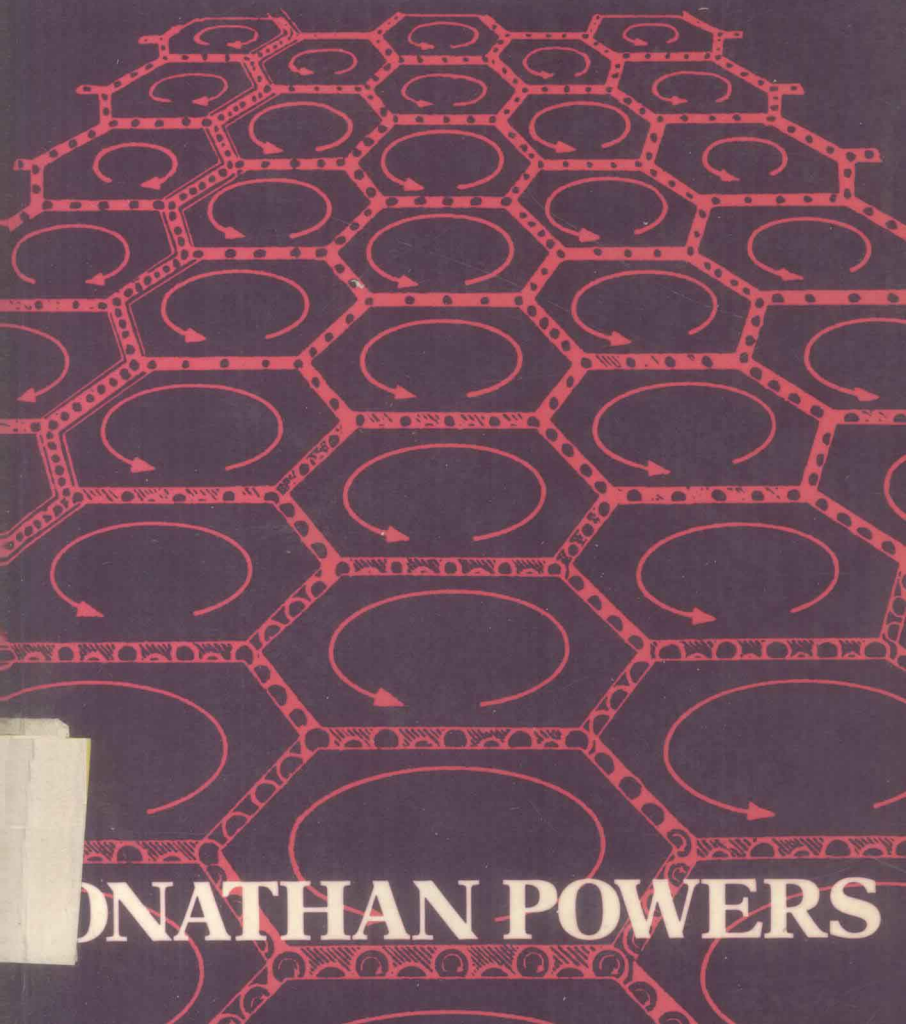


IDEAS General Editor Jonathan Rée

PHILOSOPHY and the NEW PHYSICS



JONATHAN POWERS

Philosophy and the New Physics

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Social Philosophy *Hans Fink*

For

Natasha, Eleanor, Andrew and Alastair

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C.S. Powers, I. Rappaport, Dr S. Sofroniou, Dr S. Schaffer, Dr P. Williams and Dr C.P. van Zyl. I do not seek to claim their authority for anything I have said, since the responsibility for that rests entirely with me, however I would like to express my gratitude. I have found quite frequently that ideas which seemed to be original when they first occurred to me, were already being worked out in considerable detail by someone else. I have tried to acknowledge such studies in the notes, but complete annotation is inappropriate in a nontechnical work. My apologies to anyone inadvertently omitted.

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Finally I would like to express my thanks to Anne and our family for coping with this obsessive typewriter, and for the affection which showers my desk with rival, homemade 'publications'.

Preface

The interests represented by this book were stimulated in the mid-1950s when, as an overgrown primary school child, I went burrowing into the non-fiction section of my local branch library. Reared on Frank Hampson, H.G. Wells and Arthur C. Clarke, in a period of scientific and technological optimism following the 'Festival of Britain' and the 'Atoms for Peace' exhibitions, I went in search of something which would tell me what Einstein's theory of relativity was and what it meant. The master's own book *The Meaning of Relativity* was the only thing on the shelves, and in the handful of pages which were intelligible without a facility with the tensor calculus I was given the powerful impression of an immensely luminous intellect able to penetrate the inmost secrets of nature. But the book did not tell me what I wanted to know, and nor did any of the books I unearthed in the following years, though many claims were made about the 'significance' of modern physics for our view of the world.

