

Giorgio Lando. *Mereology: A Philosophical Introduction*. London and New York: Bloomsbury Publishing, 2017.

Nowadays, mereology represents a considerable research topic for many philosophers. Due to the increasing number of investigations, it has become a quite broad and sometimes unspecified topic. Here is where Giorgio Lando's book *Mereology: A Philosophical Introduction* makes its first contribution. In the introduction, he distinguishes three different meanings of the word 'mereology' to have a more perspicuous discussion. First, we have mereology as a discipline (mereology<sub>dis</sub>), which is 'simply the study of the relation of parthood and of strictly related topics' (p. 3). We are dealing with mereology<sub>dis</sub> whenever we try to delineate a specific domain of parts and wholes, such as parts and wholes in mathematics or physics. A second meaning of 'mereology' is mereology<sub>theo</sub>: 'a theory that characterizes parthood and other connected relations (such as composition) in a certain way. This characterization is provided by some axioms, formulated within a given logical framework. These axioms imply some theorems: these theorems are the content of a certain mereology<sub>theo</sub>' (p. 4). Third, mereology can be understood as a philosophical thesis (mereology<sub>phi</sub>). It states that Classical Extensional Mereology (CEM) is 'the unique, general, and exhaustive theory of parthood and composition' (p. 4).

Given such a distinction, the book aims 'to present and defend mereology<sub>phi</sub>' (p. 5), also known as *mereological monism* (Fine 1994). In spite of the fact that mereological monism was embraced by many scholars of the past<sup>1</sup>, *Mereology* is the first book-length study which upholds the validity of this philosophical thesis.

Besides introduction, the book is divided into three parts and an appendix. Part One further develops the previous assumptions explaining what mereology<sub>dis</sub> is about, and it specifies some basic features of the parthood relation. According to the author, *spatial* parthood can be regarded as the paradigmatic case for the genuine meaning of parthood. Then, we can use it to discriminate the *literal* occurrences from the *metaphorical* ones, and to identify the formal features of parthood in general: *Reflexivity*, *Antisymmetry* and *Transitivity*.

Since the main purpose of *Mereology* is to defend mereological monism, CEM is extens-

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<sup>1</sup>For example, Tarski (1927), Goodman (1956), Quine (1981) and Lewis (1991).

ively presented and discussed in the book. The presentation is given *from above*, where ‘a presentation from above typically consists of a compact list of axioms, which can be accepted or rejected as a single package’(p. 35). Instead, ‘a presentation from below typically consists of a longer list of axioms of increasing force. It is possible to reject some of the stronger axioms in a presentation from below, while accepting the weaker ones’ (p. 35).

The axioms of CEM are *Transitivity*, *Uniqueness of Composition* and *Unrestricted Composition*. Transitivity is the least controversial one, and it is quite easy to show that the alleged counter-arguments against its validity are not compelling. They mainly concern selective parthood and other cases (e.g. membership relation), which were already put aside by the previous considerations about the literal meaning of parthood. Reflexivity and Antisymmetry are introduced as theorems of CEM, together with three notions related to parthood: *proper parthood*, *overlap* and *fusion* (in the book, ‘fusion’ is used as a coreferential of ‘composition’). Uniqueness of Composition and Unrestricted Composition are about fusion. The first one makes fusion an *operation*, that is, a specific kind of  $n$ -place relation where the first  $n - 1$  *relata* determine the last *relatum*. The second one warrants that this operation is *always defined*, that is, given any  $n - 1$  *relata* there is always a *relatum* which is related to them.

Part Two is about Uniqueness of Composition and *Extensionalism*. Uniqueness of Composition states that, given some things, they have no more than one fusion. Extensionalism is the idea that ‘there cannot be two distinct things with the same parts’ (p. 67). It represents the core of mereological monism, and it is worth examining in detail.

First, Uniqueness of Composition and Extensionalism are not equivalent. The former is about fusion, and warrants that it is an operation; the latter provides an identity criterion for complex entities: Given two complex entities, they are identical if and only if they have the same proper parts. Then, Uniqueness of Composition implies Extensionalism, but not *vice versa*.

Second, Extensionalism would be driven by *nominalism about structures*, that is the claim that the structure does not exist. Again, however, Extensionalism is not equivalent to this form of nominalism. In fact, let us consider a structure as ‘the way in which pieces of something are arranged (that is ordered, repeated or stratified)’ (p. 70). What Extensionalism

claims is that CEM does not require a commitment to structures, but it does not mean that the structure does not exist.

