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# Model-Based Reasoning in Scientific Discovery

The volume is based on the papers that were presented at the International Conference Model-Based Reasoning in Scientific Discovery (MBR'98), held at the Collegio Ghislieri, University of Pavia, Pavia, Italy, in December 1998. The papers explore how scientific thinking uses models and explanatory reasoning to produce creative changes in theories and concepts. 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. Traditional accounts of scientific reasoning have restricted the notion of reasoning primarily to deductive and inductive arguments. 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 to be considered in this book. 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.

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