

Preface

The volume is based on the papers that were presented at the International Conference *Model-Based Reasoning: Scientific Discovery, Technological Innovation, Values* (MBR'01), held at the Collegio Ghislieri, University of Pavia, Pavia, Italy, in May 2001. The previous volume *Model-Based Reasoning in Scientific Discovery*, edited by L. Magnani, N.J. Nersessian, and P. Thagard (Kluwer Academic/Plenum Publishers, New York, 1999; Chinese edition, China Science and Technology Press, Beijing, 2000), was based on the papers presented at the first “model-based reasoning” international conference, held at the same place in December 1998.

The papers explore how scientific thinking uses models and explanatory reasoning to produce creative changes in theories and concepts. Some address the problem of model-based reasoning in ethics, especially pertaining to science and technology, and stress some aspects of model-based reasoning in technological innovation.

The study of diagnostic, visual, spatial, analogical, and temporal reasoning has demonstrated that there are many ways of performing intelligent and creative reasoning that cannot be described with the help only of traditional notions of reasoning such as classical logic. Understanding the contribution of modeling practices to discovery and conceptual change in science requires expanding scientific reasoning to include complex forms of creative reasoning that are not always successful and can lead to incorrect solutions. The study of these heuristic ways of reasoning is situated at the crossroads of philosophy, artificial intelligence, cognitive psychology, and logic; that is, at the heart of cognitive science.

There are several key ingredients common to the various forms of model-based reasoning considered in this book. The term “model” comprises both internal and external representations. The models are intended as interpretations of target physical systems, processes, phenomena, or situations. The

models are retrieved or constructed on the basis of potentially satisfying salient constraints of the target domain. Moreover, in the modeling process, various forms of abstraction are used. Evaluation and adaptation take place in light of structural, causal, and/or functional constraints. Model simulation can be used to produce new states and enable evaluation of behaviors and other factors.

The various contributions of the book are written by interdisciplinary researchers who are active in the area of creative reasoning in science and technology: the most recent results and achievements about the topics above are illustrated in detail in the papers.

The conference, and thus indirectly this book, was made possible through the generous financial support of the MURST (Italian Ministry of the University), University of Pavia, CARIPLO (Cassa di Risparmio delle Provincie Lombarde) and of Georgia Institute of Technology. Their support is gratefully acknowledged.

The editors express their appreciation to the other co-chair of the conference K. Knoespel (Georgia Institute of Technology, Atlanta, GA, USA), and to the members of the Scientific Committee for their suggestions and assistance: A. Bostrom, Georgia Institute of Technology, Atlanta, GA, USA; E. Gagliasso, University of Rome "La Sapienza", Rome, Italy; D. Gentner, Northwestern University, Evanston, USA; R. Giere, University of Minnesota, Minneapolis, MN, USA; M.L. Johnson, University of Oregon, Eugene, OR, USA; P. Langley, Stanford University, Stanford, CA, USA; B. Norton, Georgia Institute of Technology, Atlanta, GA, USA; Claudio Pizzi, University of Siena, Siena, Italy; Mario Stefanelli, University of Pavia, Pavia, Italy; P. Thagard, University of Waterloo, Waterloo, Ontario, Canada; Ryan D. Tweney, Bowling Green State University, Bowling Green, OH, USA; S. Vosniadou, National and Capodistrian University of Athens, Athens, Greece.

Special thanks to the members of the Local Organizing Committee R. Dossena, E. Gandini, M. Piazza, and S. Pernice, for their contribution in organizing the conference, to R. Dossena for his contribution in the preparation of this volume, and to the copy-editor L. d'Arrigo. The preparation of the volume would not have been possible without the contribution of resources and facilities of the Computational Philosophy Laboratory and of the Department of Philosophy, University of Pavia.

The more logically and computationally oriented papers deriving from the presentations given at the Conference will be published in the book *Logical and Computational Aspects of Model-Based Reasoning*, edited by I. Magnani, N.J. Nersessian, and C. Pizzi, which will appear in the Applied Logic Series, directed by D.M. Gabbay and Jon Barwise, of Kluwer Academic, Dordrecht. The remaining selected papers will be published in five Special Issues of Journals: in *Foundations of Science*, Abductive Reasoning

in Science; in *Foundations of Science*, Model-Based Reasoning: Visual, Analogical, Simulative; in *Mind and Society*, Scientific Discovery: Model-Based Reasoning, in *Mind and Society*: Commonsense and Scientific Reasoning, all edited by L. Magnani and N.J. Nersessian; *Philosophica*, Diagrams and the Anthropology of Space, edited by K. Knoespel.

Lorenzo Magnani, Pavia, Italy
Nancy J. Nersessian, Atlanta, GA, USA
December 2001



<http://www.springer.com/978-0-306-47244-2>

Model-Based Reasoning

Science, Technology, Values

Magnani, L.; Nersessian, N. (Eds.)

2002, XV, 404 p., Hardcover

ISBN: 978-0-306-47244-2