

Philosophy and Geometry

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Lorenzo Magnani. *Philosophy and Geometry, Theoretical and Historical Issues*. The Netherlands: Kluwer Academic Publishers. 2001.

This book is an attempt to provide a new perspective on the geometric ideas of several prominent mathematicians and philosophers of mathematics, notably Plato, Kant, and Poincaré. In order to achieve this, the author compares the interpretations of the work of these scholars by such philosophers as Torretti, Petitot, Parrini, Reichenbach, and Nersessian, and providing his own analysis within the context of theirs.

This book also serves to illustrate important connections between geometric reasoning and cognition, viewed from both historical and modern perspectives. The author first makes a study of the anthropological and historical problem of the origins of geometric knowledge, with an analysis of certain issues of cognitive psychology, cognitive anthropology, and history. In this effort, he discusses primitive spatial frameworks which he sees as associated with the effects of the proper meanings embedded in natural language, and the reason why we say that spaces are conceptual. Along with Thom, he considers such spatial frameworks as ‘local maps’ which “emanate from the individual as forms of control of the external world and identification of one's own body” [page 11]. Such maps, as ‘anthropomorphic versions of space’, presuppose an implicit geometry and provide a means to objectify a conceptual space, “which at the same time becomes a modality of spatial identification of the subject's body” [page 13]. Geometry is expressed through the conceptuality of local maps and therefore possesses a great capacity to shape the world and communicate with it. The author sees in this the ‘great cognitive fertility’ of geometry. He then explores certain geometric structures in different contexts and primitive

cultures to demonstrate the wide variety of the forms of expression of geometrical thought and their characteristics of universality. The author returns to the problem of the origin of geometry later in the book, in the context of the phenomenological approach of Husserl. He contrasts the ideas of Husserl with those of Kant (whose ideas are treated extensively in Chapters 2 and 3), noting that for both philosophers, geometry can be considered a model of philosophy.

Magnani seeks to demonstrate a commonality of concerns that underlie the work of philosophers of science and cognitive science researchers. For example, he explores the importance of manipulative skills made evident by the role of cognitive research in dynamical systems, relating certain cognitive behaviors and attitudes to the exploitation of formation of geometrical shapes and frameworks. He traces the path from two dimensional geometric diagrams used in antiquity for both practical and mathematical problem solving to their embodiment in modern computational programs. Magnani provides the reader with a great wealth of references concerning recent research in logic, cognitive science, and artificial intelligence regarding spatial imagery, as well as visual, spatial, and diagrammatic reasoning. In fact, the great strength of this book is its rich reference list, and the authors' careful review of the literature. Both an author index and subject index are provided. In terms of weaknesses, one can only point out that the author might have been better served by a more careful translation and editing of the text.

The book is partitioned into seven chapters, which broadly treat, but are not limited, to the following topics: the origins of geometry; geometry as a model of knowledge and space as the object of geometry; geometry as a synthetic science, its foundations, and the roles of logic and intuition in its construction; the objects of geometry and their history; pure and applied geometry and the relation of geometry to experience; problem-solving in geometry —thinking through drawing vs. thinking through doing; geometry and cognition.

In my opinion, philosophers will be better able to fully appreciate the analyses provided in this book, but mathematicians will find it to be readable and interesting, providing insights into the philosophy of geometry, and the connections between geometric reasoning and cognition.