

## In defense of the titular heros

LAWRENCE & OPPENHEIMER. By Nuel Pharr Davis. 384 pp. Simon and Schuster, New York, 1968. \$7.50

by Frank Oppenheimer

The conception of a book that would develop a bit of crucial history around the interwoven activities of two famous men would indeed seem to be a promising one. The two men, Ernest O. Lawrence and J. Robert Oppenheimer, had very different personalities, values and talents; at times the men augmented and at other times interfered with each other. The history covers a period of about 30 years. The book touches on the development of physics and the physics department at the University of California at Berkeley, the organizational and technical problems of the wartime atomic-bomb project and the ideals, tensions and frustrations of postwar policymaking.

However, despite the promise of its conception, the book turns out to be inaccurate and muddled. The failure of the book arises, in part, because the relevant issues of the times are not presented with any sense of conviction or clarity. The primary fault of the book, however, lies in its treatment of people. Not merely the titular heroes, but many others are portrayed with little humanity.

The author, perhaps consciously and wisely, refrains from casting people as villains or heroes but in the process he manages to convey the impressions (and it would appear, his own convictions) that there are no worthwhile people. At one point he even says: "The great day when the FBI gives up its dead files is worth looking forward to. We shall then learn not only what bastards everybody used to be . . ." Through omission, distortion and inaccurate anecdotes, not one of the people who appear in the book emerges as a person worth knowing.

The author, for example, has missed entirely one of Lawrence's most redeeming qualities: his basic purity of motive, purity in the sense that there were never any hidden motives behind what he did or said. Nor is it ever clear from the book where his enor-

mous talents lay. He is portrayed as a man who used his "connections with the high and mighty" to satisfy his drive to build huge machines and accelerators, based on principles of doubtful validity and with brute force and unsubtle technology. In fact, the very basis for his fame, the cyclotron, was remarkable for its elegance in that it used small voltages to obtain high-energy particles in contrast to the concurrent attempts to build high-voltage generators.

Although the Calutrons developed by Lawrence turned out not to be the most economical devices for uranium-isotope separations, the machines were not, as Davis implies, brute-force instruments. Their success depended on a subtle phenomenon. The ion-plasma edge of the source could be adjusted to form a part of the focusing system so that one could get both high yield and high resolution.

Lawrence's great talent lay in his

ability to foresee when it was worth pushing harder on some developmental project because some small clue promised success. Alternatively he could decide when a given line of development should be abandoned as fruitless even though an enormous effort had already been expended on it.

The surprising result of the war effort was that almost every conceived method for the preparation of fissionable material worked or could have been made to work, a result that was certainly not predictable at the outset. Lawrence, during the war, was not preoccupied with building his empire of influence but was captured, as we all were, by the sense that he was participating in the beginnings of a new age. In trying to make a group of unclear workers at Oak Ridge feel that what they were doing was important, he told them that future history books would conceivably stress the ramifications of the project they were working

COURTESY OF LAWRENCE RADIATION LAB., UNIVERSITY OF CALIFORNIA, BERKELEY



ENRICO FERMI stands between Frank Oppenheimer and Ernest O. Lawrence in this photograph taken at the Lawrence Radiation Laboratory in the late 1930's.

on at much greater length than the war we were engaged in.

However, although Lawrence was aware of the social implications of atomic energy, he did not want these issues to penetrate into his laboratory, as he mistakenly believed that such issues would disrupt its scientific unity and progress.

Davis appears obsessed with the idea that my brother was a simple man. The idea is asserted repeatedly, both directly and through rather meaningless and unconfirmable comparisons: He (Oppenheimer) was simpler than Tuck, simpler than Bainbridge and so on. My brother was certainly not devious (neither was Lawrence), but he did involve himself with complexity both in connection with people and in his evaluation of the problems that confronted him. It would be inappropriate for me to discuss my brother in connection with this review but he most assuredly does not emerge from the pages of the book as the guy I loved to be with and do things with and who made me, as well as many other people, feel better about themselves for having known him. Nor could one perceive, from this written account, that although my brother knew how to relax, he never learned how to be lazy . . . at least not until about a month before he died.

