Preface

This volume is a collection of selected papers that were presented at the international conference *Model-Based Reasoning in Science and Technology. Models and Inferences: Logical, Epistemological, and Cognitive Issues* (MBR015_ITALY), held at the Centro Congressi Mediterraneo, Sestri Levante, Italy, June 25–27, 2015, chaired by Lorenzo Magnani.

Heidelberg/Berlin 2013), was based on the papers presented at the sixth “model-based reasoning” conference, held at Fondazione Mediaterraneo, Sestri Levante, Italy, June 2012.

The presentations given at the Sestri Levante conference explored how scientific thinking uses models and explanatory reasoning to produce creative changes in theories and concepts. Some speakers addressed the problem of model-based reasoning in technology and stressed issues such as the relationship between science and 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 and in other disciplines requires expanding the concept of reasoning to include complex forms of creativity 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. 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 modeling reasoning and creative reasoning in logic, cognitive science, science and technology: the most recent results and achievements about the topics above are illustrated in detail in the papers.

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Other more technical formal papers presented at (MBR015_ITALY) will be published in a special issue of the *Logic Journal of the IGPL*, edited by L. Magnani and C. Casadio.

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