

sure in the large veins and large lymphatic vessels and the flow of blood into the heart. Although the test questions may be quite similar to one another, reflecting a point of view different from those of the authors and hence unfair, I am still disappointed with the degree of difficulty experienced in obtaining information pertaining to these matters.

These shortcomings are minor when compared with the overall excellence of *Animal Function*, which I can recommend without hesitation to all vertebrate biologists as a general source and as a supplementary text for courses in vertebrate morphology, phylogeny, and general natural history in addition to its natural role in physiology courses.

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Planck's Thought

Max Planck als Philosoph. HERMANN KRETZSCHMAR. Reinhardt, Munich, 1967. 115 pp. Paper, DM 11.

I was never able, though I was in occasional contact with Planck during my years spent at Berlin University as a student and later as an assistant, to regard him as a philosopher. Of course, he had read Kant, also Schopenhauer and Nietzsche, and was well acquainted with the dogmatic positivism of Mach. In contrast to Mach, Planck believed in a *really real* world; he was a naive realist. But so were and are many physicists, chemists, biologists. True, Planck meditated, especially at the sunset of his life, on metaphysical issues such as free will versus determinism, causality, the all-embracing role of the principle of least action, and the need for a unitary or unified physical picture of the universe. And analytic philosophers—such as Russell, Ryle, Popper, Carnap—are indebted to him for his discovery that there are “phantom problems” in many sciences, such as the body-mind antithesis, the dilemma of freedom of will versus causality, and the vitalism-mechanism controversy. Where the “professional” philosopher had often uttered nonsense, Planck applied unambiguous, rational criteria based upon objective, nonpersonalized knowledge. But it was to the foundations of physics, rather than to philosophy of science in general or to philosophy proper, that

Planck made his (indeed substantial) contributions.

The book under review attempts to deal with Planck's so-called philosophic insights. But the most essential aspects have been omitted, and less important ones are stressed or misinterpreted. The biographical data presented do not include any information not already well known to the educated physicist. Moreover, Planck's views and his major discoveries are evidently not understood by the author, who quotes generously, but out of context.

It has been demonstrated by Max Born, von Laue, Yourgrau and Mandelstam, and many other authors that Planck's appraisal of variational principles, that is, of the exact mathematical methods applicable to the principle of least action, is wrong. Schrödinger, Russell *et al.* also refused to share Planck's and de Sitter's almost naive faith in the privileged status of the least-action principle. Nowhere does Kretzschmar suggest that Planck may have committed such blunders. Planck's dogmatic commitment to strict causality (in the spirit of Einstein's often-cited belief) is presented without critical comment.

Nor does Kretzschmar discuss Planck's abstruse conception of the nature of fundamental constants in physics. The quantum of action, h , is depicted by Kretzschmar too as a “novel mysterious messenger from the real world.” It is impermissible, in my view, to treat physical entities and concepts in this manner. It is crassly unwarranted to compare a few arbitrarily selected ideas of Lenin with Planck's views on the same topics. Toward the end of this painfully inadequate book Planck is dubbed a successor of Leibniz. Planck's h is considered to be the logical (or physical) development of Leibniz's monad. A plethora of similar bold claims are thrown at the reader without substantiation.

Still, perhaps one should not condemn an author who tried to do the impossible, namely, to transform Planck, one of the greatest physicists of all time, into a profound philosopher. It seems that the time is ripe for someone to present us with a sound, critical, and perspicacious account of Planck's significant contributions to the very foundations of physics.

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Oxford Doctor

Thomas Willis, 1621–1675. Doctor and Scientist. HANSREUDI ISLER. Translated by the author from the German edition (Stuttgart, 1965). Hafner, New York, 1968. xiv + 235 pp., illus. \$6.

Anyone interested in the origins of scientific societies will enjoy this well-written biography of one of the founders of the Royal Society of London. The author first produced this work in German, and now gives us a first-class English version. Erwin H. Ackerknecht writes the introduction. Willis' circle included Wren, Boyle, Lower, Petty, Hooke, and others of that remarkable group in Oxford and London whose “Invisible College” developed into a great scientific society.

Willis emerges from this study as a father of endocrinology, epidemiology, microbiology, neurology, and psychology. His Hippocratic approach to disease led him to some shrewd clinical concepts, but more importantly to broad scientific generalizations in what we would today call biochemistry and in comparative behavioral studies and comparative anatomy. Extensive quotations and some paraphrases allow Willis to speak to the reader.

The four years (1642–1646) which William Harvey spent in Oxford, as warden of Merton College, coincided with the years during which Willis studied medicine there. Thus Willis absorbed the great Harveian truths at first hand. As a clinician he wrote on fevers, including malaria and “that Peruvian bark” quinine, on typhus in Oxford, hypoproteinemia in dropsy, cerebral localization, the meningeal origin of headache, “contagion” modified by passage through various hosts, secondary sexual characteristics, and the depressor nerve to the heart. His *Cerebri Anatome* was the outcome of a concerted research project involving Wren, Lower, and Millington, and was favorably reviewed in the first scientific periodical, *Journal des Scavans*, in 1665. *Pathologiae Cerebri* was, in 1667, the first book by Willis to be reviewed in the *Philosophical Transactions* of the Royal Society.

Isler has left all scientists in his debt for this masterly study of a slightly neglected doctor-scientist of Oxford's golden age.

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