In scattered sentences and paragraphs, the author does include some genuinely discerning remarks about both Lawrence and Oppenheimer, but one would have had to know both men extremely well to distinguish these passages from the general murk.

In addition to Lawrence and Oppenheimer, many other personages are woven into the book. Their characterization is sloppy and one is led to the general impression that these people do not amount to much. Thomas Lauritsen is described as a round-faced, cheerful little man. There is no mention of his wisdom, his accomplishments or the strength of character that had led him to desert the Royal Danish army sharp shooters and, years later, to study for a PhD in physics after having been inspired by a lecture given by Robert Millikan. E. U. Condon, a physicist of enormous prestige and a crusader against injustice and hypocrisy, is described as a "puckish little man" and later in the book as one with "slyly glinting eyes and slyly curled lips." Raymond Birge, former head of the physics department at the University of California at Berkeley, appears as an anti-Semite (presumably because he did not take to the 1930 version of hippies) despite all evidence that I have to the contrary. Mark Oliphant, an Australian physicist, is portrayed as one opposed to the electromagnetic-isotope separation process but there is no mention of the years during which he helped with the development of this process. The working arrangement between Lawrence and Stanley Livingston, codeveloper of the cyclotron, is thoroughly distorted by the introduction given of Livingston: "In 1932 Lawrence entangled his career with that of a student Stanley Livingston . . ." Although many of the achievements of Edwin McMillan are well described, he is characterized

at the beginning of the book as a man who enjoyed doing mean tricks such as throwing a research associate's dog into a creek. Toward the end of the book the author says: "McMillan showed strong tendencies to putter with inexpensive devices of paper and string . . ." There is no mention of the fact that at the time he supposedly was showing these tendencies he was designing and building the world's first large electron synchrotron. The author, with no obvious purpose other than parsing of the prose, states that I had no vocation for the teaching of freshman physics, a statement that does not coincide with my reputation among either faculty or students and that certainly does not reflect my own interests and efforts.

The most clear-cut failure of the book *Lawrence and Oppenheimer* is that it is replete with factual error. The errors are numerous, some are trivial, but many have implications that are not trivial. One cannot but be impressed by the enormous effort the author must have expended in gathering his material. The list of documents he read and the number of people he interviewed and quotes from is indeed substantial. Unfortunately, however, it would be difficult to recommend the book as source material for future historians or biographers. Even the relatively few events with which I had any personal connection are inaccurately reported. There was no minute of silence following the thunder of the test bombs in the Alamogordo desert. Its thunder continued as though it would never cease as echo upon reëcho reverberated through the valley of the Jornada. I was with Lawrence on the afternoon of the Pearl Harbor attack and must contradict Davis's statement that Lawrence did not show much reaction. W. Higinbotham was active in the organization of scientists at Los Alamos that played a major role in the formation of the Federation of American Scientists, so that it would appear a rather pointless bit of misleading fantasy to state, as Davis does: "Released from Oppenheimer's spell, Higinbotham went to work with the Federation of American Scientists." The design group at Berkeley was thoroughly aware of the relativistic limits on the energy obtainable with a conventional design of the 184-inch cyclotron. I left the Berkeley Radiation Laboratory in 1947, along with Ed Lofgren, to teach and to work on a high-altitude cosmic-ray project

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at the University of Minnesota. Lawrence did *not*, as stated by Mr. Davis, fire me with "quick brutality." At the time I left he was affectionate, appreciative and reluctant to see me go. He did, however, refuse to see me a year later for some reason that I have never discovered. There are two instances in the book in which conversations are reported between my brother and myself: One in connection with my getting a job in Berkeley, the other at my ranch in Colorado. In both instances there are quotation-marked sentences that were never said, notwithstanding the author's assertion in the introduction of the book that "Any quotations in the book, unless otherwise attributed, come to me directly from the sources stated."

