Book Reviews

On Writing the History of Our Monumental Enterprises

This New Ocean: A History of Project Mercury. LOYD S. SWENSON, JR., JAMES M. GRIMWOOD, and CHARLES C. ALEXANDER. National Aeronautics and Space Administration, Washington, D.C., 1966. 698 pp., illus. Available from the Government Printing Office, $5.50.

This New Ocean is a book about momentous change. It is a survey of the history of Project Mercury, the successful effort made between 1958 and 1963 to place man in orbital flight. As the major concern of NASA during these formative years, Project Mercury accounted for much of NASA's dramatic growth. The project mobilized a dozen prime contractors, approximately 75 major subcontractors, and about 7200 third-tier sub-subcontractors and vendors, under whose employ some 2 million persons, at one time or another, had a direct hand in the project (p. 508). The involvement of so many persons in a single mission concentrated into such a short time gave the project an impact upon the course of history comparable to that of the many little wars and annexations over which historians have labored.

Not only were millions of skilled men involved in this government-industrial complex—this was where the engineering was—but massive resources poured into it. (The world will be considerably poorer and space slightly richer for the Mercury activity.) The mammoth expenditure of these resources demands the attention of the historian interested in locating forces shaping history. Yet if it were not for NASA's willingness to subsidize the writing of its own history—*This New Ocean* is but one in the NASA Historical Series—few historians, judging by their past interest in big technology, would devote themselves to the challenging subject.

A history of Project Mercury is challenging. Historians could attempt to establish its complex origins as they have tried to establish the origins of wars; they could attempt to identify forces that, given life and taking on momentum during Project Mercury, would help determine the course of the future; and they could try to see Project Mercury within a societal or cultural context. Swenson, Grimwood, and Alexander have not responded to these challenges; but they have given us an informative chronological survey.

Project Mercury must eventually have more than this, because it is a prime symbol of our era. President Kennedy obfuscated our understanding of Mercury, and of technology in general, when he said that "space science, like nuclear science and all technology, has no conscience . . . whether it will become a force for good or ill depends on man. . . ." On the contrary, Project Mercury is a massive expression of our values; the effects it has had, and will have, derive to a great extent from the characteristics of our society that are embodied in it. The historian could study it as a great artifact of our culture more revealing of our values, perhaps, than our art, our architecture, or our music.

The authors of *This New Ocean* have not taken this approach. Once beyond the introductory material, they have given us an internal history only of the project itself. They have not attempted to place it within the framework of related politics, economics, social factors, and psychological forces. Perhaps they made a decision to ignore the environment because they believed it too soon to analyze the relationships successfully. More likely, they have given us only internal history because of a major and questionable decision to limit themselves largely to NASA sources. In so doing they can rightly claim that they have written history based on original sources—an approach generally commended by their peers. But, ironically, these NASA sources are not those that carry the historian to the root of things. By relying so heavily upon bureaucratic paper, they overexposed themselves to records almost always written with the knowledge that the boss—or even the NASA historian—would read them. In short, many of these original sources were dictated by the values of the bureaucratic structure and written sometimes with an eye to posterity. To get to the root of things the historians needed private letters, diaries, and autobiographical sketches. Perhaps these will be available later, assuming that the actors in the events feel obligations to future historians. With as much concern as there is today for the public image, this may be a forlorn hope.

Overwhelmed with a mass of material, which also included reports of interviews of hundreds of the participants, the authors resorted to a straightforward organizational form. The book is divided into three sections: an opening section, by Charles Alexander, entitled Research; a section—the longest—by Loyd W. Swenson, entitled Development; and a final one, by James Grimwood, on Operations. The authors chose to organize each major section chronologically, and the decision was carried out less than imaginatively; the impression left on the reader is that they moved their sources across their desks by sequences of dates. Such a form makes reading the book an exasperating experience, for the reader is overwhelmed by a chaos of events. As he reads along from page to page, he realizes that he understands the course of events no better than those who participated in them. When the authors bring no more meaning to the facts than the participants were able to, they are chronicling rather than writing history. Experience may be "one damn thing after another," but the best examples of the historian's art have not been.

Swenson's section on development is the most difficult to comprehend because of his rigid adherence to the chronological presentation. Without pausing for breath, much less making a transition, he shifts, for example, from a brief account of appointing a successor to administrator Glennan to a brief account of a technological prob-

lem. Alexander errs even more substantially, if less obviously. His section is titled "research," but he gives much of his space to the history of the National Advisory Committee for Aeronautics (NACA), whose research up to the time it metamorphosed into NASA was not focused upon manned orbital flight. From the administrator's view it might appear logical to stress the history of NACA, but the technological and scientific origins of Mercury were not centered there. He should have written far more about the science of ballistic missiles, guidance and control, and the organization and management of big technology, if he wished to lead into the developmental phase of Project Mercury.

