some of the salient points made. One of the most striking new developments in the technique of radioactive dating is that of measuring the lapse of time after a meteorite falls. This technique rests on the fact that when the meteorite falls the atmosphere thereafter shields it from cosmic ray bombardment and, whereas a meteorite probably was in radioactive equilibrium before falling to the earth, it suddenly is thrown out of equilibrium, the more so as time passes after the fall. Thus the degree of disequilibrium gives what can be a quite accurate measure of the time since its fall or the age of the meteorite. This technique is somewhat similarly applied to measuring the time since breakup of whatever larger bodies may have given many of the meteorites. There are strange results from this technique in this respect—some meteorites appear to have had the cosmic rays shining on them for only a few million years, while others go well back into the billions. It is also surprising how old some of the meteorites in museums appear to be, thousands and tens of thousands of years having elapsed since fall. It leads one to wonder how they were so well preserved and in particular why the irons haven't rusted away.

Among the leaders at the conference were Cameron of the IAEA itself, Damon of Arizona, Fireman of the Smithsonian Astrophysical Observatory, Goldberg of La Jolla, Herr of Cologne, Hinterberger of Mainz, Hurley of M.I.T., Kohman of Carnegie Tech, Kulp of Columbia, Kuroda of Arkansas, Münnich of Heidelberg, Oeschger of Bern, Olsson of Uppsala, Reed of the Argonne Laboratory, Suess of La Jolla, Vinogradov of Moscow, Vogel of Groningen, and Zähringer of Heidelberg.

The International Atomic Energy Agency publications are assuming impressive importance in the scientific literature and this, their latest addition, is above their usual standards in quality. It also is comforting that it is published within one year of the time of the conference.

A particularly interesting paper on radiocarbon dating within the U.S.S.R. was read by Dr. A. P. Vinogradov in which the age of a Siberian mammoth is given at 11,700 ± 300 years, and it is concluded that the last inflow of water from the Sea of Marmora through the Bosporus occurred about 8000 years ago.

The newer methods of radioactive dating show the characteristic uncertainties of new methods but appear to be promising for the future. In particular the rhenium/osmium method for iron meteorites gives us hope where little else exists. And the thermoluminescence technique, beset as it is with many troubles, seems to have possibilities if the requisite understanding of the fundamental processes involved is gained as further researches are carried out. The paper on natural fission is intriguing. When one takes Dr. Kuroda's results and combines them with Dr. Oeschger's extremely sensitive counters, one sees possibilities of developing techniques which could be truly revolutionary, for the number of natural fission products is quite large and we are prevented from using them at the present time mainly because of the difficulty of measuring them.

It is a pleasure to recommend this book for the libraries of all radioactive daters and to all geophysicists, geologists and meteorite scientists who aim to keep their libraries current and up-to-date on dating geophysics.

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About the Reviewer: Professor Willard F. Libby, Nobel laureate in Chemistry in 1960, a USAEC commissioner from 1954 to 1959, winner of the Albert Einstein Medal in 1959, and now Professor of Chemistry at the University of California, has been a principal contributor to the field of radioactive dating.

Elementary Plasma Physics. By Conrad L. Longmire. Interscience Publishers (New York, 1963). 296 pages. $9.75.

The recent spate of books in plasma physics has been of generally high quality and this book by Longmire is no exception. It is based on a series of lectures given by the author at Los Alamos in 1956-1957. These lecture notes were widely distributed at that time and have been of great value to workers in the field. Now the author has made considerable revisions and additions to those notes and put them out in book form.

The major portion of the book is concerned with the derivation of plasma phenomena from the viewpoint of first-order orbit theory. In this method, one discusses the motion of individual particles in electric and magnetic fields, and then superposes all the particles to obtain the charge and current densities to be inserted in Maxwell's equations. This approach to the plasma equations offers one the easiest physical insight into the mechanics of a plasma. The author, who contributed considerably to this portion of the literature, is well qualified to discuss this approach and does it well. Thus, after an initial chapter in which the conservation laws of a plasma are derived in a short but elegant way, one turns to the orbit theory.