There are innumerable simple errors in the book that could easily have been checked. Emilio Segrè's Nobel prize was not for the discovery of technetium. My brother's name was not Julius; he did not collect paintings; he did not own a grand piano before his marriage, and he and his wife bought a "lovely old house," they did not build one. He did not arrive in Pasadena in a grey Cadillac in 1927; he arrived there, two years later, with me, in a tan Chrysler roadster. He did, however, as reported, wear a red sling as I, not he, had run the car into a ditch (in Colorado, not California). The Sangre de Cristo mountains are green, lush and wet, not red and desolate. The ranch in New Mexico was selected by my brother for joint vacations and was leased, not bought for

his convalescence. Our mother was with my father (she was not dead) during their visit in the summer of 1929. My brother did not stumble onto Edith Warner's tea room, I took him there. I could go on. Even fairly simple technical details such as those about the operation of Calutrons are wrong in the book. It is impossible to understand why Davis was so careless with reality. It would appear that almost any basis for morality involves taking the lives and works of people seriously.

Not only is Davis's book an annoyingly inaccurate and disagreeable biography, but it is also a very superficial treatment of the history of the times. One of the difficulties that I encountered in writing a review of the book is that the history that it attempts to cover is in itself so fascinating that even a superficial treatment of it is frequently absorbing. One is grateful for the few insights that Davis did have when he points out, for example, the inability to distinguish between "security and Security" in postwar America. And again when he writes: "By his announcement [of the crash program on a hydrogen bomb] President Truman formally initiated humanity's lemming march toward a thermonuclear bomb." And later in the book Davis states: "Thus ended Oppenheimer's strong and often successful seven-year endeavor to turn the country to a sane nuclear course."

The book never succeeds in portraying the sense of friendship and community in the prewar physics community that was engaged in the exploration of quantum mechanics, nuclear physics and cosmic rays. None of the feeling of fundamental importance and revelation that these subjects were bringing to physics appears in the pages of the book. But Davis manages to pollute the atmosphere. I was at the Cavendish Laboratory in 1933 when Lawrence talked about the Berkeley experiments on the proton-deuteron reactions, and I remember only the good humor and mutual probing of the confusing and incomplete results. I did not know Lawrence at the time but I am certain it could not have been "one of Lawrence's saddest experiences," as Davis quotes without naming a source for the quotation.

The story as Davis unfolds it, certainly fails to convey the collective mission and idealism that was characteristic of the wartime scientific effort and the spirit that influenced a

whole way of life at Los Alamos and existed at Berkeley as well.

The postwar period has been most flagrantly distorted by the author despite the fact that he seems to say much that is revealing (I must admit that one is tempted to believe the story where one does not know from personal experience whether it is accurate or not). After the war the scientists found themselves talking to the public and to Congress and working within the State Department and the War Department. They were no longer insulated from these institutions as they had been before the war by obscurity or during the war by the President and miraculously by General Groves. Virtually all atomic scientists were socially or politically involved during this period, and there were many patterns for such involvement. They saw, in the fundamentally new situation that had been created by atomic energy, the possibility for genuinely innovative political mechanisms for keeping the peace. Yet the scientists themselves were by no means a coherent or revolutionary group. They worked individually and as groups with and through the Congress, the State Department and the war machinery of the country. During this period, most of the scientists who did not drop out on principle or through indifference were in one way or another sucked into the processes of the war machine and were either corrupted, frustrated or destroyed by it. Ever since 1946, year after year, despite hopes or councils to the contrary, military paraphernalia has been



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monotonically building up in almost all countries.

Davis's book throws no light on the social and political forces that were at work during these years, but the book can, perhaps, lead people to reflect on these forces and to wonder once again at the complex interactions between individuals and history.

