nuclear instrumentation, as available to the potential users of this book, was neither very extensive nor sophisticated.

Separation procedures are discussed in this chapter at a rather elementary level, and by far the greatest emphasis is placed on all of the phenomena associated with precipitation. In most of the 37 exercises in this chapter isotopic carriers are used when available.

Chapter V contains 19 exercies using tracer techniques. For the most part they are sound but certainly not original.

Thirteen appendices (38 pages) pad the end of the book. These include lists of reagents, apparatus, and clothing, numerical tables for growth and decay calculations, a whole page of numbers on the growth of radon, and six pages of tables for multiplication by 16 and by 64! Beta-ray absorption coefficients and a selected list of capture cross sections for thermal neutrons are also given.

The translation of this book is fairly good. There are many places where awkward words and phrases are used but usually the meaning is clear. However, there are a number of sentences and even paragraphs that are utterly meaningless. It is not possible to tell whether this is due to poor translation or poor text. I am inclined to favor the latter. There are certainly a substantial number of errors in statement of fact in the text and an even larger number of half-truths that are misleading.

A very sparing use of references is made in this book, and a large majority of these are to other Russian books of the period, 1946-1954. My favorite reference, cited 10 or 12 times, is: "Curie, M., *Radioactivity,* Moscow 1947 (In Russian)". For those of us old enough to remember, this was a fine book in 1935 (in French) but is today of more interest to the historian of science than to the practitioner.

It should be obvious by now that I would not have considered this book a very good one when it was first published and a translation ten years later has not improved the situation a bit. It is unsuitable as a laboratory manual for an American radiochemistry course either for "students of advanced courses . . . or for scientific workers". The publisher must have had bad advice to bring out this translation or must have been motivated by something other than a service to science.

John W. Irvine, Jr. is Professor of Chemistry at Massachusetts Institute of Technology, Cambridge, Mass., having been a member of the MIT staff and faculty since 1937 and receiving his PhD degree there in 1939. Radiochemistry has been his field since 1935, and essentially all of his 60 publications deal with some phase of the production or use of radionuclides. In 1946 he spent six months in Oak Ridge helping to organize the isotopes production program and subsequently has maintained an active interest in that program as a consultant. Since then, he and two colleagues at MIT have given lecture and laboratory courses in radiochemistry for seniors and graduate students. During 1957-1958 he served as Scientific Liaison Officer with the Office of Naval Research in London, visiting most of the West European laboratories involved in radiochemical work. Several of his published separation procedures and some of his published cyclotron yield data are clearly recognizable in the book he reviews here, even though proper acknowledgment was absent.

ORIGINAL AND THOUGHT PROVOKING

Title The Special Theory of Relativity

Author David Bohm

Publisher W. A. Benjamin, Inc., 1965

Pages xiv + 236

Price $3.95 (paper); $7.00 (cloth)

Reviewer Irving Kaplan

In the 60 years since the publication of Einstein's first paper on relativity, thousands of papers and hundreds of books have been written on the subject. While it was once said—in the public press—that only 12 people in the whole world could understand relativity, some of us now argue about the extent to which the subject should be treated in textbooks of high school physics. The theory of relativity has deepened the physicist's understanding of the universe; it has provided puzzles for philosophers, problems for engineers, and headaches for politicians. It is easy to see why books are written about relativity but hard to see why another new one should be bought and read.

Professor Bohm's book is worth buying and reading, because the author has thought deeply and carefully about modern physics, and the results deserve serious consideration. His earlier book, *Quantum Theory,* published in 1951 and one of the finest textbooks on quantum mechanics, is notable for its treatment of the physical and philosophical foundations of quantum mechanics. Bohm has devoted many years to the analysis of the interpretation of quantum mechanics, and, although he advocates what is now a minority view, his work has raised some important questions and even opened some minds. I therefore expected that his discussion of special relativity would be original and provocative, and I have not been disappointed.