The chronological approach proves to be more suitable for Grimwood's section on operations, because it is about a simple series of events, mainly the flights of the astronauts, which had an internal integrity that one sometimes finds in battles, sports events, and the like—especially after the event. To give a narrative of the memorable flight of Glenn's Friendship 7 is judicious; to narrate "research" and "development" in the same way is a dubious approach, probably an impossible one.

Though handicapped by the chronological form and limited to internal history, *This New Ocean* could still have provided a number of discrete essays excellent in themselves as case histories of very important technology. A great experience shared by hosts of engineers, Project Mercury will lastingly influence engineering style, as did other great "schools" of engineering such as the Erie Canal, the German nitrogen-fixation project of World War I, and the Manhattan Project of World War II. It would have been praiseworthy to explain the technical achievements of its scientists and engineers. To this challenge the authors have responded with limited success. Alexander writes intelligibly and interestingly of engineer H. J. Allen's attack on the reentry problem, allotting more space to it than to most other particular problems. Also in this brief section he touches upon a highly significant exchange between engineering experimentalists at Langley and theoreticians at the Ames Laboratory, with each propounding different approaches to engineering problems; the episode is not, however, explored thoroughly enough. Writing of the effort to establish the reliability of booster-spacecraft systems for manned flight, Swenson reveals an interesting controversy between engineers at Langley and mathematicians at NASA in establishing the meaning of reliability as determined by probabilities and achieved by redundancy. But he never defines or develops clearly the basic theme of his part of the book—the integrating of the man and the machine—although this was the fundamental problem behind "man-rating the machines" and "machine-rating the men" (the titles of two of his chapters). Swenson does present the history of the successful efforts made to correct the situation after the failure of the first unmanned Mercury-Atlas launch. It is an enlightening example of engineering development, well told.

In general, however, the unselective chronological treatment adopted precludes striking case histories. The reader will learn again—as he has already learned from television—what the astronauts had for breakfast, and he must read the names of dozens of persons present at launchings. These facts do not create a greater sense of authenticity; they fill with trivia space that could be better used. Too often the three authors muddle already cloudy technical accounts with NASA jargon—"aborts," "ablations," "q," "MR-BD is not MR-3" (a section title), and "bare Atlas"—and they use a multitude of agency and subproject initials. No glossary has been provided either for technical terms or for acronyms.

Finally, some note must be made of the failure of the authors to portray the men involved in the engineering and science of Mercury. Even though this was big-systems technology, it seems reasonable to assume, on the basis of the histories of similar projects, that some individuals helped shape the character of Mercury by the force of their personalities. Perhaps James E. Webb, NASA administrator, or R. R. Gilruth, director of Mercury, made a mark by the style of their management, but neither emerges from this book. Another question the authors might have asked, but did not, was whether the engineers and scientists who created Mercury shared characteristics that might have helped determine its nature.

THOMAS P. HUGHES
Center for the Study of Recent American History, Johns Hopkins University, Baltimore, Maryland

Manhattan Project. The Untold Story of the Making of the Atomic Bomb. STEPHANE GROUEFF. Little, Brown, Boston, 1967. 384 pp., illus. $6.95.

When, some ten years ago, the Atomic Energy Commission decided to undertake an agency history, it recognized that many volumes could be written about the development of nuclear energy. There was opportunity for dozens of books on the scientific, engineering, diplomatic, administrative, industrial, military, and other aspects of this great enterprise. AEC had the choice of sponsoring a large number of monographs to cover the field comprehensively or of proceeding with a smaller series of broad historical narratives, written from the perspective of top management, which would mark the way and stimulate others to step forward with more specialized books conceived in the light of their own imaginations. The Commission chose the second approach, and *The New World,* the first volume of its history, appeared in 1962. Stephane Groueff's *Manhattan Project* does much to justify the AEC decision.

Groueff, a native of Bulgaria who is now an American citizen and the New York Bureau chief of *Paris Match*, covers the Manhattan Project from its beginning in 1942 to the bombing of Hiroshima. He avoids most of the more-than-twice-told tales and concentrates on the engineering and industrial effort that went into producing the first atomic weapons. It is evident that he started with the AEC volume and used it as a guide for an intensive interviewing effort. The result is a popular but responsible account, episodic in structure, rich in detail and human interest, which brings to mind another successful venture in popularizing recent history, Collins and Lapierre's *Is Paris Burning*?.

Nuclear physicists have dominated other popular accounts of the wartime atomic energy program. Now for the first time a book aimed at the mass market gives engineers and industrialists their due. It is a great story of the almost incredibly complex task of translating theory and experiment into industrial and military reality. No wonder some military and industry men thought it would take another power, starting from scratch, a decade or more to develop a nuclear-weapon capability. It was not that they naively thought that the laws of nature could be "classified"; rather, they knew how much

economic strength, technical skill, and just plain luck went into separating uranium isotopes and manufacturing plutonium.

