methodological principles of neuroscience, the "neuron doctrine" (Barlow 1972; Guillery 2005; Bullock et al. 2005). This is the idea that individual neurons constitute the basic functional "building blocks" of perceptual and cognitive processes and that investigations of neural systems should first determine the properties of individual neurons and build up from there. When applied in this way, the neuron doctrine is a clear example of the traditional Cartesian approach to scientific understanding: in the case of vision, for instance, the expectation is that adequate knowledge of the components and architecture of the visual system will allow us to assemble a working model of the system as whole. A crucial assumption for this approach is that basic functional properties of the components—e.g., the RFs of individual neurons—are relatively fixed, that is, unaffected by the activity of neurons at the same or higher levels of the visual pathways. However, recent research in V1 physiology has not supported this assumption (ibid., pp. 207-12); instead, it points to a substantially revised, dynamic notion of the RF or perhaps even to the rejection of the RF concept altogether (pp. 214–15). The response properties of V1 neurons seem to vary depending on the nature of stimuli—lighting conditions, patterns of motion—and other conditions, including perhaps the arousal and interest of the perceiving subject. Accordingly, one possibility that arises from this research is that an adequate understanding of our visual system requires reference to the dynamic influences of higher levels of circuitry, which themselves may be dependent on the purposive activity of the animal within a natural environment.

Now, what can we infer about the role of philosophy from this potentially dramatic turn in the neuroscience of vision? Chirimuuta and Gold are rather circumspect in their assessment of its implications. They refuse to draw any conclusions about the classical model of vision, let alone the neuron doctrine. Rather, they argue that questions about RFs are to be settled empirically by further investigation and, moreover, that the best way to settle these questions is to continue to explore revised versions of classical "single-unit" explanations of visual processes along with "circuit-level" explanations (pp. 216–17). Philosophers who are eager to move past reductive frameworks would do well to keep their example of prudence in mind. On the other hand, Chirimuuta and Gold's statement that "the encouragement of philosophy is neither necessary nor particularly helpful" (p. 217) seems to be contradicted by their observation that the failure of scientists to pay attention to the "complex nonlinear properties of RFs" was only partly due to the limited availability of data. Chirimuuta and Gold cite a 1953 paper that notes the "flexibility and fluidity" of RF activity patterns (Kuffler 1953; cited in Chirimuuta and Gold, p. 211). The implication is that neuroscientists such as Hubel and Wiesel could have adopted a very different theoretical approach, one that embraced a dynamic, situation-dependent view of neural response properties. If they had done so, perhaps empirical research of the last half-century would have proceeded very differently (see Noë 2009, pp. 149–69). In light of this oversight, together with the fact that many philosophers have long argued for a more interactive model of perception (e.g. Dewey 1972 [1896]), cannot we imagine a more constructive role for philosophy in its engagement with science?

This question cannot be deflected by saying that philosophical complexities only get in the way of scientific progress—namely, the practical business of devising testable models and carrying out experiments. The history of science shows that it is naïve to think that any theory that yields readily testable predictions is worth pursuing. Scientific theories are not so easily falsified, especially once they are established within the scientific community. As long as there is new data to be mined, a "degenerate research programme" (Lakatos 1970) can persist for decades despite diminishing explanatory returns. Also, we should be wary of the idea that scientific fields progress through stages of increasing complexity, such that simplification is a necessary first step toward understanding. Surely Chirimuuta and Gold are right that "the most promising route for any new science has always been to seek out any underlying simplicity in what appears to be a formidably complex and unpredictable object of investigation" (p. 212). But this begs a key question: *What kind of simplicity should we be looking for?*

As exemplified by the neuron doctrine, the guiding assumption of modern science has been that the simplicity we seek will take the form of basic building blocks from which we can assemble models of more complex phenomena. In recent decades, however, this assumption has been increasingly called into question in a wide variety of fields by scientists and philosophers alike. Such broad questioning of reductionism cannot be viewed as just another paradigm shift. We are not just deciding between theories or even between paradigms; we are talking about the very meaning of scientific explanation. Perhaps, then, the bias that leads scientists to believe that the only way to progress is to break down objects of investigation into Cartesian building blocks stems from the deep acceptance of some rather abstract ideas about causality, identity, and the ultimate nature of science. If so, this bias may not be removed without richer engagement between philosophy and science.

Fortunately, we are not without exemplars for this difficult task. Scholars in a wide range of disciplines have begun to engage critically with neuroscience with the aim of promoting a more integrated understanding of human behavior (Choudhury and Slaby 2012). Among philosophers, Maxine Sheets-Johnstone (2011), Alicia Juarrero (1999), Shaun Gallagher (2006), Alva Noë (2009), Evan Thompson (2007), Nancy Murphy (2006), Dan Zahavi (2005), and P.M.S. Hacker (Bennett and

Hacker2003) have demonstrated the value of engagement with neuroscience, illuminating the significance of recent scientific advances while, at the same time, deflating scientific claims to have "explained" mind and consciousness by brain processes alone. These critical and constructive exchanges belie the simplistic view that philosophy must accept the findings of science without reflecting on the assumptions that underpin scientific analysis, including the assumption that common experience, the wellspring of philosophy, is inferior to "hard data" as a source of knowledge, or that only scientific data provides a proper basis for philosophical theories.