This book, then, is intended to interest anyone who is either puzzled or excited by popular 'interpretations' of modern physics. It represents a distillation of material I have written in the last ten years or so for courses in the philosophy of physics, which have been taken by humanities students, by students of 'science, technology and society studies', and by practising science teachers. I am firmly convinced that students of philosophy should know something of the development of physics, but there is relatively little they can read in the gap between highly technical treatises and philosophically unreflective popularizations. I am also convinced that students of physics should take time between the rounds of laboratory exercises and problem sheets to think about conceptual puzzles of the subject, for experience shows how easily profound misunderstanding can be masked by technical facility – important though that is. Finally, students of the social sciences may find particular interest in one underlying layer of argument in the book – that both science and philosophy are aspects of culture which may be 'socially conditioned'. This book is but a small pebble skimming the surface of a very deep pool, but it will serve its purpose if it tempts some readers into the water!

Introduction

The Revolution of Modern Physics erupted into public consciousness on 7 November 1919. A British astronomical expedition, led by Eddington, reported that it had found dramatic confirmation of the ‘General Theory of Relativity’, and Einstein awoke to find himself famous. Thus after the crisis of its great ‘War to end Wars’, European culture was able to find symbolic unity in a science which transcended national boundaries.

Retrospectively the public learned that the theory of relativity dated from 1905, when Einstein had been working as a Scientific Officer Class III in the Berne Patent Office. With hindsight 1905 became Einstein’s *Miraculous Year*, during which – in his spare time – he not only had laid the foundations of the theory of relativity, but also had exposed the revolutionary implications of Planck’s quantum theory and had clinched the case in favour of the atomic theory of heat. Only Newton is similarly honoured with an *Annus Mirabilis* – 1666 – when the calculus, the composite nature of light and the law of gravitation were ‘revealed’ to him.

In the mythology of science Einstein was elevated to the summit of Olympus, to sit, eyes twinkling, an unkempt bohemian, alongside the stern, authoritarian figure of Newton, 'with his prism and his silent face'.¹

Einstein's scientific revolution seems unlike earlier ones. In 1543 Copernicus upset a whole world picture by transforming the earth from the stable centre of our universe into a speck, spinning through space. In 1859 Charles Darwin overturned hitherto taken-for-granted assumptions about natural order by focusing on the struggle for survival rather than pre-ordained design, and subsequently portrayed man's place in nature as being a little higher than the apes, rather than a little lower than the angels. In both cases the essential change in perspective is dramatic and easily grasped. The Copernican Revolution culminated in Newton's synthesis of physics and astronomy, which was greeted as if it were a divine revelation. Einstein's revolution, on the other hand, was widely received as if it wrapped nature in a cloak of impenetrable mystery once again.²

The first decade of this century seems to be marked out for its self-styled 'revolutions', both cultural and political. 'Classical' physics, i.e. the physics of the period from Newton to Einstein, provided a clear and intelligible picture of a world which remained the same no matter how you looked at it. Einstein's work threatened this, and some have argued that it did for physics what cubism did for art, what atonality did for music, and what the break-up of linear narratives did for literature: each of these changes can be seen as embracing the idea that different viewpoints are of equal value.³ But it is one thing to suggest such a similarity; it is quite another to show that it is more than a contrived coincidence.

Ironically, the same Einstein whose work in the first two decades of the century earned him a reputation as the revolutionary thinker *par excellence*, found himself, at the height of his fame, heading the forces of 'reaction'. The new quantum mechanics, articulated by Bohr and Heisenberg in the 1920s, seemed to Einstein to be deeply unsatisfactory and he reacted to it as if it were the expression of a cultural threat, necessitating a

fundamental and unacceptable change in the aspirations of science. Einstein had initiated one such change and seen it triumph, but he was not prepared to endorse the next.

If we embark upon a discussion of the different kinds of philosophies which have been associated with modern physics, we will find ourselves engaging with the arguments of the physicists themselves. Physics may deal with 'a real, external world', but it is possible for different interpretations of physical theories to exist without there being any 'scientific' procedure for adjudicating between them – the choice may come down to a matter of religious or political commitments. This book will attempt to show that there may be points in the development of physical theory where such commitments play an ineliminable role.

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