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## In the tradition of Enrico Fermi

ADVANCED QUANTUM MECHANICS,  
By Jun J. Sakurai. 336 pp. Addison-Wesley, Reading, Mass., 1967. \$15.00

by Henry S. Valk

In the past few years there has been a multitude of books on quantum mechanics and field theory, and it might be thought that there is little need for yet another. However, as Jun J. Sakurai's recent work shows, there is always a place for good physical discussions of the subject. This text is an attempt to provide graduate students with an introduction to the recent (since 1927) advances in quantum physics and is an outgrowth of lectures that Sakurai gave in the third quarter of a required three-quarter quantum-mechanics course at the University of Chicago. If one is to judge by his text, the author has followed in the tradition of Enrico Fermi's lectures at the same institution: The basic theory is presented in a straightforward fashion with an emphasis not on the most elegant but on the most physical approach to each topic. The result is a book that can be read with profit by either second-year graduate students or professional physicists.

The subject matter, the quantum theory of radiation, Dirac theory and the covariant formulation of quantum electrodynamics, is divided into four chapters. The first chapter introduces the reader to basic aspects of classical field theory. This is followed by a chapter on the quantization of the radiation field. Here Sakurai pursues the traditional approach of Fermi and Heitler rather than the usual methods of Bleuler and Gupta. Most physicists find the Bleuler-Gupta formalism more intellectually satisfying because

it exposes the relativistic aspects of the problem in a simple manner. I must admit, however, that the author has a point when he remarks that the simplicity of the Bleuler-Gupta approach is offset for the beginner by the corresponding necessity of introducing concepts such as the indefinite metric and negative probabilities. The third chapter is an exposition of the relativistic quantum mechanics of spin-1/2 particles; the Dirac wave equation, *Zitterbewegung*, the inadequacy of the one-particle interpretation, and the quantization of the Dirac field are all here, but developed with especial emphasis on symmetry principles. The final chapter (comprising nearly half of the book) concerns the covariant description of the interaction of photons and electrons. Again the material is treated in the traditional manner.

The problems (47 of them) and examples spread throughout the text amply illustrate the physical principles and provide the reader with a continuing test of his understanding. The only real annoyance in the book is one common to many first editions, namely that of misprints and typographical errors. One of the most glaring of these mistakes is "communication" for "commutation," on pages 24 and 28.

Although the adherence to the conventional may disappoint some readers, I must confess that I found it refreshing to discover a book without a new "gimmick." In a time when so many authors feel the need for such devices to justify their efforts, Sakurai and his publishers deserve congratulations for having produced a direct and eminently readable account of what every young (and old) physicist should know.

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## "Warfare for science"

THE GERMAN ATOMIC BOMB. By David Irving. 397 pp. Simon & Schuster, New York, 1967. \$16.95

by Joseph J. Ermenc

This book appeared in 1967 as a British importation entitled *The Virus House*. This title indicates the "cover"

name for the small wooden laboratory on the grounds of the Kaiser Wilhelm Institute of Biology and Virus Research at Berlin-Dahlem where some experiments were directed toward achieving a self-sustaining nuclear reactor. The code name of the laboratory was intended to mislead and keep away unwanted visitors, and its use as a title of a book evidently accomplished a similar objective for prospective readers in the US; hence its reappearance under a more interesting title, with minor changes in the text and photograph format. This title, however, will be considered misleading by many readers as there was no German Atomic Bomb Project.

In general, this is a very interesting and detailed account of the simulta-



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neous development of nuclear science and nuclear technology in Nazi Germany between 1939 and 1945. It should be interesting to the nuclear expert as well as the layman conversationalist looking for new facts and controversial conclusions.

The research for the book has been exhaustive. Indeed, two of the leading characters in this absorbing narration, Werner Heisenberg and Paul Harteck, with whom I discussed parts of *The Virus House*, have said that it is factually correct; but they were not in agreement with the author's conclusions. My feeling is that many of the conclusions are premature. One finds that the conclusions do give the story a dramatic quality, which does a lot to