

## INTRODUCTION

*Tim De Mey*

In his (1905), Mach coined the term *Gedankenexperimente* to refer to certain arguments in physics and to reasoning processes, like those involved in the set-up of a real experiment, quite similar to them. Since then, philosophers of science have developed views on the nature, significance, legitimacy and heuristic value of such *thought experiments*. However, with some notable exceptions, like Kuhn (1964), Mach's original conception has been narrowed down over the century. As many of the papers collected in Horowitz & Massey (1991) testify, thought experiments are nowadays more often than not conceived of in terms of, roughly, *counterfactual reasoning* for argumentative purposes. Partly as the somewhat paradoxical result of this more narrow conception of thought experiments and partly due to the growing interest for the so-called special sciences, philosophers of science have recognised that thought experiments do not only prosper in physics, but in both other natural sciences and the social sciences as well (for the latter, see, e.g., De Mey & Weber 2003). In turn, the recognition of new sets of instances, has given an impetus to adjusting the conception of thought experiments in function of, basically, two seemingly conflicting goals: firstly, doing justice to the specificity of thought experiments *as they function in the domain at hand* and, secondly, being able, nevertheless, to pinpoint and account for salient cross-domain commonalities.

The first paper in this volume, *Thought Experiments in Mathematics: Anything but Proof*, clearly exemplifies such exercises. Motivated by an analogy with thought experiments in the natural sciences, Jean Paul Van Bendegem develops and defends a conception of thought experiments in mathematics. He argues, more specifically, that relative to the goal of providing proofs within the framework of a mathematical theory, any

consideration that provides insight as to what an unavailable proof could look like or that leads to a better understanding of an available proof, is a mathematical thought experiment. Moreover, he shows that there is a wide class of such thought experiments and that it is necessary to have the very concept of a mathematical thought experiment to do justice to a major part of mathematical practice.

In a similar vein, but focusing on social studies of sciences, Petri Ylikoski conceives in *Thought Experiments in Science Studies* of a thought experiment quite broadly, i.e. in terms of an imaginary or hypothetical example, and he contrasts it with an empirical case study. Although neither is by itself an argument, both can play argumentative roles and Ylikoski sets out to investigate the argumentative roles they *actually* play. On the basis of his analyses of (1) the use of thought experiments by sociologists of scientific knowledge and of (2) the work by Kitcher on the division of cognitive labour, Ylikoski argues that David Hull's negative attitude towards the use of thought experiments requires some tempering.

The issue whether a thought experiment is or is not by itself an argument is investigated in my *The Dual Nature of Thought Experiments*. I argue that two seemingly rival views on the nature of thought experiments in physics, i.e. the experiment view and the argument view, are not only compatible, but even complementary. I show, more specifically, that one can only solve the most pressing problem thought experiments in physics gives rise to, i.e. their evidential significance, if one takes them as experiments and arguments simultaneously. Moreover, I argue, that on such a dual nature view of thought experiments, the problem is dissolved that has recently dominated the literature about thought experiments, i.e. the source of thought-experimental knowledge.

In his paper *The Roles of One Thought Experiment in Interpreting Quantum Mechanics. Werner Heisenberg Meets Thomas Kuhn*, Maarten Van Dyck also aims for a more fruitful approach to thought experiments in physics than as a mere test of whether the resulting knowledge can be exhaustively traced back to experience (as empiricists hold and rationalists find wanting). To that end, he discusses a quite controversial thought experiments in physics, i.e. Heisenberg's gamma ray microscope. He shows that an equally controversial philosophical account of thought experiments in physics, i.e. Kuhn's, provides the clue to the most fruitful understanding of Heisenberg's thought experiment. Van Dyck not only

argues that giving Heisenberg's gamma ray microscope a Kuhnian rendering enhances our understanding of the development of quantum mechanics and its interpretation, it also broadens the domain of application and thereby our understanding and assessment of Kuhn's account of thought experiments in physics.

The fifth paper involves a broadening of the standard diet of scientific thought experiments as well. Benoît De Baere discusses in *Thought Experiments, Rhetoric and Possible Worlds* cosmogonies developed and defended in the seventeenth, eighteenth and the first half of the nineteenth century. He investigates the polemical ways in which they are related to one another. According to De Baere these cosmogonies are thought experiments because the sort of knowledge they desire to offer could not possibly be established on an experimental basis, but merely thought of and narrated in a particular way.

The last paper in this volume does not focus on scientific thought experiments. Rather, in *Personal Identity and its Boundaries* the question is to what extent and in what way scientific knowledge curtails the widespread practice of thought experimenting in philosophy. Farah Focquaert discusses, more specifically, the vices and virtues of thought experiments with respect to personal identity through time. She argues that it is very difficult to get a firm and justified grip on the subject without taking the current results in neuroscience, biology and other relevant sciences into account. According to Focquaert, it is precisely the lack of backing scientific knowledge that explains the failure of many thought experiments on personal identity.

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## REFERENCES

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