BOOK REVIEWS

Under the Cloud: The Decades of Nuclear Testing. *Miller, Richard L.* Macmillan: The Free Press, New York, 1986, 547 pp., $24.95.

This self-proclaimed "first complete history of America's nuclear testing program" actually only describes the 70 or so tests conducted at the test site in Nevada, between January 1951 and October 1957. Much of this has been covered before, and while Miller's account is a readable introduction, it adds only marginally to what we already know.

The author reviews the preparations for a test—or shot as it is known in the trade—then describes the detonation and the movement of the fallout clouds as they drift away eastward. (Both the United States and the Soviet Union carried out "atmospheric"—above-ground—nuclear detonations until the Limited Test-Ban Treaty sent all tests underground in 1963.) In a valuable 80 pages of appendices, Miller provides maps showing where fallout from the various tests went and lists cities over which it passed.

It is these appendices that broaden our view, and that show graphically that it is not just people living in or near Nevada who have been exposed to radioactive fallout: most Americans have at one time or another been downwind. Previous books on U.S. atmospheric testing in the 1950s, on the other hand, have mostly focused on what happened to nearby residents and participating military personnel. Miller seems to be the first to have used (but even he does not fully exploit) the Defense Nuclear Agency's recently completed 41-volume study on the exposure of test participants, including soldiers and civilian scientists, to radiation from atmospheric blasts.

Miller also makes a detailed attempt to put the nuclear tests in the context of contemporary popular culture and politics, mentioning movies, television programs, and popular songs. In broad strokes, this helps recreate the period, but he often provides excessive detail to little purpose. We don't necessarily care what was playing at some small-town drive-in theater on a night in 1957 when a fallout cloud passed over.

His material is juxtaposed in a confusing or even troubling way. He tells that while fallout from test-shot Galileo was crossing Pennsylvania on Sept. 7, 1957, a Ford Edsel was stolen in North Philadelphia. Did the one circumstance relate to the other?

This kind of uncertainty unfortunately permeates the book. The reader is never sure either of Miller's purpose or of his main arguments. He has done much research, but he draws no conclusions. And though most of the book is focused and the detail holds the reader's attention, the sense of direction is lost in the last 100 pages as the narrative bounces from topic to topic.

Many important issues are hardly touched. Miller writes little about how contentious the testing issue became in the United States and abroad. Absent from Miller's sources is Robert Divine's excellent *Blowing on the Wind: The Nuclear Test Ban Debate, 1954-1960* (Oxford University Press, New York, 1978). The 1963 Limited Test-Ban Treaty receives only three short paragraphs, and the 30-month moratorium on nuclear testing in the United States, which began in November 1958, is only mentioned briefly.

When books cover areas shrouded in secrecy, mistakes are bound to creep in. The Miller book is no exception. In his description of the Bravo test in the Castle series, the author seems to confuse tritium (an isotope of hydrogen) with heavy water (in which the hydrogen atoms are the heavy isotopes, deuterium and tritium). That test, he writes, was the first real demonstration of the Teller-Ulam configuration, the pioneer design for the hydrogen bomb. In fact, the Mike test in the Ivy series was the first detonation of a thermonuclear bomb.

There are other errors as well. No new bomb design was tested in the Crossroads series. Two Fat Man bombs—the same type as the one dropped on Nagasaki—were used. Also, the last French atmospheric test was in 1974, not 1971.

The accident in South Carolina on March 11, 1958, was not the "first time an atomic bomb was accidently dropped on American soil." On May 22, 1957, a B-36 bomber accidently dropped a nuclear weapon just south of Albuquerque, N.M. (Neither bomb was armed, so there was no explosion in either case.)

Miller also perpetuates a common misperception by referring to Lawrence Livermore National Laboratory in California as "the home of the American H-bomb." But it was the Los Alamos National Laboratory in New Mexico that first tested a production-model weapon, in the Castle series, which led to the introduction of several types of thermonuclear bomb to the stockpile in 1954. The first thermonuclear weapon designed at Livermore was not added to the U.S. arsenal until November 1958. Most literature on U.S. nuclear testing has focused on the atmospheric tests of the 1950s and on the hazards they inflicted on nearby residents or soldiers and other participants.

Miller has explored the hazards caused by the 1950s atmospheric tests to the country at large, but a complete history would have to cover many other areas, addressing the reasons and purposes for testing as well as its relationship to the types of weapon continually added to the stockpile.

Testing nuclear weapons happens within the context of evolving technologies that drive and are driven by the Pentagon's

war plans, strategies, and demands for new weapons. Putting testing into that context can only be done with great difficulty, given the secrecy in the work and the complexity of the Pentagon bureaucracy. But to overlook this is to leave the story half untold. —*Robert S. Norris*

Robert S. (Stan) Norris is a senior research associate with the Natural Resources Defense Council in Washington, D.C. He is a coauthor of several volumes of the Nuclear Weapons Databook *series, published by Ballinger Publishing Co. in Cambridge, Mass. He is at work on a book on nuclear weapons testing.*

Robotics: Basic Analysis and Design. *Wolovich, William A.* Holt, Rinehart and Winston, New York, 1987, 393 pp., $41.

Of the several introductory textbooks on robotics published over the past few years, Richard P. Paul's *Robot Manipulators: Mathematics, Programming, and Control* (M.I.T. Press, Cambridge, Mass.) has become something of a standard since its publication in 1981. William A. Wolovich's new book covers much the same material but presents it more clearly.

The book grew out of lecture notes for a one-semester robotics course at Brown University, where Wolovich is a professor of electrical engineering. Because the course is intended for majors in electrical engineering, mathematics, computer science, or physics, the book assumes only a knowledge of matrix algebra and calculus. It should be useful in any departmental course for technically oriented students.

The book's core has chapters on forward, inverse, and motion kinematics, force and torque relations, trajectory planning, dynamics, and positional control. (Sensor-based control is discussed only within the context of force and torque.) The first chapter sketches the history of robotics, describing current industrial uses and outlining the various classifications, technical disciplines, and programming languages. This overview offers a feel for the types of problem encountered in making robots work, and serves as a warm-up for the more technical material. Five appendices cover such background subjects as matrix algebra and Laplace transforms for students who need to catch up in those areas.

The book is written well enough for students to be able to absorb most of it on their own. Each chapter has several handy summary sheets of important equations and concepts, printed on gray paper to set them off from the main text, which Wolovich says have proved useful in the classroom.

At the end of each chapter are 15 to 20 problems—which with the available solutions manual makes the book useful as a self-study text. One minor flaw is the printing, which is slightly blurry, as though the book was set on a laser printer. Although this does not reduce readability, the publisher owes both author and readers a better job.

Anyone who teaches or is planning to