

BOOK REVIEWS

Lorenzo Magnani, *Philosophy and Geometry: Theoretical and Historical Issues*. The Western Ontario Series in the Philosophy of Geometry, vol. 66. New York: Kluwer Academic Publishers (2001), xix + 249 pp., \$110.00 (cloth) and \$44.00 (paper).

Every author faces the challenge of selecting a title for his work that is appropriate to the subject matter and, at the same time, sufficiently captivating to elicit interest from a wide audience. Though Magnani has succeeded on this latter score, he has fumbled on the former. For contrary to what his chosen title suggests, the issues in the history and philosophy of geometry that Magnani addresses are far from broad ranging. He presents a highly focused treatment of the history of geometry, which assumes an intriguing though philosophically contentious theoretical framework. The inspiration for this framework: Kant's philosophy of geometry, or more fairly, a particular version of Kant's philosophy of geometry to which Magnani commits two of his seven chapters (cf. chapters 2 and 3).

The book opens with Magnani's examination of spatial representations such as maps, which he takes to illustrate the anthropomorphic nature of locally determined space. Historically, such spatial representations are primary, emerging at a time before Euclid had set forth the axioms and postulates of a universal system of *conceptual* geometry. Relying on a notion of *implicit*, or *latent*, geometry, Magnani turns the historical priority of local spaces on its head, and contends that an *implicit* universal geometry is presupposed and "activated" at those pre-*Elements* instances at which local somatic spaces are presented independently of a universal geometrical framework. The outlines of a Kantian-inspired history of geometry now take shape. Claiming that local somatic maps can be considered "implicit" geometrization, and claiming further that geometry "expresses itself through the conceptuality of local maps," Magnani declares,

We are therefore reconnected with the Kant of transcendental Aesthetics, where the necessity of space, as a form of external senses...,Becomes "The condition of the possibility of appearances," and therefore the possibility to identify objects and the preliminary basis for nomination through the conceptuality embedded in language. (13)

In chapters 2 and 3, Magnani highlights what he takes as the key features of Kant's understanding of geometry. The crux of the Kantian approach to geometry lies, for Magnani, in the notion of schematism, which Kant characterizes, at various times, as those rules, models, and procedures that underwrite the universal character of our geometrical reasoning. Recalling here that knowledge, for Kant, hinges on the cooperation of sensibility and understanding, the schemata are presented as mediators between our particular intuitions and universal concepts, both in geometry and experience in general. How the schemata fulfill this mediating role is nothing short of enigmatic, and Magnani embraces the enigma of Kant's schematism, not as an interpretative complication to be tackled, but as itself indicative of the generally enigmatic nature of geometrical reasoning. In this regard, he lays heavy emphasis on Kant's description of schematism as "an art concealed in the depths of the human soul, whose real modes of activity nature is hardly likely ever to allow us to discover, and to have open to our gaze" (*Critique of Pure Reason*, A141/B181). Thus, taking our cues from Kant, Magnani urges us to accept that implicit rules or models of reasoning, which are immune to formal rationalization, are part and parcel of geometrical reasoning, and geometrical construction, more specifically (36).

In the chapters that follow, Magnani traces the Kantian thread of *implicit* geometry through various notable figures in the history of geometry, including but not limited to Plato, Aristotle, Proclus (chapter 4), Poincaré and Reichenbach (chapter 5). When we reach the final two chapters, the overall project of Magnani's book is brought to the fore: he aligns his particular brand of Kantian geometrical reasoning with Peirce's notion of abduction (chapter 6) and with recent attempts in cognitive science to model cognition (chapter 7). In making this connection, Magnani also connects his history of geometry to his recent work in both these areas (Magnani 2001 and Magnani and Nersessian 2002).

The goal of Magnani's project is bold. In broad strokes, he sweeps over the history of geometry with a Kantian brush, and though the approach is provocative, we are left with a question of what role history plays in Magnani's work, or more specifically, what sort of interplay he allows between the history and the philosophy of geometry. Magnani does not allow history to point us to a particular philosophy. As indicated in chapter 1, philosophy takes priority over history; he assumes a peculiar Kantian perspective which serves as the framework for the history of ideas he presents. The general philosophy-then-history approach may not itself elicit negative reaction, but what is problematic in this case is that Magnani provides no explicit reasons why his Kantian interpretation rather than, say, an empiricist's interpretation of geometry is more appropriate. Without a philosophical justification brought to his aide, we

are left to assume that Magnani's Kantian position is *prima facie* superior to its alternatives; a grand assumption indeed!

