

Hiroshima Revisited

Governments seek agreements to control the atom, but historians still disagree on its first military use.

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It is a satisfaction to read the documented account of events in which one has participated, as told by an able historian who has access to papers that have long been hidden; but the distorted coloring that can be brought into such a story by a historian with a biased approach constitutes a warning of the caution with which even such an authenticated history must be read. In the two books before us, both of these aspects of written "history" are exemplified.

In *Japan Subdued* (Princeton University Press, Princeton, N.J., 1961. 206 pp. \$4) Herbert Feis presents a serious study of the timing and an explanation of both the Allied demand for unconditional surrender and the decision to use the atomic bomb to compel that surrender more promptly. The author has made free and careful use of the collection of papers concerned with the Potsdam Conference, which were assembled by the State Department, and of various personal records not available to earlier students who reviewed the facts or the significance of these events. He has not hesitated to include his own judgments of the procedures followed, judgments that I consider well balanced.

Three methods are considered by which the war in the Pacific area might conceivably have been won: These were: (i) by combined assault by American, British, and Russian forces; (ii) by inducing the Japanese to accept an honorable surrender on liberal terms before they were compelled abjectly to do so; (iii) by using the atomic bomb to shock the Japanese into recognizing the inevitability of their disastrous defeat, and thus causing them to surrender before an expeditionary force invaded their home islands.

The evidence indicates that either of the latter two methods in the hands of the United States alone would have been

adequate eventually to bring about surrender. But by using them in combination and with the cooperation of our British and Russian allies, the date of surrender was substantially advanced. In fact, Feis believes that both Russia's entry into the war and the cooperation of Britain and Canada in the preparation of the bomb were of marked help in advancing the timetable of peace negotiations.

Critical Factors

The author quotes, with evident approval, Robert Oppenheimer's testimony that the critical factors which determined the American decision to use the atomic bomb in Japan were "the belief that this would effect the saving of many lives of Americans and of Japanese and that the postwar world might thus be stabilized." This he supports by quotations from the memoirs of both Stimson and Churchill. Feis finds that the documents confirm Truman's contention that up to the last the American effort was directed toward bringing the Russians quickly into the war against Japan, with the hope of further shortening the war and thus saving many lives on both sides. He finds no evidence to support the view that the United States was trying to forestall the Russian entry into the Pacific War by prompt use of the bomb, but he notes that Russia commenced operations in Manchuria some weeks earlier than she had indicated she would, apparently motivated by the atomic bomb attack to achieve some military success before the Japanese could negotiate a surrender. He does not believe that Stalin was much surprised by Truman's word of American readiness with a new type of bomb, but

he believes that our postwar relations with Russia might have been eased if Truman and Churchill had told Stalin candidly about the successful test explosion in New Mexico and of our intention to use the bomb on the Japanese early in August.

Without the use of the bomb, the Combined Chiefs were prepared to continue the war for more than another year. With the bomb available and with Britain and Russia fighting on the side of the United States, the author says that seldom has so crushing and relentless a combination of forces been arrayed against an enemy. Yet he notes "seldom has so large a residue of toleration remained."

Feis notes that the American government was fully aware of the tentative peace feelers the Japanese were extending to Russia during the spring and summer of 1945. To me this is a matter of some interest, because the scientists who were asked to advise the Interim Committee on various aspects of the use of the bomb were, as far as I know, given no inkling that such negotiations were being considered. It is clear, however, that our government was correct in its judgment that Japan was still far from ready to enter into any fruitful peace discussions and that these overtures were rather a step toward getting from Russia some preferred terms of settlement.

It is noteworthy that the tragic obstacles which have prevented an agreement on the international control of atomic weapons were clearly foreseen by Stimson as early as the spring of 1945, and that at the same time Bush, Conant, and the scientists at Chicago predicted the American advantage in nuclear armament would not last long.

Perhaps the most that can be said for this remarkable adventure of faith in the power of science to give the world a new start is that by demonstrating the effectiveness of its atomic bomb the United States made it possible to avoid any disastrous world conflict for the half generation world political observers have considered the most dangerous of our century. Feis' account of these events gives an impressive indication of the large amount of mutual consideration that underlies even the most drastic actions of modern governments.

The author, distinguished service professor of natural philosophy at Washington University, St. Louis, Mo., directed the work that resulted in the first atomic chain reaction.

