Millikan and Her Critics, by Dan Ryder, Justine Kingsbury and Kenneth Williford (eds.), Chichester, Wiley-Blackwell, 2013, pp. 297, £26,95

Anyone interested in Millikan's work should warmly welcome the publication of this engaging and thought-provoking book. This collection contains thirteen articles (plus a very emotive foreword by Daniel Dennett) addressing three main themes of Millikanian philosophy: intentionality, concepts and kinds. Both lays and experts on her work will find this book highly understandable, partially thanks to an extremely useful introduction by the editors and to Millikan's clever use of her replies to further clarify her own ideas and avoid possible misunderstandings. For obvious reasons, in this brief review I will not be able to summarize all contributions, which range from friendly suggestions to feisty criticisms and which address a wide range of philosophical topics, so I will simply outline some of the key arguments and add some brief notes from a reader's perspective.

Millikan is well known for having developed the most comprehensive teleological theory of intentionality. According to her approach, representations are states standing between a sender (or 'producer') and a receiver (or 'consumer'), in which both systems have historically cooperated and are endowed with certain biological functions. Godfrey-Smith's essay provides a very illuminating summary of these ideas, with special emphasis on cooperation and the sender-receiver framework. It is one of the most stimulating articles of this collection, since he considers possible directions of future research and identifies certain problems concerning the application of teleosemantic ideas to cognition.

Millikan's theory claims that senders produce representations that are supposed to map onto states of affairs in accordance with a certain mapping function. Indeed, she maintains that there is always an isomorphic relation between representations and what they represent, a claim discussed in detail in Shea's contribution. Shea's main purpose is to show that in general isomorphisms are not doing any substantive explanatory work in Millikan's framework, since isomorphic relations are a consequence of satisfying the teleological (functional) condition, rather than a further requirement for representing. Nonetheless, he acknowledges that isomorphisms can play a more substantive role when a natural relation between representations corresponds to a natural relation between the represented entities, because in that case these relations can be exploited by organisms. An especially valuable aspect of Shea's picture is that it helps us to understand how productive representational systems could evolve, an issue that has rarely been tackled in the teleosemantic literature. This engaging discussion also leads Millikan to draw an innovative distinction between what she calls 'projected' and 'substitutional' mapping rules.

Less understood notions of Millikan's writings such as the nature of what she calls 'consistency-testers' and her use of the law of non-contradiction also find their place in this volume. The former is sketched in Millikan's reply to Godfrey-Smith and the latter is discussed in detail by Nussbaum's contribution. Interestingly, in her reply to Nussbaum, Millikan outlines her view of modal operators (which, as far as I know, she has never developed), the idea being that the primary function of 'actual', 'necessarily' and ‘possibly’ is not to represent some state of affairs, but rather to produce some change in the cognitive system of the hearer.

From a different perspective but still within a broad teleosemantic framework, Neander puts forward an alternative and original theory, which relies on some of the ideas contained in her previous work. Her approach is based on the notion of response functions, which are functions to produce states in response to certain occurrences in the environment. She takes pains to defend this kind of functions, but I think they could be understood as a particular kind of Millikan’s relational functions. Her main claim is that a sensory state r represents s if it has the response function to carry information about s, where a particular state carries information about another if there is a single causal relation between them.

The main difficulty of Neander’s view has always been the distality problem: is the response function of the toad’s sensory state to respond to worm-like motion, to worms or to light impinging the retina? In this new essay, she attempts two responses. First, she claims that it is supposed to respond to worm-like motion because toads have only the capacity to distinguish worm-like from non-worm-like objects. But the challenge, of course, is to define this capacity without already presupposing its function (and Neander agrees that mere correlation does not suffice). Secondly, she argues it is *by* reacting to worm-like motion that states react to more distal features, and not vice versa. However, we could use a parallel argument to conclude that the toad’s sensory states are supposed to react to worms *by* reacting to worm-like figures. So, it is unclear whether her new approach can effectively solve this difficult problem.

