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BOOK REVIEW

Hans-Jörg Rheinberger, *Split and Splice. A Phenomenology of Experimentation*

Chicago and London: The University of Chicago Press, 235 pp, 2023

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The book's peculiar title should not prevent philosophers and historians of science from taking note of a highly original, systematically organized, and empirically enriched essay on scientific experimentation. 'Split' refers to manual activities of partly rough, partly fine taking something apart. 'Splice' is the opposite process of skillfully joining different parts together. The allusion to practical activities metaphorically reflects the emphasis Rheinberger wishes to put on the practice of doing experiments. He certainly could have kept the established terminology of analysis and synthesis, but that is precisely what he wanted to depart from. In his view, experimental science is an ongoing process of generating and developing epistemic objects that do not have a definitive beginning nor a specific end. There are 'results' and there are 'theories'. But what really matters is that experiments are spatially interconnected in wide networks and built an endless chain of continuation.

The aim of the book is "to come a good step closer to understanding the fundamental cultural technique of experimentation" and "to determine more specifically what goes on, from an epistemic viewpoint, in the material transformation processes of scientific experimentation" (13). The structure of the first part of the book follows steps which could be called an ideal reconstruction of experimental work. The introduction provides an overview of these steps and introduces Rheinberger's peculiar epistemological terminology, of which the book's title is only the first example. It starts with "traces". Objects to be experimentally investigated – so-called "epistemic things" – are known to the researcher only in preliminary, partial and even faulty contours. However, if experimentally treated, they leave behind traces which the pathfinder-researcher is skillful enough to observe and to follow. For Rheinberger, "trace" is a technical term supposed to capture that knowledge about a largely unknown object begins with taking note of fleeting, inconspicuous, and random appearances

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that somehow point the researcher to something and, if followed, brings him or her a step closer to the epistemic thing. In contrast to traces found in the wilderness, traces of epistemic things occur only in fixed technical environments that comprise instrumental technologies, methods, recording procedures, and documentation of data, all of which serve to trace the vague nature of the epistemic thing. Through the transformation of these manifestations in the "trace space" of the experimental system into data, texts, and models, knowledge of the epistemic thing emerges, albeit interspersed with surprises, errors and detours.

The first part of the book is devoted to unfolding this interplay between research technology and research object in experimental systems. Being not only a philosopher of science but also a historian and – in his earlier life – an experimental molecular biologist, Rheinberger is able to illustrate or perhaps better to generate his epistemology of experimentation accurately by using examples from 20th century molecular biology.

While this part of the book deals with all components of a single experiment, which Rheinberger brings together under the title "infra-experimentality", the second part is devoted to "supra-experimentality". It explores all kinds of connections between experiments. Again, material practices play the main role. They generate temporal "trajectories" and spatial "ensembles" of experimental systems, which he calls experimental cultures. These cultures can be observed by different parameters - such as participation in common technologies in the case of different objects or overlapping epistemic objects in the case of different technologies (cf. 132). Rheinberger's point is that the agency of things is no less effective than their change through technologies. Both come together in what Rheinberger – following Michael Polanyi - calls the "manifestation" (p. 140) of the object of knowledge: the experimenter's hands shape the object which, in turn, directs the operations (playing with the dual meaning of Latin "manifestare" as laying hands on something and let something become obvious). This "palpability" of knowledge, which precedes its conceptualization, is linked in experimental cultures by the ongoing "narrativity" in which all experiments are linked to past, present, and future experiments.

It is almost impossible to summarize the book's rich world of epistemological research. While its first part convinces with a precise and logically ordered analysis, the second part leads through a broad variety of philosophical thoughts and observations. Whether Rheinberger ultimately succeeds in binding all aspects together may be left open here. For what counts more are his imaginative views and his thoughtful incorporation of rather different epistemological perspectives. He borrows from Alfred Kubler's art-inspired *History of Things* as a "search for new categories that make the different materialization of history visible and tangible" (114). He introduces various concepts from the French epistemological tradition, among others Gaston Bachelard's ideas on the fragmentation of knowledge areas, and he refers to Karin Knorr-Cetina's conception of epistemic cultures. Rheinberger's overarching intent is to let these views contribute to what he calls a "phenomenology of experimentation".

The coherence of the book's second part is not always easy to grasp. Rheinberger works with terms that do not fit well into a systematic framework, even if they are extremely important. Among these are 'contingency', 'bricolage', 'fragmentation', and 'wild thinking'. In a self-referential way he employs these categories to his own

work. However, the reader is taken on an impressive journey through the vast territories of experimental knowledge cultures. And it adds to the surprises of the journey that each and every part of it is enriched with examples from the history of molecular biological experimentation.

The important question that remains open concerns the generalizability of the approach. Science is a huge network of very diverse research practices and knowledge cultures. Even if the social sciences, humanities and technologies are left aside, doubts remain as to whether the richness and diversity of these practices and cultures can be understood according to the model derived from molecular biology research. The conclusion is not that Rheinberger's book has limited explanatory power, but that it should stimulate similarly careful and deep epistemological inquiry into other areas of science, including the social sciences, humanities, and technology.

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