Verbal Jockeying

Erwin Hiebert, an American with a Canadian background, is professionally interested in the history of science, but his book, **The Impact of Atomic Energy** (Faith and Life Press, Newton, Kans., 1961. 312 pp. \$4) is primarily concerned with group reactions of governments, scientists, and religious bodies toward the development of nuclear weapons and the peaceful uses of nuclear energy. In his opening discussion Hiebert reviews the growth of knowledge of nuclear science during the early 20th century. In this summary he wisely attempts to correct the impression that this development was primarily an American achievement but shows that, in fact, it was rather an achievement of scientists throughout the world. In doing so, however, he frequently leans over backwards, slighting important contributions made by Americans. Thus he notes the observation by Joliot-Curie and his Parisian colleagues of the multiple emission of neutrons by uranium as a part of the fission process, but he neglects to note that the same phenomenon had been discovered earlier by Szilard and Zinn and that it became the spark that started the intensified American program leading to the first nuclear chain reaction. He fails to mention the American discovery of the delay in the emission of some of the neutrons, which made it possible safely to control the nuclear chain reaction, and he omits any description of the painstaking British-American studies of the energy dependence of the capture and collision of neutrons with various atomic nuclei. This study revealed the usefulness of graphite as a moderator for the nuclear reactor and also showed that an explosive nuclear bomb of limited size could probably be successfully constructed. Hiebert even fails to mention the discovery, by Seaborg and his California team, of the artificial element plutonium and its fission properties, which provided the reason for undertaking the whole reactor development. The author is correct in saying that in truth there was no nuclear arms race in the early 1940's between the Allies and Germany, though he fails to note that it was the American knowledge that the Germans were working intensively on problems of nuclear fission which spurred our scientists to make a supreme effort. He gives more weight than would most American scientists to

Junck's claim that the German scientists were deliberately stalling Hitler's program of atomic research and notes rather the view that "the American scientists, overcome by a desire to accomplish a brilliant technical achievement, were persuaded into signing a pact with the devil."

The author's lack of balance in discussing the military aspects of atomic energy appears most sharply when he comments on the "deliberate, premeditated destruction" involved in the use of the bomb on Hiroshima. He seems oblivious to the fact that such destruction is an essential part of all war, even of defensive war. In discussing the reasoning that supported such use of the bomb, he fails to note what Feis selects as "the critical factors that determined the bomb's use": (i) that the power of Japan's military clique to make their nation again a military menace to the world must be destroyed and (ii) that the war be brought to a successful conclusion with a minimum loss of American and Japanese lives. This blindness appears again when he describes very sympathetically the efforts of the scientists at Chicago and Los Alamos to prevent the unannounced bomb attack on Japan. The writers of this appeal (Rabinovitch and Szilard) were greatly concerned about the unfavorable international sentiment such use of the bomb would stimulate and about the resulting difficulties that would develop in obtaining any effective international control over atomic weapons, but only passing allusion is made in their appeal to the hope of the military leaders that American lives might thus be saved. This matter of saving lives was of paramount importance to the Secretary of War, Stimson, and to his military staff, and it was prominent in the minds of the Scientific Panel (of nuclear scientists) as they drew up their recommendation to Stimson's civilian "Interim Committee" approving use of the bomb. This consideration of soldiers' lives is hardly mentioned in Hiebert's summary. Feis' history is in this regard a much better treatment.

Religious Groups

Hiebert is at his best when he discusses what is obviously closest to his heart, the responses of religious groups to the problems posed by nuclear energy. As representing the Catholic re-

sponse, he quotes liberally from Thomas E. Murray, Catholic layman and former member of the Atomic Energy Commission. To Murray "the modern concept of 'total victory' meaning total enemy ruin or unconditional surrender has become the chief cause of war's immorality"; and this, he remarks, is a regression to a type of barbarism. The author comments that many Catholics do not support Murray's definition of a "just war." They have said that if the society we aim at cannot be brought about by large-scale violence, then discriminate small-scale violence will not help either. Both produce an atmosphere of conflict and disruption in which any attempt forcibly to impose ideas on large groups of people in the world is bound ultimately to fail. The author notes further that in 1945 the Vatican vigorously opposed the obliteration bombing of Hiroshima and Nagasaki on the ground that it provided no immunity for civilian populations. In the Encyclical of 6 December 1950, "Atomic Weapons," the Pope expressed the need for renewal of conscience, repression of passions, calming of hatreds, putting into practice the norms of justice, more equitable distribution of wealth, and reciprocal charity.

Especially noteworthy is Hiebert's quotation from a statement by the National Council of Churches in 1957, as adopted at a General Assembly in St. Louis: "Even when arming our nation, we believe, must persistently seek workable agreements for universal inspected, controlled, reduction and regulation of all armaments, including nuclear weapons. We believe that the accelerating arms race which now grips our world may lead directly to a war which will destroy civilization, and that efforts must be redoubled to realize the final goal of world-wide disarmament in the framework of the U.N." There was a further pronouncement by the General Board of the N.C.C., "The Churches and the Use of Nuclear Energy for Peaceful Responses," published in 1960: "We therefore deem it our Christian responsibility, as faithful stewards, to work for an orderly development of nuclear energy for peaceful purposes for the benefit of all mankind." The report goes on to commend the safety record that has been achieved, but to warn that strong efforts must be made to prepare reasonable safeguards against accidents and to take all protective and curative measures against in-

jury. The Council recommends wide dissemination of knowledge about the safety record, the dangers, and the safeguards involved.

