awards and biographies. Also, the reader who picks up one volume to read, say, Pauling's elucidation of the chemical bond may also be attracted to a parallel reading of Hemingway's remarks on writing as a lonely life, as a writer tries for something that has never been done and that may be beyond attainment.

Statistical Mechanics of Charged Particles

By R. Balescu. 477 pp. Interscience, New York, 1963. $15.00.
Reviewed by J. E. Mansfield, Harvard University.

The intention of the author is to provide an introduction to plasma physics that avoids some of the limitations of the standard treatments. Existing monographs stress classical magnetohydrodynamics or special topics, while the quantum statistical mechanics of charged particles is handled mostly in general statistical mechanics textbooks. Here we have a unified and rigorous statistical-mechanical development of the fundamental equations of plasma physics using the Prigogine methods of nonequilibrium statistical mechanics. A diagrammatic technique is used, and the long-range difficulties of the Coulomb force can be handled rather simply.

Chapters 1-13, the first two-thirds of the book, are an introduction to the nonequilibrium statistical mechanics of classical systems. This supplements Prigogine's volume in the same series, "Monographs in Statistical Physics". The diagrammatic technique is developed for the classical gas. In the treatment of the short-time behavior of classical plasmas, the Vlassov equations are developed and solved by the resolvent method and by the van Kampen—Case method. Collective effects and long-time behavior are studied, and the Fokker-Planck approximation is developed. This leads to the ring fragment approximation, by which the kinetic equation and correlation functions are studied. The theory of the equilibrium plasma is given as an asymptotic limit; and by way of contrast, the cluster expansion development of the Mayer theory of electrolyte solutions and of the perfect Lorentz gas are given.

In general, the methods developed for the classical case are so chosen as to be generalizable to the quantum-mechanical case, which forms the second part of the book, Chapters 14-18. The diagram technique is developed with Wigner distribution functions, and the quantum Vlassov equation is developed and solved. The quantum analog of the summation of cycle diagrams used in developing the Fokker-Planck equation is used to study the long-time behavior of the reduced one-particle Wigner function. The quantum ring approximation is developed, and binary correlations in an electron gas are studied.

Much of the basic mathematics is relegated to eighty pages of appendixes, as are several unrelated calculations added after the book was set. These treat of kinetic equations for stable and unstable classical plasmas. The past-history dependence in the short-time kinetic equation is well shown. Recent developments in the theory of plasmas in strong external fields are discussed briefly. Symbol, Author, and Subject Indices are provided.

Man-Made Transuranium Elements.

By Glenn T. Seaborg. 120 pp. Prentice-Hall, Englewood Cliffs, N.J., 1963. Paper, $1.50; cloth, $3.95.
Reviewed by Norman Feather, University of Edinburgh.

In the beginning—or fairly soon thereafter—there were three fissile species, uranium 233, uranium 235, and plutonium 239. But that was five thousand million years ago, and when North Atlantic Man came on the scene, in the twentieth century of our present era, that most desirable state of affairs no longer obtained. Indeed, had homo sapiens but delayed his appearance on this planet for just twice as long as he did, his chance of warming his hands at the nuclear fire (on earth) might well have passed beyond possible recall. There would have been no uranium 233 nor plutonium 239 (there was none in A.D. 1940, anyway), and, instead of 0.7 percent of uranium 235, ordinary uranium would have provided him with no more than 0.01 percent of that valuable isotope. However, that was not to be: "by the grace of an odd combination of unusual circumstances", according to Dr.

Seaborg (p. 99)—even the half-life of uranium 235 is some ten times longer than it might well have been —all things worked together for good (in that the excitement of winning new knowledge was not denied to the scientist), and the world's original unspoiled state has at last been partially restored. Now "the 'Big Three' fissionable nuclides" (p. 97) are all available again—to those with sufficient funds and good credentials. (The "Three", of course, are "Big" in barns, in respect of thermal neutrons.)

Since 1940, not only plutonium 239, but also some hundred other transuranium species have been produced and characterized by the nuclear scientists of the world, thereby adding eleven new elements to the Periodic Table. In truth, this most exciting chapter in the history of science has been written almost exclusively in USA, and Dr. Seaborg, more than any other single person, has been its author. Having received, in full measure, the unstinted acclaim of his brother scientists of all nationalities for his discoveries, he has now put the college freshmen of his own country in his debt—and every person with an intelligent interest in the new elements, also. This slender book is intended to supplement Chapter 23 of the CHEM Study textbook, *Chemistry—An Experimental Science*, but it will do much more than that. It will provide exciting reading for the scientific layman (not all of it, perhaps, but enough to repay his attention), tabloid instruction for the undergraduate, and it will serve as a handy data-book for the nonspecialist researcher. It might be said that to have attempted all these things was to have attempted too much, but that is a churlish objection. It is very unlikely that Dr. Seaborg took deliberate aim at three targets: more probable that he had only to press the trigger, steadily and without fuss, to score three bulls in a single burst. Of course, he can be faulted by the pedant in matters of detail. This reviewer, being somewhat pedantic himself, finds him over addicted to the adjectival phrase "ever-increasing" (or "decreasing"): "elements of ever-increasing atomic number" (pp. 5,