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Special Issue: The replication method in history of science

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Editorial

The idea of a special issue of the *Archives des Sciences* devoted to the replication method goes back to a much appreciated talk that Peter Heering and Christian Sichau gave in Geneva on November 2003. Their presentation was opening a festive workshop organized by the local *Association of the Friends of the Science Museum* to celebrate its 50th anniversary. Gathering some of the best specialists in the field of history of science and museology, the workshop aimed at presenting some issues in the current debate on the future of science museums. In their contribution, Heering and Sichau put forth their extensive expertise of the replication of experiments (hereafter the replication method) as a way to better penetrate the experimental practice of science, and to help Museums make the best use of their collections. This same year, our Department of History and Philosophy of science at Geneva University was launching its first replication project devoted to the experimental work of the Swiss physicist Charles-Eugène Guye. Willing to make Heering and Sichau's paper available to a larger audience, I asked Peter Heering to suggest some authors whose contributions could supplement their paper and make up together a volume devoted to the replication method as presently used in contemporary historical and didactical research. The present issue of the *Archives* is the result of this initiative.

There exist a number of papers and books which deal with the replication method, discussing its origins, theoretical motivations and possible pitfalls[1]. Let me remind here just some basic facts which will help the reader to better understand the issues which underlie the papers presented here. Rooted in reflections ranging from how to better teach science and science history, to how to better account for scientific practice and display its instruments in science museums, the replication method is becoming today a standard tool in the service of science historians. The basic idea is to replicate experiments to better penetrate the scientific practice of the past, especially those features of it which hardly make it into the usual accounts. Doing so, one is not only able to discover concealed truths about how the experiment was "really" performed, or uncover some "recipes" that the experimenter preferred to keep for himself. This may happen and is certainly worthwhile, but there are more subtle benefits. One recovers some long forgotten experimental skills, and learns to tame unfamiliar apparatuses long disappeared. One rediscovers elements of scientific practice so widespread at the time of the original experiment that they were not judged even worth mentioning, and which went forgotten because of new experimental techniques which made them obsolete. Quite often, one ends up with a vision of the experiment far different from that offered by the official accounts where experiments are mainly described with respect to the theories that they helped to vindicate or to disprove. As Ian Hacking, quoted in Heering and Sichau's paper nicely phrased it, "Experimentation has a life of its own", and nowhere this gets more palpable than in the process of trying to penetrate someone else's experimental work. When wrestling with the experimental setup and techniques of a (remote) predecessor, trying to make them one's own, one quickly confronts prob-

[1] See for instance the classical *Restaging Coulomb* (Blondel and Dörries 1994), or the collection of papers *Im Labor der Physikgeschichte. Zur Untersuchung historischer Experimentalpraxis* of authors affiliated to the Research Group on Higher Education and History of Science in Oldenburg, Germany, which pioneered the replication method (Heering, Riess and Sichau 2000).

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lems at odds with what one might have expected or anticipated on the basis of one's solely historical and theoretical knowledge. What the replication method immediately reveals, is what historians and philosophers of science have come to recognize only after a long process of critically questioning their own tradition of appraisal of scientific knowledge. Anyone attempting to replicate an experiment soon realizes that there is much in what he is confronted with which does not seem to be fully determined by theoretical imperatives. As Heering and Sichau write, the "goals and specific pathways chosen by the experimenter cannot always be explained by reference to theory, and, the "same is true for experimental tests and justifications of empirical data". The whole process of experimenting appears then in a new light: though certainly related at some stage to reasons pertaining to theory foundation and validation, it quickly appears to be driven by an intrinsic rationale, with an investigative (and sometimes even recreational) function of its own.

If these characteristics of the experimental practice, often undocumented, are also part of science (and they surely are, lying probably at the roots of what makes good and bad experimenters), then the modern historiography must somehow account for them, and develop techniques to explore their realm. The replication method proves here simply irreplaceable[2]. From this perspective, it is easy to understand why many classical experiments, formerly considered as mere illustrations or confirmations of theoretical ideas become the focus of renewed interest and yield genuinely new and often unsuspected perspective on the scientific practice of the past. The historical material available to the historian increases consequently: it appears natural that the domain of investigation should no longer be limited only to experiments which were "successful" but should consider as equally informative the forgotten and even unsuccessful ones.

Let me now come back to the present volume. Rather than another contribution to the theoretical grounding of the replication method, mirroring contemporary debates among historians and sociologist of science[3], the collection of papers gathered here aims more modestly at presenting concrete examples of replication work done in various research contexts. After the introductory paper of Peter Heering and Christian Sichau, the replication cases presented here should speak for themselves. Surveying their replication activity and reporting how it influenced their views and drove them into new questions, the authors of the contributions make a convincing case for the utility of the replication: this will hopefully encourage the reader to explore further literature[4].

I shall conclude my brief introduction with a final consideration. Apart from the historiographical and methodological reasons which motivated the various contributors to start their replication project, reasons which legitimate their work and which should certainly be quoted first, one will perhaps get a hint, reading their accounts, of another benefit related to the replication method. Jérôme Fatet's reconstruction of Edmond Becquerel's actinometer, Ryan Tweney's replication of Faraday's research on the optical properties of gold, Elizabeth Cavicchi's study of sparks in Page's spiraled conductors, Weber and Frerck's reconstruction of Schmidt's electrical machine, and finally our own surprises with Guye's cathode rays, all these investigations convey a sense of genuine thrill. In spite of difficulties, dead-ends and failures, there seems to be in these works a sense of intellectual excitement combined with the sheer pleasure to manipulate devices. At this cross point of reasoning and manipulating, in this appraisal of (historical) enigmas while "turning knobs", I see a way of deepening our own experience of what science is all about, in its historical dimension, and maybe of recovering the feel of the initial motivations which made some of us study it in the first place. In our times where science is often presented as not attractive anymore, and history of science as an elitist enterprise detached from concrete scientific concerns, the sense of enjoyment emanating from these contributions will perhaps help to dismiss some recurrent commonplaces and bridge some disciplinary gaps.

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[2] Of course, it has to be used with discernment, but then the same holds true of any method of historical investigation. For some critical considerations, see Pestre 1994 and Heilbron 1994.

[3] For a survey of present trends, see Pestre 1995 and 2006.

[4] See the References at the end, and also those of Heering and Sichau's contribution.

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