the United States who have become steeped in the subject as a result of the debates on the ABM here during the last year.

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Massive Investments

The Economy of Death. RICHARD J. BARNET. Atheneum, New York, 1969. vi + 202 pp. $4.95.

The Politics of Weapons Innovation. The Thor-Jupiter Controversy. MICHAEL H. ARMACOST. Columbia University Press, New York, 1969. xiv + 306 pp. $10. Institute of War and Peace Studies.

Barnet's compelling essay indicts the economy of a nation preoccupied with security and defense for a generation; Armacost gives us a study in miniature of the political process in the Thor-Jupiter missile controversy. The two books go together in a curious way. Armacost shows us good and sincere men seeking the best response to new strategic needs. Barnet, on the other hand, argues that such men have over 20 years created a grotesquely distorted society which is about to devour itself.

Barnet, a founder and codirector of the Institute of Policy Studies, Washington, served during the Kennedy administration in the Arms Control and Disarmament Agency. In this book he dismantles the basic assumptions of the defense budget. He sees the inevitable and early demise of the system, but only after a renewed climax of struggle. He draws up the battle plan to redirect American priorities away from military mysticism.

> There is no way to fix a rational limit to defense spending other than by the application of old-fashioned political judgment and moral insight. Unless the American people begin to ask and keep asking what real security they are buying, there is no hope of stopping the mindless expansion of the war machine.

For a generation no project of the military, no matter how massive the investment, roused any significant interest group to ask that challenging question. Every new weapon system has been presented to the public doubly wrapped, "an inside wrapping of baffling technical detail, and on the outside, the flag." But suddenly the opportunity for change is at hand. The reversals of Vietnam policy and the revolt of submerged social groups have suddenly made it possible to cast off "the economy of death." Barnet writes a powerful, staccato prose. The essays in this slim volume strike sure and terrible blows against the Cold War way of life.

Armacost's book is one of a series of studies sponsored by the Institute of War and Peace Studies of Columbia University. It is an excellent addition to the list. Although dealing with the early years of the missile race (mid-1950's), it is as fresh and topical as if the events were just happening—and in a sense the ABM controversy is reenacting the struggle.

The treatment in this study is unemotional and comprehensive. The process of policy making is skillfully recounted. The verbal and rhetorical dimension of policy represents a search for consensus among the power groups involved in formulation and execution. All participants have a high degree of autonomy and are summoned into combat by the necessity of responding to a new strategic need. All the agencies articulate demands and present them as programs to those legally and politically capable of authorizing action. They mobilize support for their programs through persuasion and bargaining. They seek to transform their recommendations into policy through the various channels of influence in the policy-making process. Like interest-group activity in any political system, inter-service politics is conditioned by the substance of existing policy, by the prevailing procedures for policy making, by the culture norms that constitute the political ground rules, and by the environment of policy making, that is, the external parameters to which the new policy must respond.

The struggle for operational control of the emerging missile systems is a classical drama of new technology and its painful assimilation into human affairs and national policy. The study delves into the incentives giving rise to the development of two separate intermediate-range missile systems, one by the Air Force, the other by the Army, and describes the struggle for operational control of both research and development and eventually deployment. It looks at and evaluates the dilemmas of collaboration and competition in the development of the system. Finally, it considers the international diplomacy of deploying the system and the impact of the learning process on both the strategic reformulation and the reorganization of the nation's space efforts in 1958.

The Thor-Jupiter controversy affords an excellent case study of public decision making under conditions of strategic indeterminacy. The goals and requirements of strategy and policy were not fully grasped and were themselves the subject of dispute. The facts were complex and poorly understood and the goals contradictory and multiple. The controversy offers an opportunity in microcosm to view the learning process forced upon the nation by new technology.

It is no secret that Washington is a jungle of quasi sovereignties in which conflict is continuous, necessary, and ubiquitous, although not total. The reality principle emerges from the process of political infighting itself, involving all kinds of institutions and individuals in and out of government. Thus there is no substitute for politics in the process of choice.

Both books are highly pertinent, and they are mutually illuminating. The Armacost study provides a humanistic insight—good men working to achieve legitimate purposes can, through fate and events, create a monstrously distorted set of values and institutions which ultimately—now, as Barnet so compellingly argues—requires reform and change.

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Living with Radioactivity

Biological Implications of the Nuclear Age. Proceedings of a symposium, Livermore, Calif., March 1969. Division of Technical Information, U.S. Atomic Energy Commission, Oak Ridge, Tenn., 1969 (available as CONF-690303 from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va.). x + 342 pp., illus. Paper, $3. AEC Symposium Series, vol. 16.

When hydrogen bombs began to be tested in the Pacific in 1954, and reports of fallout started to appear, many scientists became increasingly worried about the possible long-term hazards to mankind, particularly because so little was known about the effects of

small doses of radiation. Other scientists, such as Libby and Teller, who for various reasons wanted the tests to continue, dismissed these fears as totally unfounded; they used for example the argument that the population of Denver, Colorado, which receives from background radiation a dose as high as the rest of the United States population was likely to receive from all tests, showed no ill effects. However, the weight of scientific opinion appeared to be against the Libbys and the Tellers and eventually led to the treaty banning nuclear tests in media in which radioactive fallout might result.

