

J. Robert Oppenheimer and the politics of science

J. Robert Oppenheimer: Shatterer of Worlds

P. Goodchild
301 pp. Houghton Mifflin, Boston, 1981.
\$15.00

Robert Oppenheimer: Letters and Recollections

A. K. Smith, C. Weiner, eds.
376 pp. Harvard U. P., Cambridge, Mass.
1980. \$8.95

Reviewed by Robert Andersen

Recommending his best student for graduate study at the famed Cavendish Lab of Cambridge University, Harvard professor Percy Bridgman warned Sir Ernest Rutherford that he would find it a "bit of a gamble" whether this brilliant superachiever would "ever make any real contributions of an important character." But, Bridgman went on to add, "if he does make any at all, I believe that he will be an unusual success."

Rutherford's gamble seemed a sure bet, for the prodigiously gifted J. Robert Oppenheimer had already swept through Harvard Yard like an intellectual cyclone, piling up courses in a three-year binge of omnivorous mental activity, taking his degree in chemistry *summa cum laude* almost as an afterthought. Having begun the study of physics at the graduate level, Oppenheimer quickly demonstrated an unnerving facility with the most demanding formulations, finding his only severe challenge in his too-melancholic nature. Once across the Atlantic, after a shaky start at Cambridge, he found his métier at Göttingen, amid the arcane splendor of the revolution in quantum theory. For several years he conducted an intellectual barnstorming tour of Europe before he finally returned to the States in 1929 as, in his words, a "hot property," with no fewer than ten job offers, his alma mater's among them. Taking the "spirit of Göttingen" to California, where he divided his time between Caltech and Berkeley, he proceeded to build a superb school of theoretical physics at UC, all the while capitalizing on the



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mystique which came to envelop him. He proved to be a charismatic teacher and a first-rate physicist, and by the time the war broke out he enjoyed, in scientific circles at least, a worldwide reputation as an omniscient savant. Still, first-rate was not first-rank, and the "contribution of an important character" continued to elude him. Bridgman's doubts, it turned out, were well founded.

The war gave Oppenheimer his "unusual success," and, in nine years, his unusual defeat as well. Between the zenith of his powers and the nadir of his disgrace Oppenheimer made contributions of a life-and-death character in the service of the state. To date, the study of the life of the "father" of the atomic bomb and the "conscience" of the atomic scientists has focused on these melodramatic extremes, exaggerating them by melding the riddle of his character to the moral transgression of the bomb.

The contradictions so evident in this complex, remarkable life have been too

often misunderstood and misrepresented. As a hand-wringing intellectual with a suspect past he proved a sitting duck for a vengeful AEC only too eager to cite "fundamental defects of character" as the reason for its gratuitous assault. As a visionary and humanist with an unfortunate penchant for florid vacuity, he lurks in ethereality, cut off at the neck. And as an extraordinary technician, one too easily lulled by the siren-song of the "technically sweet," he appears as a caricature of cold-blooded reason. It is the great virtue of this superbly edited and prepared volume of letters and reminiscences that the man finally appears in his own light—as student, brother, friend, colleague, confidant—before the klieg-light glare of notoriety and celebrity imposed his infernal invention into his identity and gave us instead the Faustian bargainer or the servile technician.

The 167 letters in this volume, all but a handful written by Oppenheimer himself, cover the years from 1922

through 1945. In addition, the editors, historians Alice Kimball Smith and Charles Weiner, have crafted an incisive, elegant parallel narrative that draws on the reminiscences of friends of long standing and Thomas Kuhn's oral history interviews with Oppenheimer in 1963. This juxtaposition of letters and commentary provides a close approximation to the autobiography Oppenheimer never wrote. The result, then, is first-rate, an intimate yet scholarly revelation of a life that turned the fiercely ambitious Harvard freshman into the "weary forty-one-year-old administrator who tried briefly after the war to resume a quiet life of teaching and research."

