BOOK REVIEW

Dominique Raynaud, ***Scientific Controversies: A Socio-Historical Perspective on the Advancement of Science***, trans. Lisa C. Chien. New Brunswick, NJ: Transaction (2015), xxii+298 pp., $110.00 (cloth).

What is a scientific controversy? What makes a controversy 'scientific' as opposed to political, religious, or aesthetic? What are the differences between scientific controversies and other kinds of public debates? Dominique Raynaud's book attempts to reply to these questions. Through a series of case studies, Raynaud develops an understanding of scientific controversies as "characterized by: *the persistent and public division of members of a scientific community (either individually or as coalitions), who sustain contradictory arguments in the interpretation of reality*" (8). Thus, for Raynaud scientific controversies are characterized by their content, while in their form they may appear as regular conflicts or debates. They involve disagreement of at least two scientists over their understanding of the world, and this distinguishes them from conflicts over priority, authority, or other matters.

Adopting a sociological-historical perspective and considering the advances made by the sociology of scientific knowledge, Raynaud develops a new sociological account of science that finds relevant lessons in epistemology. He calls his account "epistemological incrementalism." Incrementalism is a "form of a collective action in which the transformation of [a group's] products depends on a series of small, unplanned changes" (221). His account recovers the collective nature of scientific knowledge that justifies its sociological study. It also allows that, in isolation, these incremental changes may be imperceptible. Although, for Raynaud, the gradual accumulation of such changes can lead to radical change, thereby allowing for the possibility of genuine advancement in science. In sum, epistemological incrementalism explains the collective nature of scientific knowledge and allows for the possibility of scientific advancement.

Raynaud's starting point in the first chapter is the "Metacontroversy" between Rationalism and Relativism. Scientific controversies, for Raynaud, "provide the best practical laboratory for the critical scrutiny of the tenets of relativism" (46), often associated with SSK (sociology of scientific knowledge). Through his case studies of scientific controversies, Raynaud hopes to subject SSK's main principles and methods to rigorous historical-sociological scrutiny. Of particular importance to the author is the principle of causality, which states that there is a causal (to be understood in terms of "efficient cause") connection between the state of the society and a scientific theory (D. Bloor, *Knowledge and Social Imagery* [London: Routledge, 1976]). Raynaud shows in subsequent chapters that various versions of the claim that the

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social context causally determines the production of scientific knowledge cannot stand up to historical scrutiny.

In chapters 2–4, Raynaud provides thorough analyses of three scientific controversies, which he takes to be paradigmatic cases: that between Pasteur and Pouchet regarding spontaneous generation, the Vitalism-Organicism Controversy between Paris and Montpelier, and the debate over Extramission and Intromission in optics at Oxford. Raynaud's analysis of each brings to light deficiencies in earlier analyses from sociologists of scientific knowledge. He uses the analysis of the controversy between Pasteur and Pouchet to criticize the symmetry principle according to which the same causes should explain both false and true beliefs (B. Latour, "Pasteur et Pouchet," in *Éléments d'histoire des sciences*, ed. M. Serres [Paris: Bordas, 1989], 423–45). Raynaud shows that an allegedly symmetrical treatment of beliefs obscures asymmetries that are important for an accurate historical reconstruction.

The Vitalist-Organicist controversy bears on the issue of the social causal determination of scientific knowledge. Here, Raynaud emphasizes the distinction between the internal and the external factors in the production of scientific knowledge. His analysis shows that the factors playing a major role are the 'internal' ones, such as method, doctrine, or considerations of scientific productivity, and that, with the exception of institutional affiliation, no other 'external factor' (professional interests, political values, political affiliations) has any role in the controversy. Moreover, the influence of institutional affiliation alone does not provide a basis for relativism. Belonging to a certain institution might make access to the best experimental techniques easier or lead to better publications, but this is far from what would be required to show that institutional affiliation determines the content of research.

The focus of chapter 4 is on the norms of rationality and their alleged historical character in SSK. Raynaud considers an example of a controversy in which cultural and institutional factors cannot explain the divergent views of the protagonists since they originate in the same context: Oxford University in the thirteenth century. He provides evidence that favors a reconstruction of the disputants' arguments based on logic and observational evidence, and not on principles of authority. His analysis calls into question the historicity and contextual dependence of the norms of rationality, another one of the relativist tenets of SSK. The operative norms in this debate, according to Raynaud, are objectivity, defined as correspondence with the world, and rationality, understood as internal consistency. He takes the use of these norms in a dispute between thirteenth-century Oxonians as evidence for their ahistorical and noncontextual character and evidence against the relativist thesis of historical-contextual rationality.

The fifth chapter presents al-Samarqandī's theory of controversies to critique the thesis that truth is socially negotiated. Al-Samarqandī's theory

of controversies provides an argument against the 'Great Division' between scientific and nonscientific countries assumed by many sociological accounts of scientific knowledge. According to this division, a small minority of countries in the occidental world (Europe, Canada, and the United States) are the producers of scientific knowledge, whereas the rest (the vast majority) of the world are producers of mere 'local beliefs'. This latter fact suggests that "universal knowledge is contextual and contextual knowledge is universal" (164). Raynaud chooses an Arabic thinker to challenge this assertion. Al-Samarqandī employs a juridical theory that owes nothing to the social negotiation of truth—and as such, to contextual elements—since it is based on the study of the intrinsic order of debates.

The sixth chapter is probably the most interesting for philosophers of science. Raynaud devotes it to "SSK in the Name of Prestigious Ancestors: Duhem, Quine and Wittgenstein" (183). He states that "the aim is to propose a rereading of the continual exchange between SSK and epistemology, and to attempt to understand what SSK seeks to borrow from philosophical texts" (184). The chapter analyzes epistemic holism, the underdetermination of theory in both its Duhemian and Quinean versions, and Wittgenstein's thesis of the conventional nature of knowledge and his notion of a language game. In none of these authors does Raynaud find a possible defense or justification of the relativist theses of the SSK. For example, Raynaud argues against a defense of relativism on the basis of an analysis of science as a Wittgensteinian language game. He contends that the conventional nature of methods does not imply the conventional nature of results. Thus, an analogy between conventional rules of science and games need not imply any deeper similarity in their natures. Raynaud's book might be interesting for philosophers because he carefully examines the arguments in the disputes from an internal point of view, a job usually carried out by philosophers rather than sociologists. Also, his presentation of sociology as an empirical science may be interesting for philosophers of science who discuss the limits and scope of empirical knowledge.

Raynaud devotes the conclusion to defining epistemological incrementalism (discussed above). Probably the most controversial part of his view is its allowance of values in models of scientific controversies. Raynaud states that great scientists are credited not only for their scientific achievements but also for their moral qualities, which are reflected in the moral qualities of their work. This is problematic since not every recognized scientist has been guided by the same moral values, nor has every scientist's attitude in discovering new theories or carrying out experiments always been "ethical." This allowance also revives worries about 'arguments from authority' playing an outsized role in sociological studies of science.

To conclude, the historical accuracy of Raynaud's studies makes his proposal of epistemic incrementalism worthy of careful attention. His

arguments make us reflect on the adequacy of previous sociological studies of the same controversies. According to Terry Shinn ("Les dessous de la sociologie des sciences," in *Le Relativisme est-il resistible*? ed. R. Boudon and M. Clavelin [Paris: Presses universitaires de France, 1991], 77–81), the descriptions found in many studies analyzing scientific controversies "are sprinkled with theoretical prejudices and, frequently, a deliberate ignoring of the nuances" (79). Thanks to Raynaud's book, this is no longer true.

María de Paz, University of Seville

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