and Einstein's successful use of the idea to explain the photoeffect, then the Rutherford atom and Bohr's and Sommerfeld's explanation of spectra. This explanation is rounded off by considering Pauli's exclusion principle and his introduction of spin. This brings us to the end of the "semiclassical" period of quantum theory, about 1925. De Broglie's and Schroedinger's wave theories, Heisenberg's matrix theory and uncertainty principle, and Dirac's successful unification of quantum theory and relativity bring this period to a certain close. Fermi and Yukawa's application of the previous results to nuclear forces are treated in two chapters.

The presentation is such that it should be understood by a nonscientist, although the background of the arguments may sometimes be unfamiliar. The book is characterized and made delightful by the fact that the author attaches the development of the physics to the personalities of those who were responsible for its development—Planck, Bohr, Pauli, de Broglie, Heisenberg, Dirac and Fermi, and others. Gamow has known most of the people involved, and he tells illuminating anecdotes and stories about personal encounters with them. The book is illustrated with a number of photographs, most of them not previously published, which show the human sides of these scientists. Each chapter begins with an impressionistic pen drawing by Gamow, which shows the head of the person concerned. The only one that I find uncharacteristic is the sketch of Heisenberg (compare with the excellent photographs of Heisenberg on plates 4 and 8). Because few of Heisenberg's personal characteristics are described, I would like to relate an anecdote.

Heisenberg's father was professor of Byzantine Greek at the University of Munich, and when I taught at that University (1920 to 1926) I occasionally walked home with Professor Heisenberg. The latter commented on the difference between philology and physics, emphasizing the long hesitation of the philologist to publish a new theory or attack somebody else's theory, and continued: "On the other hand, my son says that he ought to put at the end of each of his papers: Six months guarantee."

Gamow's book ends with a parody of Faust which was performed in the spring of 1932 at Bohr's Institute.

Although the printing is very good, there are a few errors, and three of them may confuse the uninitiated: On page 45 a plus sign is used instead of a minus sign; on page 112 two minus signs are used instead of plus signs; and on page 66 the eight-line comment on Fig. 15b appears as comment on Fig. 15a.

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The Boston Colloquium for the Philosophy of Science

Like Professor Philipp Frank, to whom this volume is dedicated, its contributors range widely over science and philosophy, concentrating mainly in the areas of philosophy of science and physics. The volume, **Boston Studies in the Philosophy of Science,** volume 2 (Humanities Press, New York, 1965. 511 pp., $9.75), edited by Robert S. Cohen and Marx W. Wartofsky, is the proceedings of the Boston Colloquium for the Philosophy of Science, 1962–1964.

The longest sequence of connected essays contains an analysis by J. J. C. Smart of "Conflicting views about explanation" in the work of Nagel, Feyerabend, and Sellars. In an entirely sympathetic manner, Smart presses some of the objections to Feyerabend's radical and seemingly paradoxical thesis that "theory" and "meaning" are interchangeable, and that even our commonsense language must be seen to embody theory, and *false* theory at that, so that it is, in principle, due for replacement. Sellars then enters some caveats with regard to the dispensibility-in-principle of the observation language, and Putnam launches a crisp attack on the whole Feyerabendian enterprise, earning from Feyerabend some equally tart replies. In his essay, "Reply to criticism," Feyerabend develops explicitly his belief in the positive value of theoretical pluralism, and replies more carefully than before to the charge that if alternative theories infect all observations with their own categories and concepts they are incommensurable and untestable. In another interesting contribution in the same area, Sellars discusses "The identity approach to the mind-body problem" in terms of an analogy with the reducibility of chemistry to physics, concluding that the analogy breaks down at the point where we ask what *is* the theory of brain-states which would be adequate to reduce the percipient's "raw feels." We have no such theory, and if we had, it might turn out to require raw feels as irreducible categories.

Three essays are concerned with topics closer to logic and mathematics. In "Instantiation and confirmation" G. Schlesinger has some genuinely new and significant things to say about the much canvassed paradoxes of confirmation. N. R. Hanson explores an admittedly "loose" analogy between the absence of consistency proofs in elementary number theory and the absence of stability proofs in gravitation theory. D. Follesdal carries the attempt to quantify causal contexts into some highly undesirable predicaments, and concludes in despair that all the causal modalities of interest to science should be avoided. The history of physical and biological ideas are represented ably and respectively by E. McMullin's "From matter to mass" and E. Mendelsohn's "Explanation in nineteenth century biology."

Altogether this is in substance an entirely worthy offering to Professor Frank, and the organizers of the Boston Colloquium are to be congratulatd on assembling a series of essays of such consistently high quality. Unfortunately standards of printing and proofreading leave something to be desired; for misprints sometimes interfere quite seriously with sense—for example, on page 69, line 6, where I take it "fact" means "face."

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History of Science

Editions of classics in the history of science are always welcome. But when the writings of two early investigators, who worked in consort, appear at the same time it is a double treat and an invaluable clue to the ways in which modern science struggled to protect its birthright. The two volumes reviewed here are such a treat: **The Anatomy of Plants: With an Idea of a Philosophical History of Plants and Several Other**