

Does Reduction Entail Identity?

A widely discussed topic in the philosophy of science is *reduction*. Reduction is often taken to be a relation holding between one entity (such as a physical object, property, event, or kind), and another, where it is said that one entity ‘reduces’ to the other. For instance, an instance of pain reduces to a brain state. Reduction, however, is also taken to be a relation holding between one thing and *many things*, in a particular, between a whole and its parts. For instance, reductionists say that a cell reduces to many molecules.

This talk will be concerned with the one-many variety of reduction. Furthermore, it will take reductionism to be a metaphysical or ontological thesis, rather than an explanatory, epistemic, theoretical, or methodological one. The question of the talk is: What is it for one thing to be reduced to its many parts?

A popular view is that *reductionism entails identity*: if A reduces to B, or to many entities the Bs, then A is identical to B or the Bs (van Riel, 2013). Call this view ‘*Reduction Entails Identity*’ (REI). According to REI, a cell should be identified with its molecular parts.

I will argue that REI entails two controversial mereological theses: 1) *Mereological Essentialism* – the view that objects have their parts essentially (Merricks, 1999) – and 2) *Unrestricted Composition* – the view that for any things, there is something they compose (Lewis, 1986). These theses, I will argue, are especially controversial for philosophy of biology and biology.

Firstly, consider Mereological Essentialism. A central debate in contemporary philosophy of biology is the *Problem of Biological Individuality* which asks ‘what is an organism?’ (Clarke, 2010). A popular answer is the *Physiological Approach* which takes an organism to be a functionally integrated whole (Pradeu, 2010). I will argue that Mereological Essentialism and, therefore, REI, implies that the Physiological Approach is false. Furthermore, Mereological Essentialism is in tension with the persistence of objects through change. This is especially surprising for biology given that organisms are the paradigmatic example of objects that persist through the changing of matter.

Secondly, I will argue that Unrestricted Composition and, therefore, REI, causes problems for performing counting operations in biology. Evolutionary biologists are often required to count organisms in order to make predictions and explanations about evolutionary phenomena, for example, when measuring the spread of a trait in a population. If Unrestricted Composition is true, however, then there are far more organisms than biologists ordinarily think there are, and, furthermore, it is impossible to count organisms in practice.

The upshot is that if we want a theory of reduction that is not committed to these controversial metaphysical theses, then we ought to reject REI. In other words, we need an account of reduction that takes reducible entities to be numerically distinct from their parts. Reduction, therefore, must be a weaker relation than identity.

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