Bohm reminds us that the physics of any period in history has it presuppositions, its underlying axioms, its metaphysical basis. He traces some of these presuppositions, those concerning space and time, from Aristotle through Newton and then through nineteenth century physics to Einstein. He emphasizes that Einstein's basically new step was the adoption of a *relational* approach to physics and the derivation of the invariant relationships which constitute physical laws. He examines Einstein's conceptions of space and time and develops the physical and mathematical apparatus and the results of special relativity. The basic problems and applications are treated: the Lorentz transformation equations, the addition of velocities, momentum, and mass, the equivalence of mass and energy, the behavior of charged particles in an electromagnetic field, and so on. The discussion is clear and is always within a philosophical framework in which the reasons for the ambiguities of classical physics are made plain. The problems are looked at from several points of view, physical, analytical, and geometrical, and the reader's understanding is thereby broadened. Particular attention is paid to the use of the geometric method based on the "Minkowski diagram" for space and time; the "K calculus", an ingenious and illuminating method, provides additional insights into the meaning of the theory.

The philosophical framework within which Bohm writes is indicated by a quotation from his preface, "... a great deal of attention is paid quite generally to the habitual tendency to regard older modes of thought as inevitable, a tendency that has greatly impeded the development of new ideas in science. The notion of absolute truth is analyzed in some detail in this book, and it is shown to be in poor correspondence with the actual development of science. Instead, it is shown that scientific truths are better regarded as relationships holding in some limited domain, the extent of which can be delineated only with the aid of future experimental and theoretical discoveries". Although few of us would disagree with this statement in principle, we too often forget it in practice.

The book ends with an Appendix, 45 pages long, entitled "Physics and Perception". Here Bohm discusses recent research in experimental psychology on the nature of perception. Psychologists have been studying the development of ideas of space and time in infants and young children, and Bohm thinks, on the basis of this work, that our actual mode of perception of the world (seeing it, hearing it, touching it, etc.) is much closer in character and general structure to what is suggested by relativistic physics than it is to what is suggested by prerelativistic physics. He concludes that, "In light of this evidence it would seem that nonrelativistic notions appear more natural to us than relativistic notions, mainly because of our limited and inadequate understanding of the *domain of common experience*, rather than because of any inherent inevitability of our habitual mode of apprehending this domain".

I am not qualified to comment on the ideas developed in the Appendix, but they appear reasonable and are interesting and challenging. They may have significant influence on how some of us may teach physics and write about it in the future. They are certainly worth reading and thinking about.

Irving Kaplan is Professor of Nuclear Engineering at Massachusetts Institute of Technology and the author of a well-known textbook, Nuclear Physics *(Addison-Wesley Publishing Co., 1955). Until 1958, he was Head of the Reactor Physics Division of the Nuclear Engineering Department at Brookhaven National Laboratory and one of the first members of the scientific staff of that laboratory. During World War II he worked on isotope separation at the S.A.M. Laboratories (Columbia University) and on reactor design at the Metallurgical Laboratory under the Manhattan District. A Fellow of the American Nuclear Society, he received his academic training through the PhD degree (in chemistry) at Columbia University.*

A RAPIDLY EXPANDING FIELD

Title Thermodynamic and Transport Properties of Uranium Dioxide and Related Phases

Editor Charles Holley

Publisher International Atomic Energy Agency, 1965, (Technical Report Series No. 39)

Pages 105

Price $2.50

Reviewer W. Kermit Anderson

The foreleaf on this small volume states that it is the "Report of the Panel on Thermodynamic and Transport Properties of Uranium Dioxide and Related Phases, Held in Vienna 16-20 March 1964". A glance at the table of contents shows that besides the usual introduction, major attention was directed toward: structure, thermodynamic properties, surface and oxidative properties, physical properties, practical implications of thermodynamic and transport properties, and conclusions.

The introduction contains a brief summary of the state-of-the-art circa 1963 anent phase relationships of the oxygen-uranium system, and a very good discussion of the structure of $UO_{2\pm x}$ as determined by x-ray and neutron diffraction. Of practical interest is the tabulation of linear expansion coefficients. Conclusions drawn from the diffraction results include a list of additional unsolved problems, which should be of interest to workers in the field.

The treatment of the thermodynamic properties, though brief, is quite good. The older American readers may miss the familiar notation of Gilbert Newton Lewis in the discussion of free energy, but this fault is not serious and undoubtedly is a virtue in a book designed for international use. The critical selection of values for standard enthalpy and entropy changes is certainly a contribution to the practical arts, as is the discussion of the heat capacity of the uranium-oxygen materials. Engineering evaluation of UO_2 fuels should be aided by the discussion of vaporization processes.

Of most interest to the engineer bent on design of a fuel rod containing UO_2 is the section on physical properties, especially the discussion of the thermal conductivity. The shortness of this discussion coupled with omission of tables or curves of thermal conductivity at