Still, there is no easy way to define the proper stance of philosophical work whose aim is to contribute to a non-reductive science of mind. Engagement with ongoing research has to be combined with a certain degree of imaginative "distancing" from dominant explanatory frameworks such as computational or information-processing theories of mind. In this respect, philosophers who have embraced a reductive stance (e.g. Bickle 2003) have a more straightforward, if not easier, task, as they typically do not have to imagine how current research would look from the perspective of an entirely different framework. The risk of such a close partnership with science is that philosophers can become overly invested in theories that fall in and out of favor over the course of a decade or so. Perhaps it is better for philosophers to take the long view and remain somewhat aloof from the shifting currents of scientific research. On the other hand, if philosophical contributions are to be taken seriously by the scientific community, philosophers must be willing to make their theories vulnerable to correction by scientific experimentation.

In our understanding, one of the philosophers who better exemplified the intrinsic relation between philosophy and science is Aristotle. Perhaps no other figure in western thought enjoys the stature of progenitor of both speculative philosophy and empirical science, even if his contribution to science, while impressive, was unsystematic. While not every chapter in this volume deals specifically with Aristotle's views or draws from the Aristotelian tradition, all of them can be said to be Aristotelian in a broad sense: they adopt a non-reductive and empirically committed approach to life and mind. In this sense, an Aristotelian approach can be described as any empirically guided search for explanatory principles that are appropriate to the kind of phenomena to be explained. Such an approach calls for the sophisticated combination of theory and observation usually attributed to Aristotle. The same thinker who gave us the grand systematic vision of the *Metaphysics* and *Categories* is also considered to be the first biologist and even the first physiological psychologist. In the words of Daniel Robinson, a historian of psychology:

> No predecessor could possibly or plausibly lay claim to the title of an early physiological psychologist, and this is precisely the title we may assign to Aristotle. He was the first authority to delineate a domain specifically embracing the subject matter of psychology, and within that domain, to confine his explanations to principles of a biological sort. That the entire body of Aristotelian philosophy does not fit into a materialist mold is clear; the philosopher himself goes to some lengths to make it clear. But on the narrower issues of learning, memory, sleep and dreams, routine perception, animal behavior, emotion, and motivation, Aristotle's approach is naturalistic, psychological, and empirical (1976, p. 83; cited in Keeley 2009, pp. 228–29).

In fact, Aristotle's legacy for modern psychology is rather complicated, especially with respect to the issue of reductionism. This is indicated by recent debates over the question of whether or not Aristotle's psychology counts as an ancient precursor to functionalism (Nussbaum and Rorty 1992; Langton 2000), which has been portrayed as a kind of non-reductive approach to mind. Although we cannot enter into the details of these debates here, it is worth noting the irony that the same philosopher who is celebrated as the first empirical psychologist could also be viewed—at least by some—as an early champion of functionalism. Defined as the view that mental states are constituted solely in relation to their functional role in relation to other mental states, sensory inputs, and behavioral outputs (Putnam 1994), functionalism has been roundly criticized for allowing cognitive scientists (at least in the 1970s and 1980s) to disregard the biological instantiation of mental processes. How could the first physiological psychologist be taken for a functionalist?

These debates probe the distinction between formal and material causes in Aristotle's psychology and its implications for the relation between mind and physical embodiment. Because Aristotle often explains the formal cause of a substance by reference to its function (*De Anima* II 1, 412b 10–24), the functionalist reading of the mind-brain relation claims that formal causes do all the work, such that the physical embodiment or material cause of a thinking substance is incidental. If this were Aristotle's view, perhaps he would be akin to a functionalist. But it is questionable that the formal cause can be explained solely in functional terms. In any case, for the purposes of orienting the following collection of essays, we wish to point out an alternative reading, namely, that Aristotle saw something in the materiality of living things that is just as essential to life and mind as their formal properties. The upshot of this insight is an approach that eschews functionalism by its attention to the details of embodiment, and eschews reductionism by its attention to the emergent properties of the organism as a dynamic, purposive whole. Thus, life and subjectivity cannot be reduced to their underlying materiality, but they are nevertheless wedded to their materiality in ways that non-living systems are not.

The contributions of this volume have been written in this spirit. Through a variety of perspectives and traditions, this book seeks to illuminate possible contributions of philosophy to non-reductive forms of neuroscientific research and thereby to promote a rich form of interdisciplinary exchange. As a whole, the book questions the naïve assumption that the language and concepts of philosophy will eventually be superseded by those of neuroscience, but more importantly, it shows the continuing value of philosophical thought. Each of the contributions addresses one or more aspects of subjectivity in relation to science, including (1) the meaning and scope of naturalism and the place of consciousness in nature, (2) the relation between intentionality, teleology, and causality, (3) the nature of life and its relation to mind, and (4) the role of value in mind and nature. In addressing these issues, the contributions aim to show how philosophy might contribute to real explanatory progress in science while remaining faithful to the full complexity of the phenomena of life and mind. At the same time, the volume displays a considerable width of philosophical support for non-reductive neuroscience, whether by means of hylomorphism, the notion of *enérgeia*, teleology, dynamical systems, enactivism, value