

Alamos (2 November 1945), the final selection of Smith's and Weiner's book. Here, in perhaps the finest thing he ever wrote, Oppenheimer lays down the double bind that assails the political role of science and that turned his journey, from the laboratory to the corridors of power back to the museum setting of the Institute for Advanced Studies, into an emblem of the transformed/deformed nature of contemporary science itself. Here it is magnified and distorted by the "unusual" moment at which he did his work.

* * *

Robert Andersen is a visiting scholar at the Hastings Center, Hastings-on-Hudson, New York, where he is working on the politics of science and technology. He is currently writing a book on the atomic scientists, Oppenheimer included.

Atoms and Molecules (Student Edition)

M. Weissbluth

713 pp. Academic, New York, 1978. \$24.50

The advent of high-powered lasers and of dedicated synchrotron light sources and the needs of research in such areas as astrophysics and fusion have led to a resurgence of interest in atomic and molecular physics. Concurrently, there have been significant advances in atomic and molecular theory, not only in the ability to make more reliable numerical predictions but also in the detailed understanding of the dynamics of atomic and molecular collisions. The nonspecialist or beginning graduate student who must read the scientific journals to learn of these advances often finds that the requisite basic knowledge is extensive. Mitchell Weissbluth, whose book has just been published in a paperback edition, intended to meet the basic needs of such a graduate student. As stated in the Preface, the book is an outgrowth of a one-year course in atomic and molecular physics in the department of applied physics at Stanford University for students who came from such diverse fields as spectroscopy, magnetic resonance, Mössbauer resonance, quantum electronics, solid-state electronics, astrophysics and biological physics. The book aims, and largely succeeds, in providing a good grounding in atomic and molecular structure and spectra using the modern analytical tools of tensor algebra and group theory.

Before discussing atoms and molecules, Weissbluth presents two very tersely written sections of necessary background material. The first provides the mathematical background on angular momentum, group theory, tensor algebra and vector fields, and the second gives the quantum mechanical background: symmetry properties,

time dependence, Slater determinants, second quantization and density matrices. The discussion of atoms starts in the third part, which is concerned with one-electron atoms. Weissbluth interestingly starts with the Dirac equation and proceeds to its nonrelativistic approximation, thereby obtaining in the simplest way all of the interaction terms that are important in atomic physics. This part also includes the hydrogen atom, electric and magnetic fields, and hyperfine interactions. Part IV is concerned with N -electron atoms, including the Hartree-Fock approximation. Electromagnetic absorption and emission processes in atoms are the subject of Part V. Finally, Part VI provides an excellent brief introduction of molecular structure and spectra.

The background material, in Parts I and II, is probably too compactly written to be used in textbook fashion and includes no problems and too few examples. It does serve as a valuable summary, however, for the more experienced reader as well as for the lecturer. Weissbluth has written the parts of the book on atoms and molecules, on the other hand, in a more leisurely style. They are appropriate for a solid course on atomic and molecular structure even though they do not go into the depth required to satisfy the needs of researchers. In particular, only the simplest approximation methods for atomic and molecular wave functions are discussed, collision processes are omitted altogether, and no attempt to compare theoretical results with experiment is made. However, these are the criticisms of a researcher. Students will like this book, and their advisers and lecturers will be grateful that a book such as this exists to be recommended to them.

ANTHONY F. STARACE

University of Nebraska
Lincoln

The Image of Eternity: Roots of Time in the Physical World

David Park

150 pp. U. of Mass. P., Amherst, 1980. \$14.50

David Park, professor of physics at Williams College, has written a book—for physicists and nonphysicists alike—concerned with the nature of time. Refreshingly, this is not a book for the general public that "explains" in nontechnical terms what those wonderful physicists have wrought, but one in which the author poses and discusses problems that have not yet received fully satisfying resolutions. In fact, the questions raised, which go far beyond the confines of any one discipline, con-

cern the relationship between the individual and the world, the nature of consciousness, freedom and necessity, and the role of science in our understanding of the universe. It is within this wider framework of philosophical-historical discussion that Park looks at aspects of time.

Very briefly, there is the time that occurs in Newton's laws of mechanics, a time that is modified and restructured by the theory of relativity. Then there is the time that "flows" in the consciousness of the individual, the time that has a past and a future in it, separated by that most important but ever-changing divide, the present. Closely connected to how these are related to each other is the problem of reversibility: Each event involving just a few molecules in interaction obeys reversible laws, that is to say, laws whose forms do not change if $+t$ is changed into $-t$. But matter in reasonable quantities, the matter that we encounter in daily life, obeys the second law of thermodynamics, which asserts that most developments are irreversible, that increasing time (the future) differs profoundly from decreasing time (the past).

Park explores all these topics in ten chapters, often charming and persuasive, that even include some cosmology. Technical discussions, which require at least some familiarity with algebra and with elementary physics, are relegated to four appendices.

PETER G. BERGMANN
Syracuse University

High Speed Pulse Technology, Vol. 4. Sparks and Laser Pulses

F. B. A. Früngel

448 pp. Academic, New York, 1980. \$49.50

This book is a comprehensive review of techniques for generating short, intense light pulses, with emphasis on the use of these pulses to photograph very high-speed phenomena. This field, rapidly developed over the past decade, promises to make increasingly important contributions to such diverse fields as aerodynamics, materials testing, controlled fusion and photochemistry.

As he states in the Preface, Früngel aims to give a comprehensive account of light pulse research and technology from 1964 (when Volume II of *High Speed Pulse Technology* was published) to mid-1978. The book deals primarily with three types of light sources: sparks, discharge lamps and pulsed lasers. As he does in the previous volumes of the series, the author touches on a large number of topics and