Another, more important outcome of that controversy was a spate of research on radiation problems. In a number of countries new laboratories were set up and teams of workers from various disciplines got busy studying all aspects of the interaction of ionizing radiations with living matter. The protagonists of nuclear tests themselves sponsored such research, perhaps in the hope of disproving the claims made by the opponents of tests but probably mainly because it became clear that, if nuclear explosions were to be used, whether for testing weapons or for peaceful purposes, the public would have to be satisfied that the possible consequences had been fully investigated.

Thus it came about that in 1963, in Teller's center for the study of nuclear explosions, at the Lawrence Radiation Laboratory in Livermore, there was set up a Biomedical Division the purpose of which was "to study the impact of the release of radiation and radionuclides upon the biosphere—especially upon man—from nuclear activities, particularly with reference to the uses of nuclear energy for excavations and other Plowshare events, and weapons testing activities, and also relevant to reactor releases, reactor accidents, and nuclear war." Toward the end of 1968 a new building to house the division was constructed, and a dedicatory symposium was held in March 1969 under the title "Biological Implications of the Nuclear Age." A number of papers dealing with different aspects of the problem, such as release and distribution of radionuclides in the biosphere, possible measures to counter their harmful consequences, and the effect of radiation in man and animals, were read and discussed. The book under review contains the proceedings of that symposium.

By the time the symposium was held the Bio-Medical Division had already carried out extensive research resulting in a series of laboratory reports, which in the words of the authors represent "a practical state-of-the-art approach for predicting the dosage to man from each and all the radionuclides produced in the detonation of a nuclear device." The symposium proceedings give just a glimmer of the nature of this research. Its main impact came several months later, toward the end of 1969, when the head of the division, John W. Gofman, together with a member of his team, Arthur Tamplin, came out with a series of documents, primarily destined for Congressional ears, in which they allege that the whole basis of the assessments of radiation hazards is wrong. The accepted maximum permissible concentrations of radionuclides in water and air, they say, may result in dangerously high doses; and they recommend that the maximum permissible doses to the population should be reduced by an order of magnitude. They also draw appropriate conclusions from this about the future development of nuclear power, the Plowshare project, and so on. Teller appears to have nourished a snake in his bosom.

We now witness the amazing—and somewhat amusing—spectacle of members of one laboratory of the AEC being flatly contradicted in public by other employees of the AEC. Which goes to show that scientists are not corruptible, even though some may be slow to learn. Teller still defends Plowshare and other nuclear ventures, using the same old argument about the radiation level in Denver, Colorado.

But to return to the book under review. None of the aforementioned petards seem to have been hoisted at the time of the symposium, which on the whole was conservative and docile. In fact, in his summing up of the symposium, Gofman strikes a cheerful note; he appears to agree with the speakers who thought that we are on the safe side in radiation safety regulations, and that "it really was not the low radiation dose that was responsible for the increased frequency of childhood leukaemia and malignancy." Which goes to show how far a scientist will go to be courteous to his guests.

On the other hand, the proceedings may not necessarily present a faithful picture of what went on at the symposium. There is evidence of heavy editing. Thus, much of the discussion of the paper by Herbert Parker is concerned with a statement, apparently made in that paper, about the magnitude of life-shortening produced by radiation; but however carefully one reads Parker's paper in this volume one cannot find in it any mention of life-shortening. And although Teller figures in the list of attendants as a speaker, together with 20 other speakers whose papers make up the volume, there is no paper by Teller.

To sum up, the reviewer is somewhat doubtful about the value of publishing these proceedings. The papers contain many interesting data, but most of these have been published in scientific journals, and the remaining probably will be published later. The most important feature of a symposium is the opportunity for discussion, but with a few exceptions the standard of the discussions, as presented in the volume, was not high. The real significance of the research of the Biomedical Division of the Lawrence Radiation Laboratory does not come through. Those who are interested will have to wade through the numerous reports published by Tamplin, Ng, and their colleagues, reference to which is made in the proceedings.

In his introduction to the symposium, John R. Totter, director of the Division of Biology and Medicine of the Atomic Energy Commission, defines the objective of biomedical research in relation to atomic energy as follows:

> The ultimate objectives can be stated in a few words, namely: to learn how to live with radiation and radioactivity inexpensively and surely and with a minimum of hazard or disturbance to people anywhere.

He then goes on to say:

> The accomplishments to date . . . can also be stated relatively simply: we have learned to live with radiation and radioactivity but not cheaply, not yet surely enough, and with what appears to be altogether too much disturbance to quite a number of people.

Too true. The revelations from the Biomedical Division at Livermore have caused a disturbance which will take a long time to subside.

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