Groueff is at his best in describing the parts played by individuals. He provides an infinitely better measure of Groves's sound technical instincts and remarkable powers of leadership than the general does in his own story, *Now It Can Be Told.* He highlights the contributions of the many behind-the-lines heroes, men of Kellex, Chrysler, Houdaille-Hershey, Tennessee Eastman, Union Carbide, and Du Pont, who fought the war in New York, Detroit, Decatur, Oak Ridge, and Hanford. None of these deserves recognition more than Percival C. Keith, a swashbuckling yet sophisticated Texan and Harvard English major turned chemical engineer. A man who gave rather than got ulcers, Dobie Keith assembled and headed the Kellex team that designed and built K-25, the mammoth gaseous-diffusion plant at Oak Ridge. No comparable figure marks the Du Pont effort at Wilmington and Hanford. The achievements there, fully as remarkable, were the work of organization men.

The episodic treatment, which gives *Manhattan Project* much of its appeal, at the same time sacrifices a central focus and thus blurs some of the most exciting moments in the race to build the bomb. Although the details are present, the book fails to show how black things were in the summer of 1944, when both gaseous-diffusion and electromagnetic plants were in trouble, when it was doubtful that Hanford could turn out plutonium in adequate quantity, and when identification of plutonium-240, a strong spontaneous fissioner, in sample plutonium made it necessary for Los Alamos to pin all hopes for using the Hanford product on perfecting implosion. Another flaw is the constant straining to supply drama and human interest. This can be self-defeating. Groueff also risks putting off serious readers by reporting, as though verbatim, conversations which could not have been recorded or even remembered accurately. These manufactured quotations detract from the stature of the book even though they quite uniformly reflect the substance and spirit of what people thought and often must have said.

These criticisms aside, the book is definitely worth reading—not only for entertainment but for understanding our times. Read this book and you remember that a "crash project," a term loosely used these days, means round-the-clock efforts on parallel approaches to an objective no matter what the cost. You see the forcing effect of technological goals that lie beyond the current state of the art. At the same time you understand why men living in the afterglow of the Manhattan Project sometimes made the mistake of believing that the application of large amounts of money and effort would automatically overcome even the most stubborn technical obstacles. Not least, you appreciate again the creative relationship between government, industry, and academic community which is sustained by the restless drive and energy of American leadership, both public and private. Is this not our greatest national resource?

OSCAR E. ANDERSON, JR.
9010 Charred Oak Drive,
Bethesda, Maryland

The Grand Prize: Opportunity for Retrospection

Nobel Lectures in Physics. Vol. 1, 1901–1921. Published for the Nobel Foundation. Elsevier, New York, 1967. 510 pp., illus. $85 for the 3-volume set.

The Nobel Prizes, initially awarded in the first year of this century, have acquired a unique and sometimes overpowering prestige. This is particularly true of the prizes in the sciences, where there is probably less scope for capriciousness in the award than there is in the literature and peace prizes. The statutes of the Nobel Foundation require every laureate to deliver a public lecture on a subject connected with the work for which the prize has been awarded.

These Nobel Lectures, which constitute part of the official record of the prizes, have been published annually by the Foundation in the languages in which they were originally given. They are now being collected and made available in English in a series of volumes each of which contains the lectures in one field for a 20-year period, together with the presentation speeches and brief biographical sketches of the prizewinners. The volume under consideration covers the prize lectures in physics for the period from 1901 through 1921. (Volumes 2 and 3, 1922–1941 and 1942–1962, were published earlier.)

Such a collection evidently makes its appeal to the reader interested in the history of science. It is not that the Nobel Lectures, by and large, give much new substantive information about the discoveries or developments that they commemorate, for in almost every case these discoveries have been incorporated into the structure of physics and are known, at least in outline, to every serious student of this science. Their historical interest lies rather in their character as historical documents, as contemporary or almost contemporary accounts of major discoveries by the discoverers, emphasizing those aspects of the work that seemed most significant at the time. And this assessment of significance has often changed in important ways over the years, a fact also made evident by a reading of the presentation speeches, usually made by the current president of the Royal Swedish Academy of Sciences.

One is struck, for example, by the Academy's apparent disregard for the theory of relativity, surely one of the major achievements in physics during this period. Thus, when A. A. Michelson was awarded the prize in 1907, neither he nor the presenter of his award found it appropriate to mention the Michelson-Morley experiment which had failed to detect the classically predicted effects of the motion of the earth through the luminiferous ether. And when Einstein finally received his Nobel Prize in 1921, it was "for his services to Theoretical Physics, and especially for his discovery of the law of the photoelectric effect." In his presentation speech to Einstein, Arrhenius made only brief and passing reference to relativity, describing it as the center of widespread discussion—particularly in philosophical circles!

The quantum theory fared somewhat better, as Planck's work was recognized by the 1918 prize. Yet when W. Wien was given the prize only seven years earlier he was cited as having made "the greatest and most significant contribution" to the radiation problem. Einstein's bold hypothe-