# The Significance of the Hypothetical in the Natural Sciences

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# Preface

This volume is to its greater part the outgrowth of an international conference held at the University of Tübingen in 2005 that brought together philosophers and historians of the philosophy of science. The conference was supported by a generous grant from the *Fritz Thyssen Stiftung* and a donation from the *Universitätsbund Tübingen*. We also wish to thank Dr. Gertrud Grünkorn for including the volume in the philosophy programme of de Gruyter and for her editorial support. Our final thanks go to two referees who have done an excellent job of carefully and critically reading the contributions. We hope that the interest in the volume will not remain hypothetical but become a living reality in the end.

Tübingen and Wuppertal
June 2009

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# Introduction

*Michael Heidelberger* and *Gregor Schiemann*

Since early modern times, the significance of hypothesis in natural science has been judged in widely different ways and has become the source of many controversies. The purpose of this volume is to illuminate some general lines of development of those debates by treating cases from the history of science and philosophy. The case studies presented here deal especially with physics, astronomy, mechanics and chemistry as well as with problems posed for mathematical theories of natural science in general.

Taken together, these cases show that the role hypothesis played and plays for natural science is of central importance for the manner in which a science conceives of itself and its own methodology. Accordingly, different concepts of science entail different attitudes towards hypothesis, both in the history of science and in the discourses of the philosophy of science. The significance attributed to hypothesis is, so to say, a kind of a litmus-paper for the changing and diverging conceptions of science of the scientific actors themselves, as well as of the philosophers who reflect upon the sciences.

If we focus, though, on contemporary discussions, the concept of hypothesis seems to be taken almost as univocal. Historians and philosophers of science as well as scientists themselves seem more or less to agree on its meaning. A hypothesis is normally taken as a conjecture that is expedient for the gain of knowledge. Sometimes, this definition is accompanied by the conviction that the truth value of a hypothesis will finally be established with further research. We also find the view, however, that the hypothetical character of certain propositions will never be eliminated. These we can call "metaphysical hypotheses". Not only single propositions are called hypotheses, but also theories, clusters of them or even the whole of scientific knowledge. It is almost common sense in the philosophy of science to generally attribute a hypothetical character to empirical theories. According to this view, conjectures are not only useful for the production of knowledge, but scientific theories are nothing but a collection of conjectures. There are powerful and acknowledged arguments for this, both of a systematic and his-