

Studies in the Foundations
Methodology and Philosophy of Science 4

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Problems in the Foundations of Physics

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Preface

This is a collection of technical papers in the foundations and the philosophy of physics with emphasis on the former. It takes both “foundations” and “philosophy” in their narrow technical senses but it construes “physics” *lato sensu*, as including all the sciences of nonliving systems. All eleven papers constituting this volume were written for it.

The problems tackled in this book concern certain basic concepts, hypotheses, theories, and research programmes in physical science. Some of these problems are topical, others new, but they are all fundamental and the subject of research and controversy.

Consequently this volume is expected to serve those students, teachers and researchers who enjoy learning, teaching, discussing or doing theoretical physics. It is addressed to the nine to niners rather than to the nine to fivers. It is expected to attract the theoretician in search for new basic ideas, the teacher eager to perfect his understanding of physical theory and transmit his own zeal and his own doubts, as well as the student anxious to get down to essentials. This book may also interest the mathematician for whom physics offers a challenge (or a good pretext). Finally, it should get the attention of the philosopher of science aware of the advantages of philosophizing on foundations research problems rather than on the popularization of some results of research.

There are at least two reasons for valuing foundations research. One is purely intellectual and aesthetic: We like to know not only what is being done but also how it is being done and why, and how it might be improved on. The more we love a subject the greater pleasure we derive from working at it and beholding it. And conversely: The better we know the subject the more intensely we are bound to love it. Although most of us are carpenters and plumbers rather than architects or master builders, if we are skilled and happy craftsmen we shall take pleasure and pride in contemplating the building as a whole, from its changeable foundations upwards.

A second reason for valuing the foundations and philosophy of science is of a practical nature. In fact these disciplines take part, usually in a covert way, in the planning of research, in the allocation of research facilities and funds, and in the design of teaching curricula. And any such decision may affect entire generations of scientists. For example, the indiscriminate production of highly specialized scientists bolted to a given computation method or a given measuring device is likely to contribute to unemployment — and to boredom. A balanced diet, with emphasis on general and basic theories as well as portable methods, is likely to produce more useful investigators — and happier human beings, for whom science is both job and hobby.

May this volume, for focusing on fundamentals, wide range issues, versatile tools, and long term research programmes, contribute to reinforcing the long view of physical theory.

MARIO BUNGE

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