Third, the arguments against Extensionalism are rebutted. Most are focused on the right-to-left direction of the first biconditional of its formal definition<sup>2</sup>. This direction states that to have the same proper parts is a sufficient condition for complex entities to be identical. The alleged counterexamples to Extensionalism can be divided into two categories. On the one hand, some of them concern entities whose existence and involvement in parthood is not controversial, e.g. the whole range of concrete entities. Most involve an artifact and the colocated portion of matter. The idea is basically that an artifact and its colocated matter have the same proper parts, but since they instantiate different properties, they are not identical. Lando's answer is that (as shown by Varzi 2008) an artifact and its colocated portion of matter do not have the same proper parts and so they are not identical. On the other hand, there are some counterexamples concerning entities whose existence and involvement in parthood relations is highly controversial. This is the case of facts. However, since there is no conclusive reason for introducing such entities in our ontology, this second group of potential counterexamples can be discharged.

Part Three of *Mereology* is about Unrestricted Composition. It states that given some things, no matter how many and how disparate they are, their fusion exists. Lando argues that plural quantification is the best tool we have for formulating this principle. Fusion is a multigrade predicate, which means that there is no right number of argument places for it. Indeed, we may fuse from one to an infinite number of parts. Then, a unique symbol to talk collectively about these variably numerous entities would be useful – plural quantification. Moreover, whether plural quantification is a logic tool or not, it would not be a problem for mereology. The reason is that the non-logicality of plural quantification would be problematic only if CEM were a logic. However, since CEM is not a logic but a formal metaphysical doctrine, no problem would arise in the case at issue.

In the second part of Part Three, Lando faces the most common claim against Unrestricted Composition. It is said to be counterintuitive, because it forces us to accept the existence of many strange entities. For example, does a fusion between a chair and the Statue of Liberty

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<sup>2</sup> $\forall x \forall y ((\exists z (zPPx) \vee \exists z (zPPy)) \rightarrow (x = y \leftrightarrow \forall z (zPPx \leftrightarrow zPPy)))$ , where *PP* is the proper part relation.

really exist? According to our intuition, it does not, whereas according to Unrestricted Composition, it does. Lando makes clear that Unrestricted Composition 'says that for any things (plural quantification), there is their mereological fusion, but does not say which things there are' (p. 170). Hence, instead of denying Unrestricted Composition, one could agree that the fusions at stake do not exist because the allegedly fused entities do not exist either.

The Lewis–Sider argument plays a very important role in the above discussion and Lando gives a detailed report of it. Here, I limit myself to a brief sketch. It is based on the standard Quinean notion of existence, roughly stated by his slogan: 'To be is to be the value of a bound variable'. As a consequence, existence is not a predicate and it cannot be vague. A restrictionsist – someone who rejects Unrestricted Composition – argues that fusion is restricted by some conditions. However, if this claim was true, in some cases – for example, the one concerning a PhD dissertation – these conditions would have to be necessarily vague. Consequently, there should be something vague inside the vocabulary we use to formalise these conditions. Is that possible? The answer would be that it is not. The only two plausible candidates are the relational predicate '*P*' for parthood and the relational predicate 'is one of' ( $<$ ), which is characteristic of plural logic. However,  $<$  cannot be vague because it is strictly connected to identity, which is not vague. Instead, *P* could be vague – for example, for a water molecule to be part of a cloud – but the cloud-like scenarios can be explained using a preferable alternative: vagueness may concern the reference of the expression 'the cloud' instead of parthood. In any case, according to Lando there is a more general reason to ensure vagueness cannot affect fusion. Since everything is a fusion of itself, the domain of what exists coincides with the domain of what is the fusion of something. Because the domain of existence is not vague, neither can the domain of fusion be. This would prove that fusion cannot be restricted. For this reason, Unrestricted Composition would be a strong and stable principle.

Finally, in the appendix, Lando discusses the highly controversial thesis of Composition as Identity. In its strong version, it basically states that Identity and Composition are the same relation: To be identical is to be composed by the same proper parts. Many philosophers ar-

gued that upholders of mereological monism are obliged to defend (strong) Composition as Identity. In contrast, Lando argues that, while Composition as Identity implies Uniqueness of Composition, 'there is no convincing route from mereological monism to Composition as Identity' (p. 207). Thus, mereological monism would be independent from Composition as Identity, and there is no reason why a mereological monist should endorse such a controversial thesis.

*Mereology: A Philosophical Introduction* is an excellent book. It is certainly useful for experts who aim to deeply explore the philosophical thesis of mereological monism. But it is also very accessible for a non-expert reader who is looking for a clear and accurate philosophical analysis of classical extensional mereology. In line with the philosophical approach of the book, Lando does not prove any theorem or spend much time in the analysis of technicalities. The discussion is vivid and gives the reader an idea of how much philosophy there is on such a technical topic. Moreover, a further virtue of the book is the continuous dialogue the author holds with other philosophers working in mereology. For this reason, *Mereology* can be legitimately considered the most complete and up-to-date piece of work today available about mereological monism.

## References

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