Although he lived a charmed, quiet life of teaching and research for much of the period covered in this book, Oppenheimer, as these letters make clear, never succumbed to the "quite robust vanity" invited by his formidable gifts. His life was one of "great superiority but great charm with it, and great simplicity," as Harvard classmate Paul Horgan recalled. Writing to his brother in 1930, Oppenheimer argued that in "mature people there comes more and more to be a certain unity, which makes it possible to recognize a man in his most diverse operations." That unity—great superiority but great charm—is evident in virtually all of the correspondence, in the "overtone of the attitude that the writer takes toward what he is writing," whether he was an overwrought Harvard freshman straining—and failing—to realize grandiose literary ambitions, a severely depressed Cambridge graduate student engaged in the "far more difficult business of making myself for a career," the self-healed doctoral candidate exulting in the "more critical, more disciplined, more professional science of Europe," the much imitated and revered professor at Berkeley, immersed in "physics and the obvious excellences of the life it brings," or, finally, in the triumphant chapter of his life, the harried Director of the Los Alamos Laboratory not yet contaminated with "blood on his hands." Wit, solicitude, courtliness, civility and a cultivated depth are present throughout. Particularly affecting are the letters to younger brother Frank and Ethical School teacher Herbert Smith. That "abnormally repulsively good little boy" of his privileged, genteel upbringing was long gone by the time Oppenheimer reached Harvard. He was already in command of the poise and powers he would need in this singular life devoted to the "awful fact of excellence."

These letters are an eloquent refutation of the portrayal of the arrogant, self-aggrandizing, dissembling Oppenheimer of later repute. Still, they fall

short of providing a full self-portrait. Missing, for instance, is the romantic Oppenheimer, the handsome, courtly professor who sent many a heart aflutter in the 30s. More important, his leftist awakening is strangely absent; there is nothing here to suggest the sea-change his thinking underwent as he began to involve himself in radical causes and organizations. In lieu of the missing or nonexistent correspondence, the editors have drawn on Oppenheimer's testimony at his 1954 hearing, about this critical phase in his political evolution—an unfortunate choice. Surely some new light could be shed on this vexing, vital area.

Gaps aside, the letters themselves raise certain perplexities and disappointments. First, physics, or rather an interpretive approach to its inadequate theory and absurd revolutionary experiments, gets short shrift. True, the editors have subtracted the purely technical correspondence; what remains, however, hardly qualifies for philosophical interest or speculation. More generally, these letters, for all their erudition and stylistic maturity, are intellectually thin. If Oppenheimer had one of the better minds of the century, it is, alas, not in evidence in these pages. The guidance he offers his younger brother—"to cultivate a disinterested and catholic interest in every intellectual discipline"—is obsessive with its emphasis on discipline and detachment; unfortunately, this ampli-

fied devotion to the "*delectio contemplationis*" which is the reward and reason of our way of life" has failed to yield among these letters a single acute insight on the life of the mind.

This collection breaks off in 1945, with Oppenheimer's emergence as public figure and symbol. In his second career, as the chief architect of US nuclear development and weapons policy, he became formal and guarded in his voluminous correspondence. The primary sources for an understanding of this period are to be found in the documents and reports, many of them top-secret, that Oppenheimer wrote as chairman of a whole slew of advisory committees. Unfortunately, even with his access to some of these (and FBI documents) through the Freedom of Information Act, Peter Goodchild's otherwise competent biography only highlights a few of the political battles Oppenheimer fought during his nine years in government service. As the producer of the seven-part BBC dramatization of Oppenheimer's life (for which this volume is the research), Goodchild is neither equipped nor inclined to provide a critical analysis of Oppenheimer's peculiar new-found power. His is a brisk and readable outline, profusely photo-illustrated, that breaks no new ground and hazards no new insights.

Readers would do well to concentrate on the documents themselves, chief among them, the farewell speech at Los



The spectacular folding seen in the southern Rockies in British Columbia appears in *Mountains and Man* by Larry W. Price (506 pp. U. California P., Berkeley, 1981. \$35.00). Price describes mountains, their climates, vegetation and wildlife. He also documents damage from mining and deforestation. Courtesy Geological Survey of Canada.

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.

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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.

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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 non-technical 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.

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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