Book Reviews

Memoir of a Physicist

Why I Left Canada. Reflections on Science and Politics. LEOPOLD INFELD. Translated from the Polish by Helen Infeld. Lewis Pyenson, Ed. McGill-Queen's University Press, Montreal, 1978. xii, 212 pp., illus. $16.95.

Leopold Infeld, who died in 1968 at the age of 70, was a well-known Polish physicist whose scientific contributions were mainly in the field of general relativity. The paper "The gravitational equations and the problem of motion" (*Ann. Math.* **39**, 65 [1938]) by Einstein, Infeld, and Banesh Hoffmann is a recognized classic, and the problems raised (and partially solved) in it occupied Infeld to the end of his life. Outside of relativity, his paper with Max Born, "Foundation of the new field theory" (*Proc. R. Soc. London Ser. A* **144**, 425 [1934]), in which an interesting modification of Maxwell's theory was proposed, attracted the attention of physicists in the middle and late '30's. Distant echos of this paper are still occasionally heard (see for example p. 579 of G. B. Whitham's excellent book *Linear and Nonlinear Waves*, Wiley-Interscience, 1974).

Infeld also had a considerable literary gift and the kind of ego that finds an outlet in autobiographical writing. In 1941 he published *Quest*, a brilliantly written account of his struggle to do science, and in the '60's two slim volumes, in Polish, updating and enlarging upon *Quest*.

The present volume is a translation into English, by Infeld's widow, of parts of these two books. (Actually only the chapter on Oppenheimer is taken from the later of the two, *Kordian and I*; the rest is from the earlier *Sketches from the Past*.)

The most distressing chapter is the one that gives the book its title. It is a blow-by-blow account of a campaign of harassment and vilification to which Infeld and his family were subjected in response to his request in 1950 for a leave of absence from the University of Toronto to enable him to spend a year in Poland. Infeld finally felt compelled to resign from his post as professor of applied mathematics at Toronto and decided to remain in Poland permanently. Eight years later in a lapse into barbarism the Canadian government, through a special act of the Council, deprived Infeld's native-born children of their Canadian citizenship.

In Poland Infeld became a major scientific and political figure. He was instrumental in raising Polish physics from the ashes to which it was reduced by the war and German occupation, and until his death he represented Polish science in both the East and the West. He traveled freely, met with scientists and government leaders of many lands, and was one of the Pugwash "regulars." Glimpses, maddeningly brief, of Fock, Kapitza, Landau, and Tamm on the scientific end of the spectrum and of Chou En-lai and Bierut on the political end are scattered throughout the narrative; because of illness Infeld missed meeting Khrushchev in May 1959 at a congress of the World Peace Movement, which was held in Stockholm.

Still, the most interesting parts of the book concern Einstein. Einstein was the dominating influence in Infeld's life from the moment of their first meeting in 1920, when Infeld was briefly a special student in Berlin, to the day of Infeld's death. Lewis Pyenson, who edited the book, remarks in his most helpful introduction that "Infeld is Boswell for the mature Einstein." There is little doubt that future biographers of Einstein as well as historians of science will find Einstein's letters to Infeld (quite a few of which are reproduced in the book in translation as well as in the original German) enormously helpful in forming a picture of the man and his work.

The reviewer cannot resist two brief quotations. First from a letter written in April 1946:

> Please don't be angry with me that I have written you so infrequently; the devilish passion to find a solution for these most difficult problems has held me pitilessly in its clutches and has forced me to make desperate efforts to overcome the mathematical difficulties.

This is Einstein at 67, locked in struggle with the unified field theory.

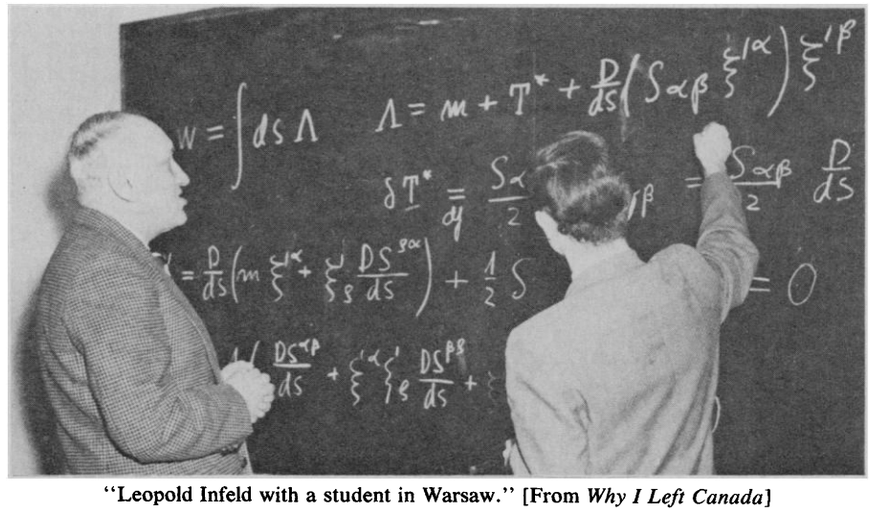
And from a letter of 6 March 1941:

> Our work on the equations of motion, surprisingly enough, has aroused greater interest than we had anticipated then.

This is Einstein, human after all, and like the rest of us not above taking notice of having been noticed.

Einstein's estrangement from the mainstream of physics and his opposition to quantum mechanics are a recurrent theme, but the puzzle remains. Perhaps Einstein felt that when he created general relativity he heard the voice of God and that he listened in vain for that voice in the noises of contemporary physics. This is anyway the impression left on this reader.