Chapter II discusses the various particle drifts resulting from external forces, non-uniform magnetic fields and time-varying electric fields. Adiabatic invariants are briefly discussed. In Chapter III these drift velocities and currents are combined to investigate the equations of static equilibrium, and in Chapter IV they are ones used to investigate dynamic problems. Exact static solutions (mostly boundary layers) are the subject of Chapter V while Chapter VI discusses small-amplitude plasma waves, including Landau damping, and Chapter VII contains a brief but lucid discussion of hydromagnetic shocks.

In Chapter VIII we turn away from orbit theory and introduce fluctuations in a plasma and Coulomb collisions. Emphasis shifts to the Boltzmann equation in Chapters IX and X as one discusses diffusion in velocity space and in coordinate space. Finally, Chapter XI covers stability theory in clear, but all too short, fashion and the last chapter touches on the coupling of plasmas and radiation.

The strong points of this book lie in the many clear, simple and highly physical derivations of familiar plasma relations. This will make this book a valuable text for a beginning course in Plasma Physics. It would seem to this reviewer to be the logical book to use following Spitzer's book in a basic course. For more advanced work one can turn to Thompson's book as well as Stix's.

There are some weak points as well. Some of the discussions, especially toward the end of the book, seem excessively brief and one hardly begins to touch on an interesting subject before it is over. This is especially true in the last two chapters. Also the coverage is far from being up to date. This is particularly true of stability theory since such things as finite larmor radius theory, resistive instabilities, non-linear, effects, micro-instabilities, universal instability, shear stabilization etc., are omitted or just barely mentioned. There is also no discussion of partially ionized plasmas. Some of the drawings in Chapter II and XI are rather poor and there are a few misprints.

All in all though, it is a very good book and will serve excellently as an introduction to the subject of high-temperature plasma physics.

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About the Reviewer: Albert Simon is the Head of the Plasma Physics Division, John Jay Hopkins Laboratory for Pure and Applied Science, General Atomic Division of General Dynamics Corporation. He is also currently the Chairman of the Plasma Physics Division of the American Physical Society. Simon was at the Oak Ridge National Laboratory from 1950 to 1961 and was closely associated with the fusion project there. He is the author of An Introduction to Thermonuclear Research, *Pergamon Press,* London (1959).

Chemical Processing of Uranium Ores. By E. T. Pinkney, W. Lurie, and P. C. N. van Zyl; published by the International Atomic Energy Agency, Vienna, 1962; distributed by National Agency for International Publications, Inc., New York; 77 pages; $1.00. (This book is bound with the one reviewed below.)

This is a small book which touches upon nearly all aspects of the relatively large field of uranium ore processing including mineralogy, physical concentration, crushing and grinding, various leaching methods, solid-liquid separation, various methods for recovering uranium from the leach liquors, a description of several processing plants and a general discussion of process economics. In some ways, it is similar to an annotated bibliography but is much more informative and should be useful to those desiring a general acquaintance with the field, as well as to the experts who wish to refresh their memory on selected subjects. Although the title implies that the principal content deals with process chemistry, much, perhaps most, of the book deals with descriptions of practical process applications. This is intended as an observation rather than a criticism since it is believed that the authors of any highly condensed review article must, of necessity, make a choice of emphasis.

The following more specific comments are offered:

(1) The authors, not unexpectedly, show a greater familiarity with processing practices in their own country (South Africa) than those in others such as the United States and Canada. This is undoubtedly contributed to by the greater diversity of ores and processes utilized in these countries and the lack of publications giving a thorough analysis of relative process merits. In the present book, various remarks, including a tendency to compare the advantages of one process with disadvantages of another, might give the reader the impression that the order of preference in the United States is $(NH_4)_2CO_3$ processing $>Na_2CO_3$ processing $>$ sulfuric acid processing. Actually the reverse is true, as it also is in Canada, for all ores except those of unusually high