While Godfrey-Smith’s, Shea’s and Neander’s essays take teleosemantic-friendly approaches, Rescorla objects that these theories are too liberal in the attribution of representations. After presenting in great detail the honeybee communication and orientation systems, he criticizes Millikan’s contention that bee dances and bee cognitive states are genuine representations. First, he argues that the assumption that they are representational states is not required in an explanation of honeybee behavior, since everything can be explained by simply appealing to correlations and functions. In response, Millikan replies that according to her view a system has representations precisely *because* it has certain causal and functional properties. Secondly, assuming that representational states should be individuated truth-conditionally, Rescorla argues it is misleading to classify these simple states in the same kind as full-fledged representations such as perceptual experiences or beliefs. Again, Millikan replies that this clear-cut distinction between representations and non-representations is precisely what her theory is supposed to deny. Thus, throughout Rescorla’s paper one has the impression that he is simply assuming a paradigm that is incompatible with teleosemantics, so unless this alternative view is independently motivated, the teleosemanticist will probably not be moved by his considerations.

The second set of papers addresses Millikan’s theory of concepts. According to her, concepts (or, more precisely, ‘substance concepts’) are abilities to reidentify substances. Having the concept DOG, for instance, involves having the ability to reidentify dogs in different situations and through different media. In a very critical essay, Antony vigorously criticizes this view and argues that concepts are vocabulary items in a language of thought (LOT), whose main function is to enable thinking (an interesting question raised by this exchange is to what extent Millikan’s approach is incompatible with these theses). Antony also presents compelling counterexamples to Millikan's theory of abilities and suggests different ways in which her theory of concepts misinterprets the LOT Hypothesis.

Fumerton questions Millikan's contention that concepts of substances are in some sense prior to concepts of properties. He distinguishes four possible ontological and epistemological interpretations of this priority claim, but finds all of them wanting. Additionally, he argues that concepts of properties are probably more fundamental, because we can only reidentify substances by means of recognizing properties. As I understand her reply, Millikan suggests that one might need to discriminate properties in order to develop substance concepts, but there is no need to deploy concepts of properties. That response leads her to lay down her theory of substances, according to which 'substance and property are relative categories'. Some categories like *gold* are substances relative to certain properties (*yellow, malleable*…), but properties relative to certain substances (*ring, crown*…). However, given that Millikan admits there are no such things as substances *simpliciter*, one might wonder whether the claim that substance concepts are more fundamental than property substances is really a substantive and informative constraint.

Fumerton's discussion provides a smooth introduction to the essays on Millikan's metaphysics. Millikan is well-known for holding a form of robust realism and an original classification of real kinds. Matthen and Elder argue against these two ideas. Elder suggests that, to be a realist about objects, one needs to be a realist about the existence of natural kinds and about their temporal persistence and Millikan fails to satisfy the second condition. In turn, Matthen takes issue with Millikan's use of the Homeostatic Property Cluster theory to define historical kinds such as biological species, and raises some objections based on cases of polymorphism and thought experiments involving isolated populations. In both cases, Millikan's reply combines a defence of her view with a dissolution of the problem: she argues that most of these questions (which include the species problem and debates concerning the identity conditions for objects) are probably due to philosophical confusions and, consequently, lack straight solutions.

The essays by Prinz, Braddon-Mitchell and the McDonalds point in a similar direction: in principle, Millikan's general approximation to mind and language seems to be compatible with the acceptance of some weak forms of internalism, two-dimensionalism or *de re* Fregean senses. So why does she insist on her radical 'Outerist' view (as Prinz calls it)? In her replies, Millikan seems to admit that her view might be compatible with some of these approaches, but agues that they are of dubious utility, given that she can already solve the problems motivating them.

In the last article, deVries compares Millikan's views to her intellectual father, Wilfrid Sellars, and identifies some unnoticed disagreements between them. Anyone interested in Sellars, Brandom and their relation to Millikan's thoughts will find this article very illuminating.

To conclude, let me highlight two threads that seem to underlie many of the essays in this volume. First, while contributors generally admit that the different parts of Millikan's worldview fit nicely together, they are not mutually entailed; hence, in principle one could adopt her view of intentionality without embracing her theory of concepts, for instance. Secondly (and relatedly), the collection confirms that teleosemantics is a rich research project that can be developed in many different and innovative ways and which offers compelling responses to a wide range of philosophical questions. Indeed, perhaps the most important common idea shared by all essays is that, after so many years, Millikan's views are still alive because they are extremely useful tools for thinking and addressing philosophical problems.

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