Of the "sketches from the past" mention should also be made of a touching tribute to Infeld's sister, Bronia, who perished with her family in the Holocaust; a study in hopelessness, about the Polish town Konin, where Infeld taught for several years in a secular Jewish school; and a portrait of Wladyslaw Natanson, for many years the professor of theoretical physics at the University of



"Leopold Infeld with a student in Warsaw." [From *Why I Left Canada*]

Cracow, who (in a weak sense) was Infeld's teacher. (Infeld, by the way, was Natanson's sole Ph.D.) The weakest sketch is that of Oppenheimer. It is petty, and it somehow trivializes a highly nontrivial person.

Infeld suffered from the ultimate in what Robert Merton calls the Matthew effect (the disproportionate dominance of the better-known of scientific collaborators, as reflected in the words in the Gospel of Matthew, "For unto every one that hath shall be given . . ."). Still, there was enough light in Einstein's shadow for Infeld to more than hold his own. After Einstein's death in 1955 he became one of the acknowledged elder statesmen of relativity, and he cherished and enjoyed the role.

The book makes a distinct contribution to the celebration of the centennial of Einstein's birth.

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Cloud Processes

Microphysics of Clouds and Precipitation. HANS R. PRUPPACHER and JAMES D. KLETT. Reidel, Boston, 1978. xvi, 714 pp., illus. $39.

This book grew out of a series of lectures to students, but it is by no means a textbook. Rather than emphasizing basic concepts and principles, the authors pay considerable attention to details more of interest to those already possessing a basic knowledge of cloud microphysics than to those seeking an introduction to the field.

The treatment of the Kelvin equation is a good example of this attention to detail. Half of the treatment deals with the effects of air and the compressibility of liquid water on the equilibrium vapor pressure of water (both are noted to be negligible). Such detailed treatment is lacking in other books of this genre and is a welcome contribution.

The overall organization of the book leaves much to be desired. Following two introductory chapters (one is a historical review of some interest), topics seem to be interspersed almost at random. Discussion of the structure of water and ice is split between chapters 3 and 5, discussion of homogeneous and heterogeneous nucleation is divided between chapters 7 and 9, and the nonwater aerosols are treated in chapters 8 and 12. Somehow "Cooling of moist air" comes between a chapter on the hydrodynamics of single particles and one on the mechanics of atmospheric aerosols. Admittedly, there is considerable leeway for personal preference, but the logic of this particular sequence escapes me. The final chapter, on the relation betweeen cloud particles and cloud electrification, seems almost an afterthought.

A chapter on the hydrodynamics of single cloud and precipitation particles is an excellent treatment of an important topic rarely dealt with in such books. Here, the interest and expertise of the authors lead to a well-organized and critical presentation. Starting with the basic equations governing fluid motion, the chapter covers flow past rigid spheres, the internal circulations and shapes of falling water drops, and the motion of ice crystals, snowflakes, graupel, and hailstones. This chapter and a companion chapter on cloud-particle interactions, have applications in many fields besides meteorology and may well be worth the price of the book.

Unfortunately, the high level of these chapters is not maintained throughout the book. The treatment of ice phase nucleation is particularly poor. No mention is made of condensation freezing as a distinct mode of nucleation. The discussion of physical mechanisms for contact freezing is an uncritical hodgepodge of different theories, some of which should not be taken seriously. It is particularly disturbing to find that a discussion pointing out the inability of present instruments to characterize natural ice nuclei is followed by several pages devoted to such measurements. I had thought the idea of an extraterrestrial source of ice nuclei had been given a decent burial, yet it is revived here as a possible explanation for so-called "IN storms." The treatment of "ice multiplication" as "processes which are known to occur in clouds" is likewise an uncritical review of the past literature.

With the exception of the chapters on cloud hydrodynamics and cloud-particle interactions, the reader is often confronted with a great many differing opinions and observations, with little or no attempt made to assess their reliability or validity. There is little evidence of an attempt to select from the incredible wealth of references presented. To the beginning student, this does a great disservice; to the experienced researcher, it provides a useful literature survey but little more.

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Neurophysiology

Studies in Neurophysiology. Presented to A. K. McIntyre. R. PORTER, Ed. Cambridge University Press, New York, 1978. xiv, 440 pp., illus. $75.

This is a collection of papers by students, colleagues, and friends of A. K. McIntyre, presented to him on his retirement. McIntyre was professor of physiology at the University of Otago before establishing the flourishing physiology department at Monash University. He is a man of broad interests whose rigorous work represents a significant contribution to the physiology of the nervous system. The diversity of the papers in this collection demonstrates the wide range of the scientists whom he influenced. The overall quality of the contributions is high.

Some of the chapters are concise, up-to-date reviews that are interesting to read and provide a good introduction for the nonspecialist. Among the papers I found particularly interesting, one by B. Katz combines a historical discussion of the vesicle hypothesis with a description of recent work with noise analysis. Y. Laporte discusses current views of muscle spindle innervation and includes his recent work on β axons, which innervate both extrafusal and intrafusal fibers. C. C. Hunt describes the mechanical and ionic events underlying the response of primary muscle spindle receptors. J. J. B. Jack provides useful data on selective activation of various muscle proprioceptors or afferents, together with a review of recent experiments bearing on the suggestion that secondary spindle receptors contribute to the stretch reflex. There are also interesting papers by R. A. Westerman on mechanisms by which muscle tension is restored after partial denervation, by C. Eyzaguirre and S. J. Fidone on carotid body chemoreceptors, by M. Zimmermann on mechanoreceptors and sensation, and by W. I. McDonald on experimental and clinical studies of demyelination. Other papers present interesting recent findings on subjects ranging from receptor physiology to memory. The emphasis throughout is on neurophysiology at different levels of complexity, but there are also excursions into psychobiology and homeostasis.

In summary, this is a good collection of papers. Most of them are both interesting and useful.

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