

Thought Experiments as Semantic Arguments

abstract

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In the last couple of decades, there has been an intensive debate concerning the epistemological status of thought experiments. Whether in science or in philosophy, these tools of investigation apparently provide important new knowledge in spite of being entirely *a priori*, and thus they pose a serious challenge to empiricism. One of the crucial questions of this debate is: Are thought experiments indispensable, or are they reducible to ordinary arguments within a given theory?

One characteristic point of view regarding this question, held by J. R. Brown [1] is that the phenomenon of thought experiments does actually falsify empiricism, providing quasi-perceptual, yet a priori knowledge. Thought experiments are experimental in nature; the only difference between them and actual experiments is that the objects of observation are abstract entities, instead of physical ones. A more moderate version of this view, put forward by T. Szabó Gendler [2], avoids commitment to Platonism by referring to mental representations instead. According to Szabó Gendler, a thought experiment is in fact an experiment made on one's cognitive models. Of course, both the Platonistic and the cognitivistic versions of this view rule out the possibility that thought experiments could be reduced to arguments. The other extreme is the reductionist view, held by J. Norton [3] and others, according to which a thought experiment is an argument in a fictional disguise, which plays a merely rhetoric role in the investigation, and can be left out without any theoretical loss.

My suggestion is that a great deal of thought experiments function as semantic arguments concerning the satisfiability or categoricity of scientific or philosophical theories. They are not experimental in nature; but they are not arguments within a (scientific or philosophical) theory either. Rather, these arguments serve as tests for theory choice. Being about (rather than part of) theories, they differ genuinely from the deductive arguments which prove the theories' facts. But, on the other hand, no appeal to either Platonistic entities or cognitive representations of the experimenter is required to account for their correctness.

As long as a theory is presented in an informal or quasi-formal manner, its semantics cannot be put forward in a model-theoretic framework. Thus it will necessarily contain intuitive elements. These are responsible for the fictional elements in a thought experiment, which are, in this framework, irreducible. However, once a theory becomes fully formalized in standard first order logic or one of its akins—as it has happened with special relativity and general relativity

in the work of Professor Némethi and his colleagues—, intuitive components in semantics give way to model-theoretic ones. This way, the fictional scenarios of the thought experiments used to test such a theory will be reduced to set constructions.

Let us illustrate the semantic nature of thought experiments with a well-known example. Stevinus’ often cited reasoning about the equilibrium of masses on an inclined plane does not appeal to any specific laws establishing the equilibrium of forces in some theory T of mechanics. Instead, he points out by an ingenious rearrangement of the objects involved that any theory T from which a ratio of equilibrium different from the proposed one follows would make a *perpetuum mobile* possible, thus violating our basic intuitions regarding motion. Stevinus’ reasoning is a convincing counterfactual argument, but it is not part of a physical theory. It gives a construction that rules out all possible theories that are deviant regarding the question of equilibrium on an inclined plane. In the talk, this example will be discussed in more detail, as well as various thought experiments in special and general relativity.

References

- [1] Brown, J. R., “Why Empiricism Won’t Work”, in D. Hull, M. Forbes, and K. Okruhlik (eds.), *PSA 1992*, vol. 2. East Lansing, MI: Philosophy of Science Association, 1993.
- [2] Szabó Gendler, T., “Thought Experiments Rethought—and Reperceived”, *Philosophy of Science* 71, 2004.
- [3] Norton, J. “On Thought Experiments: Is There More to the Argument?”, *Philosophy of Science* 71, 2004.