Stuart Glennan, *The New Mechanical Philosophy*, New York: Oxford University Press, 2017, xi+266 pp.

The development of what is now known as the New Mechanical Philosophy started in 1990s, achieved groundbreaking status during the beginning of the millennium, and established itself as one of the most discussed topics in contemporary philosophy of science over the last decade. As Stuart Glennan, the author of the book *The New Mechanical Philosophy* points out, the name does not designate a school of thought or a movement, but rather a group of philosophers who revived the philosophical talk of mechanisms and their importance across all scientific fields. Indeed, various new mechanist philosophers share different views about mechanisms and their nature, with Glennan offering one such personal account of "how things hang together", to use his own phrase, in the form of a summary on the work done in the field. The book has eight chapters out of which six are dedicated to the ontological problem of what mechanisms are, with the other two chapters discussing new mechanism in general, and the problem of explanation. With the language accessible to philosophers and scientists alike, *The New Mechanical Philosophy* provides an excellent overview of this novel approach to thinking scientifically, both as an introduction to the topic, and as a systematic reference for those well informed in the field.

In Chapter one, titled "What Is the New Mechanical Philosophy", Glennan explains the motivation that drove the need for a new mechanical approach, its roots, and its peculiarities. New mechanists distance themselves from the traditional approach of "craving for generality" which Glennan sees as a perceptual and methodological hindrance that has plagued scientists, philosophers, and common folk alike. Although the roots of this philosophical approach can be found in as far as Democritus' atomism, seventeenth century mechanism, and again in 1960s, there is much 'new' in New Mechanism. Most notably, instead of talking about laws and generalizations, new mechanists have shifted their research to talking about mechanisms, and instead of talking about theories they have shifted over to talking about models. Glennan does not, however, elaborate this rejection of generality at length but simply designates it as an approach that is too far from the reality of the world; a reality that is, in new mechanistic view, first and foremost particular. For this reason, the main approach in the following chapters is an ontological one insomuch as it focuses on defining what these particulars all around us, i.e. mechanisms are how we can properly represent them via models.

Chapter two, titled "Mechanisms", explores the ontological status of mechanisms by discussing its constituents. Following the main thesis of the book, Glennan defines characteristics of a "minimal mechanism" in order to show that the talk of mechanisms is a common denominator of all scientific fields, explaining that "A mechanism for a phenomenon consists of entities (or parts) whose activities and interactions are organized so as to be responsible for the phenomenon"—a definition flexible enough to be applied to most of scientific explanations. One important aspect the author often discusses is stability; more specifically, stability of entities' properties and boundaries, and stability of mechanical production. These stabilities enable

the scientists to use mechanical approach in order to explain regularities, however, as Glennan warns, a defined mechanism can *never* be taken as a strict law—its reality is always, and should be taken, as a particular. Each of the elements of mechanisms have been discussed over the last few decades, so this chapter functions as a concise introduction to prepare the reader for the discussions in the book that are yet to follow.

In Chapter three, titled "Models, Mechanisms, and How Explanations", the author elaborates on how we can represent particular mechanisms via models, which provide a type of general explanation, and which can represent more than one phenomenon. Models are still particular, and they are not to be confused with theory which is, in its abstractness, only a "toolkit for building models", or with laws, which are useful, but descriptions too idealized to be an accurate representation of particular mechanisms. In order to explain a phenomenon, Glennan argues, by explaining *how* it works (its underlying mechanisms), we will explain *what* it is. In order to prove the superiority of mechanistic explanations, this chapter introduces the reader with models as a midway between mechanisms as completely particular explanations, on the one hand, and theories and laws as completely abstract, on the other hand. This feature of models, as a certain level of generality, enables scientists to use them in order to explain various particular phenomena in a detailed and precise manner.