Moreover, Magnani takes several contentious issues for granted in order to forward his own reading of Kant's transcendental project. Though he warns the reader that he will oversimplify for the sake of clarity and at times explicitly side-steps interpretive complications, Magnani's treatment of Kant's position in chapters 2 and 3 assumes a great deal on the part of the reader. Too often, passages are cited without sufficient commentary, leaving the reader the formidable task of dissecting typically dense passages from the first Critique. Also, scattered throughout Magnani's discussion are intriguing though unexplored remarks that leave the reader wondering. A prime example comes in chapter 2. After presenting Kant's schematism as the foundation of universality in geometrical reasoning, Magnani cites a lengthy passage from Locke's *An Essay Concerning Human Understanding*, which is intended to show that Locke also had a notion of universality similar to Kant's. No substantive argument to support the connection is offered in the text, leaving the relationship between Kant's transcendental idealism and Locke's empiricism doubtful at best.

Of course, even if we agree with his reading of Kant, the effectiveness of Magnani's history of geometry hinges on our acceptance of his Kantian reading of figures such as Plato, Aristotle, Proclus, Poincaré, and Reichenbach. Though Magnani's ideas are suggestive, he rarely acknowledges the radical nature of his interpretation. This is especially clear in the case of Proclus, who is widely considered a neo-Platonist, though one would not gather that from Magnani's discussion.

Admittedly, a historian's quibbles may not be entirely relevant in light of Magnani's overarching goal to connect a particular portrait of Kant with contemporary discussions of abductive reasoning and recent attempts to model cognition. Remaining sensitive to this general project, Magnani has successfully supplied a historical framework in which abductive and model-based reasoning take a natural place at the end of a long sequence of attempts to come to grips with the difficulties surrounding geometrical reasoning. Though we may not agree with the nuts and bolts of Magnani's history, the ideas he puts forward are worth considering by specialists in philosophy of science and cognitive science who are interested in abductive reasoning and models of cognition, and who may be searching for a more well-defined philosophical foundation for their work. But let this audience be warned that if they, by Magnani's prompting, adopt Kant as a philosophical forefather, the Kant they adopt is himself deserving of more philosophical attention than Magnani provides.

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REFERENCES

- Magnani, Lorenzo (2001), *Abduction, Reason, and Science: Processes of Discovery and Explanation*. New York: Kluwer Academic/Plenum Publishers.
- Magnani, Lorenzo, and Nancy Nersessian (eds.) (2002), *Model-Based Reasoning: Technology, Science, Values*. New York: Kluwer Academic/Plenum Publishers.

Joseph E. Earley, Sr. (ed.), *Chemical Explanation: Characteristics, Development, Autonomy*, Annals of the New York Academy of Sciences, vol. 988. New York Academy of Sciences (2003), 370 pp., \$130.00 (cloth).

I think no subject is better suited than chemistry for understanding how reasoning works in the natural sciences, and how and why scientific understanding develops and changes. Chemistry has an available, well studied history; it stands between two sciences, physics and biology, and has contributed to the advance of both; it is quantitative and qualitative, equational and diagrammatic, informal and intensely computational; and it is, for the most part, not esoteric. So I had hopes for *Chemical Explanation*. Containing more than 40 essays in the space of 370 pages, the book is an only faintly mitigated disaster; with exceptions to be noted, a volume on average so poor in original thought, clear theory, and insight that it has at least this use: it invites skeptical reflection on the very idea of a *philosophy of chemistry*. I can only hint at how much I dislike this volume with a little autobiographical story. In the fall of 1962, after the University of Montana had sent me packing,¹ I enrolled as a Philosophy major at the University of New Mexico, and went to hear an evening lecture by the late Archie Bahm, Professor of Philosophy, originator of the Directory of American Philosophers, and champion of the theory of "Organic Polarities," illustrated with depictions of circles of Consciousness and Being and such. I immediately became a Chemistry major, thinking I would escape all that. But maybe not. In *Chemical Explanation* you will find an illustration of the "Surface of Centration," and the "Surface of Reflection" and the "Noosphere." If you like this book, you'll love Archie.

Certain fragmentations in philosophy are natural; ethics has something to do with epistemology all right, but the kinds of judgments and inferences addressed are quite different; metaphysics has something to do with both epistemology and ethics, but it is less a shared content than an interdependency of results. What about the philosophy of X, where X is

1. I did try to fill the Dean's office with Lime Jello, but that wasn't the reason. Reason was, I would not take ROTC, which was then compulsory for male students at the University of Montana.