Other quotations are made from the extreme fundamentalist American Council of Christian Churches, from the Union of American Hebrew Congregations, and from such pacifist groups as the American Friends Service Committee, the Brethren Service Committee, and the Mennonite Central Committee. These may be summarized by quoting a statement of the Executive Council of the Friends Committee on National Legislation. "The only realistic defense efforts are those which prevent a nuclear attack by abolishing war itself . . . we in the United States should use our time, energies and resources to prevent the bombs from falling and to build the conditions of lasting peace. This is our only real defense."

It is probably only an oversight that the author does not refer, as does Feis, to the fact that in its use of atomic weapons against Japan the American military forces showed no trace of revengeful passion and were eager to avoid the hand-to-hand fighting of invasion warfare, which would incite such passions.

If the reader discounts the antimilitary prejudice and the apparently anti-American bias of the author, he can find in Hiebert's account of the religious issues involved some illuminating discussion of the current politico-religious-military tangle of the world's affairs.

Hit and Target Theories

Studies on Quantitative Radiation Biology. K. G. Zimmer. Translated by H. D. Griffith. Oliver and Boyd, London, 1961. 124 pp. Illus. 15s.

Studies on Quantitative Radiation Biology is a translation by H. D. Griffith from the German version of a publication which appeared in the proceedings of the Mainz Academy of Science and Literature under the title "Studien zur quantitativen Strahlenbiologie" in August 1960. It is a very condensed discussion of a problem that has puzzled many radiation biologists, that is, the physical basis of the effects of radiation on living organisms. This short book is divided into six chapters.

The first three chapters (Short historical review, Generalized formal hit "theory," and Target "theory") that emphasize the basic physical approaches to radiobiology should be most useful for radiation biologists. These chapters which also bring out the limitations of the physical approaches and their possible pitfalls should be required reading for anyone who wants to conduct quantitative studies in radiobiology.

The "hit" and "target" theories were first brought into prominence in the late 20's and early 30's when the application of quantum theory to physics caused many investigators to apply something equivalent to quantum theory to the study of the effects of ionizing radiation on biological materials. The hit theory was first developed by Dessauer, and later the mathematical background was formulated by Blau and Altenburger. Still later Crowther and others, especially Holweck and Lacassagne, gave it further support. The important development of this concept really has come through the publications of three investigators: Timofeeff-Ressovsky; Zimmer, the author of the present volume; and Delbrück.

It is rather interesting to reflect on the background of the three investigators. Timofeeff-Ressovsky is one of the world's most prominent geneticists. After his return to Soviet Russia from Berlin at the end of World War II, however, he began to investigate the effects of radioisotopes on biological systems. Delbrück has gone on and made his mark in the phage field, as well as in this field, and in many other fields of quantitative biology not necessarily connected with radiation. Zimmer is the only one of the three men who has continued to work in this field, and he is now one of the important investigators in radiation biology.

It is unfortunate that the "hit" and "target" theories have been so much neglected in the last few years. Both are very useful and helpful for interpreting radiation effects, especially if the investigator is interested in the quantitative aspects of the interaction of radiation and biological systems. They have not, however, always proved to be the most useful, especially with the entrance of biochemical approaches to modern radiation biology.

It is just this emphasis on the physical rather than the chemical approach

that makes the fourth chapter, "Theories of action through diffusible agents," less convincing and less thorough than the first three chapters.

Finally, in the chapter "Recent developments," the author discusses electron spin resonance. I agree that electron spin resonance is a most promising approach and that the study of free radicals may some day give us a picture of what is happening when radiation is absorbed by a living substance. It is surprising, however, that so little attention is paid in this chapter to the quantitative aspects that are emphasized so well in the first three chapters.

In this volume there is very little mention of the biochemical aspects of radiation effects, especially the modern development of the chemistry of nucleic acids, the chemistry of protein synthesis, and the transfer of information from nucleic acids to proteins. All these new developments have become very important in biochemistry and also promise to become a possible key to the study of the mechanism of radiation effects. The investigator who goes into radiation biology must be conscious of the importance of the physical interpretation of radiation effects, which is so well emphasized in the first three chapters, but he also has to remember that, in the study of the basic mechanism of radiation effects, he must not ignore biochemical changes in metabolism, in synthesis of compounds, and in the sources of energy for the living cell which come about in the chain of events following the original absorption of the radiation. Only by an interplay of every possible approach is there any promise that we will some day understand the mechanism of radiation effects. As a matter of fact, radiation studies are so deeply bound up with the study of the syntheses of living cells, including their genetical makeup, that radiation studies will always lag slightly behind the basic biological, biochemical, and biophysical studies; but they have often shown also that they can open a new field and lead to an understanding of the function of living organisms.

I would recommend this book most highly to anyone who is interested in radiobiology and the quantitative aspects of the effects of physical energy on the function of living cells.

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