In the fourth chapter, titled "Mechanisms, Models, and Kinds", the author discusses abstract representations of particular mechanisms, and related problems. The aforementioned use of models proves useful even here. If, in our tendency to seek generalizations, we want to define kinds of mechanisms, the new would advise us to seek similarities between particular mechanisms in as detailed and broad way as possible, and then to construct a model as an abstract explanation that encompasses these particular instances. This process, Glennan warns, is not completely arbitrary. Although the scientist is bound by natural constraints, the type of the kind and the model to be constructed depends on their goals, resources, and interests. This "model first" approach, dubbed by Glennan, acts as a more down-to-earth approach which distances itself, just like new mechanism in general, from abstractness of traditional laws.

In the fifth chapter, titled "Types of Mechanisms", Glennan expands upon his initial definition of minimal mechanism in order to show the complexity and richness of types of mechanisms which, as he optimistically concludes, would offer a basis for interconnecting scientific talk of the phenomena. The author thus discusses elements relevant to classifying mechanisms, such as: types of phenomena, types of mechanical organization, types of etiology (how the mechanism originated), and stochastic nature of some mechanisms. One interesting idea expressed in the chapter, albeit not discussed in length, is Glennan's treatment of social sciences and phenomena. Following new mechanical approach, Glennan insists that abstract social concepts, like 'democracy' or "doctrine", are not entities on their own, but that they can only produce change and effect if explained by their constituting entities, such as individuals and their particular interactions.

In Chapter six, titled "Mechanisms and Causation", the author covers a wide variety of approaches to discussing causation as the origin of mechanical production. Indeed, the problem of causation has a long history, and in

this particular chapter Stuart Glennan attempts at situating the new mechanical talk of causes within general philosophical framework. For example, he discusses the ways of explaining causes of processes, the problem of production and relevance, which will be elaborated in the subsequent chapter, the use of truth-makers, manipulation, and generalization. The author tackles these problems by invoking various philosophical conjectures, which performs a good task at providing the aforementioned philosophical context. One aspect that strikes the eye and makes a good case for Glennan's argument that new mechanical approach to causation offers some unique benefits, in his explanation that, in order to explain causation, we need not hold onto laws, but instead it is sufficient for a cause to only once produce a certain phenomenon in order for us to call it a mechanism, and explain it via models.

In the following Chapter, titled "Production and Relevance", the author provides a more personal account of the problem by arguing with various philosophers and expressing his own views. Some of the problems covered are Wesley Salmon's etiological explanation, types of mechanical production, the problem of irrelevant production, the problem of non-productive causation, the problem of causal (i)relevance, and the problem of the fundamental level of mechanisms. The latter problem, of the fundamental level of mechanical production is quite peculiar. One could rightly ask what is the right level of examining mechanisms if we are to be thorough and properly scientific? If we take it to be the atomic and subatomic level, as so called microphysicalism would advocate, we enter a domain of non-classical and indeterministic relationships. Glennan gives a nonconclusive answer to this problem, but one has to keep in mind that new mechanism allows for a certain arbitrariness in choosing the scope and relevance of the mechanisms to be examined, as is already noted in the fourth chapter.

In the last chapter titled "Explanation: Mechanistic and Otherwise" Glennan reiterates his position that mechanistic explanation of phenomena is but one of many scientific explanations, which continues his pluralistic line of thought from the introduction that the aim of the book is to show that mechanistic explanation is "useful" and worthy of further implementation and elaboration. In this particular chapter he discusses scientific explanation in general, contrasting the mechanistic explanation with "bare causal" and "non-causal" explanation, as the only one concerned with the question *how* we arrive from causes to phenomena production. It is interesting that in this chapter, and, indeed, the whole book, the author deliberately circumvents the question of truth, and instead talks about the utility and applicability of mechanisms and models.

In the "Postscript", which acts as a short conclusion of the book, Glennan expresses his hope that the book's ontological outline of mechanisms would inspire scientists to think more about "how things hang together" and to look at phenomena in a new way with new methodological tools that he laid out in this book. There is no doubt that the readers of this book will start noticing all the wonderful mechanisms around them in a new manner, as soon as they flip the last page.

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