Justin Garson. *A Critical Overview of Biological Functions*. Springer 2016. 113 pp. $54.99 USD (Paperback ISBN 9783319320182).

Justin Garson has authored numerous articles in the philosophy of science, the history of neuroscience and medicine, and biodiversity conservation. His first book, *The Biological Mind: A Philosophical Introduction* (Routledge, 2014), shows how philosophical reflection on biology is crucial for solving the puzzles of the human mind. He is also an editor, with Anya Plutynski, of the forthcoming *Routledge Handbook of the Philosophy of Biodiversity*.

The first chapter of this book is its Introduction. Chapter 2 relays that biological functions are central to many debates in science and philosophy. In science, for example, they play a role in debates about genetics, neuroscience, biomedicine, and ecology. In philosophy, they play a role in debates about the nature of teleological reasoning, biological information, trait classification, normativity, and mental representation. However, scientists and philosophers disagree about what functions are, as well as if there are different kinds of functions. According to Garson, contemporary philosophical debates about biological function originated from earlier debates about the nature of goal directed systems in the 1920s. By the 1950s, there were two main philosophical traditions regarding goal directed systems: the behavioristic and the mechanistic. According to the behavioristic approach, a goal directed system is one that exhibits plasticity and persistency in its outward behavior. The mechanistic tradition, in contradistinction, holds that a goal directed system must be governed by the right type of mechanism. Chapter 3 focuses on the selected effects theory (SET) of function, according to which a function of a trait is whatever it was selected for by natural selection. Garson makes manifest how the SET accounts for the explanatory and normative aspects of function. He highlights the criticisms of SET and shows why they are not compelling. He closes the chapter by presenting a new version of the SET—what he terms the generalized selected effects theory—which shows how brain structures can acquire new functions during an individual's life in a manner that is similar to natural selection.

Chapter 4—Function and Fitness—focuses on the fitness contribution theory of function, which avers that the function of a trait consists in its typical contribution to the fitness of the organism that possesses it. He begins the chapter by surveying several different theories in this family of thought, and shows why any putative theory from this family must be statistical. He critically assesses a major argument in its favor—that it coheres with the way biologists actually use the term. He argues that this 'benefit' does not confer upon the theory an advantage over the SET. He also surveys theorists' considerations of whether the fitness-contribution theory can make sense of the explanatory and normative aspects of function. The fifth chapter is about the causal role theory of function, according to which a function of a part of a system is its contribution to some system-level effect, the effect of which has been selected by a group of researchers. He discusses Cummins' seminal development of this view, then presents a more sophisticated variation of it, the mechanistic causal theory. He distinguishes two different versions of the overbreadth problem (i.e. that it seems to explain too much): the problem of non-functional traits and the problem of dysfunctional traits. He notes that many biologists have recently adopted a pluralism regarding theorizing of function, according to which both the SET and the causal role theory capture important elements of biological usage. Garson recommends a new type of pluralism, which emphasizes the co-existence of function concepts within any given discipline.

Chapter 6 considers three theories of function that are relatively new, having been developed in the last twenty or so years. The 'weak etiological theory' states that a trait token in an organism has a function as long as that trait has contributed to the fitness of that organism's ancestors and it isinherited. A second set of theories, known as the 'systems theoretic' view,

contends that a trait token can acquire a function by virtue of the way that very token contributes to a complex and organized system, and thereby to its own continued persistence as a token. A modal theory of function holds that the function of a trait has to do with the behavior of that token in certain nearby possible worlds. The final chapter, the seventh, shows why describing the debate of functions as one between the SET, fitness contribution theory, and causal role theory is misguided. He argues that there is no viable alternative to the SET. He closes by discussing three problems for most theories of function: that there are a number of different activities associated with the performance of a function and most theories do not have the resources to specify which of those activities constitutes an item's function; second, a trait often has not only a function, but also an appropriate rate of functioning; and third, for many traits that have functions, one can distinguish between appropriate and inappropriate situations for the performance of those functions.

In sum, this title is a guidebook to the current literature on biological functions. It will be a welcome addition as a supplementary text in upper-division biology classes at an undergraduate level, and introductory classes at the graduate level.

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