

Performance and Participation in Scientific Experimentation

An Exploration of Human Thinking as Mental Action,
from Scientific Experimentation to Systematic Thought
Experiments

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Summary

Experimentation is at the core of the natural sciences. Experiments are done for different reasons. They differ substantially from observations, where naturally occurring processes are taken note of or measured. Experiments instantiate the specific conditions that are necessary for isolating an experimental setting from its environment and manipulating the course of events in some way. This paper focuses on the role of human thinking as a mental action in the process of experimentation. In many cases, human action, in particular mental action, is taken for granted during experimentation, and the analysis tends to focus on questions of causality, the type of instruments and materials used, etc. This paper proposes to broaden the focus in the analysis of scientific experimentation, by taking mental actions into consideration: first by considering thought experiments, then pure thought experiments, and eventually what we might call (pure) experiments in thinking. Thinking is something that all human beings are capable of and, therefore, one can explore it systematically oneself. This paper outlines what the opportunities for such first-person experimentation are and how they can contribute to the enquiry of scientific experimentation.

Zusammenfassung

Experimentieren gehört wesentlich zu den Naturwissenschaften. Experimente dienen verschiedenen Zielen. Sie unterscheiden sich deutlich von blossen Beobachtungen, bei denen natürlich auftretende Prozesse registriert und gemessen werden. In Experimenten werden spezifische notwendige/hinreichende Bedingungen festgehalten, um die Experimentieranordnung von der Umgebung zu isolieren und um darüber hinaus den Verlauf der Ereignisse in dieser oder jener Weise zu beeinflussen. Der Fokus im vorliegenden Artikel liegt auf der Rolle des tätigen Denkens im Prozess des Experimentierens. Üblicherweise wird das tätige Denken als gegeben hingenommen und die Analyse des Experimentierens konzentriert sich auf Fragen der Kausalität, der verwendeten Instrumente und Materialien usw. Es wird

vorgeschlagen, den Fokus der Analyse des Experimentierens zu erweitern, insbesondere durch den Einbezug der performativen Qualität des tätigen Denkens, indem zusätzlich Gedankenexperimente, dann Experimente des reinen Denkens einbezogen werden, und zuletzt dasjenige, was hier reine Gedankenexperimente genannt wird. Denken ist eine Fähigkeit, die allen Menschen zur Verfügung steht, und folglich sind Menschen in der Lage, dies bei sich selbst systematisch zu untersuchen. Es wird dargestellt, welche Möglichkeiten und Herausforderungen solche Experimente aus der Erster-Person-Perspektive bieten und was sie zur Untersuchung wissenschaftlichen Experimentierens beitragen können.

1. Introduction

Experimentation belongs to the core of many fields in natural science (Gooding 1990, p. xi; Gooding et al. 1989, p. xiii). Experiments are done for different reasons: to evaluate or refute theories, to explore fields of research, to find regularities, to build concepts, to design and test instruments, etc. They differ substantially from observations, where naturally occurring processes are accompanied by taking measurements, making notes, and building theories or, at least, concepts around them. The use of sophisticated technology, such as is done in astronomy, does not automatically turn an observation into an intervention (Carrier 1998, p. 176). Without doubt, an observation can be (and in many cases actually is) an intervention, but as such it still plays no role in causing, bringing about, or directing the observed process. In contrast, the set-up of any experiment instantiates the specific initial conditions that are necessary and sufficient for the experiment to work, including isolating the experimental setting from its environment and manipulating the course of events in one way or another.

This paper focuses on a somewhat unusual and neglected issue: the role of human thinking as a mental action that is an integral, performative part of the process of experimentation. What does it mean for mental activity to perform an experiment in contrast to just observing something?

Conventionally, human action, in particular mental action, is rarely discussed explicitly or in any detail within the philosophy of scientific experimentation, with the notable early exception of Dingler (1928, part II, Ch. I, §3). Sometimes it is even excluded in the philosophical analysis of experiments (Hon 1998, pp. 228, 233). Human action, particularly mental action, is often tacitly taken for granted as an inherent part of experimentation and therefore the analysis focuses, in most cases, on the issue of causality, on the type of instruments and materials used (Hacking 1992; Heidelberger 1998), on laboratory practices (Steinle 2005), on the exploration of new fields, on the problem of theory-ladenness (Heidelberger 2003), etc. See, e.g., the overviews (Gooding et al. 1989; Heidelberger