

Scientists in National and World Affairs

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Scientists gave men capacity for nuclear fission and, a bit later, for nuclear fusion. Their purpose was to manufacture atomic bombs. At once realizing that thereby they had put into human hands capacity to destroy current civilization and perhaps the human race itself, many sought ways and means to control their discovery. They engaged in a series of political efforts which are chronicled in the papers offered in a fascinating collection—*The Atomic Age* (Basic Books, New York, 1963. 634 pp. \$10), edited by Morton Grodzins and Eugene Rabinowitch. The papers are reprinted from the *Bulletin of the Atomic Scientists*.

Eugene Rabinowitch founded the *Bulletin of Atomic Scientists*, to whose editorial board was presently added Morton Grodzins. In its pages, the elite of the physical scientists proposed and urged solutions which reflected their passionate hope that the atomic djinn they had released could somehow be controlled, if not reconfined in its bottle.

The chronology is worth reviewing. On 2 August 1939, with the help of Leo Szilard, Albert Einstein wrote a now famous letter to President Roosevelt. In that letter (the letter is the first document reproduced in *The Atomic Age*) Einstein suggested a speed-up in experimental work looking toward the development of nuclear chain reactions from uranium: "This new phenomenon would also lead to the construction of bombs, and it is conceivable—though much less certain—that extremely powerful bombs of a new type may thus be constructed" (p. 11). Thereafter President Roosevelt brought into existence the Manhattan Project. In February 1945, while the Yalta Conference was in progress, the resulting bomb was successfully detonated. While the U.S. War Department was still considering what use

should be made of the new bomb, a number of the scientists engaged in its development proposed to Secretary of War Stimson, first, that the bomb not be used against Japan (Germany by this time had surrendered) but that a demonstration be made before representatives of the United Nations on a desert or a barren island; further, they urged that international agreement be sought preventing nuclear armament, enforced by actual and efficient control. Leo Szilard drafted a petition to the President (by now, President Harry Truman) asking that the United States not resort to the use of the atomic bomb, unless "the terms which will be imposed on Japan have been made public in detail and Japan, knowing these terms, has refused to surrender" (p. 29).

President Truman appointed a committee to consider the matter—as high-minded a committee perhaps as the United States has ever seen. It was chaired by Secretary of War Henry L. Stimson, and assisted by a scientific panel composed of A. H. Compton, Enrico Fermi, E. O. Lawrence, and J. R. Oppenheimer. The committee concluded that there was no acceptable alternative to direct military use. Stimson recommended, and President Truman accepted, the plan of a formal warning coupled with an ultimatum demanding unconditional surrender. The Japanese government rejected the ultimatum. On 6 August 1945 Hiroshima was bombed; Nagasaki followed on 9 August. Immediately after, Japan surrendered.

"... I have tried to give an accurate account of my own personal observations of the circumstances which led up to the use of the atomic bomb," writes Secretary Stimson, "... and the reasons which underlay our use of it. To me they have always seemed compelling and clear, and I can not see how any person invested with such responsibilities as mine could have taken any other course, or given any other advice to his chiefs" (p. 43).

The first attempt of the atomic scientists to restrain the use of the bomb thus failed.

I have the profoundest respect for Secretary Stimson and for President Truman. Yet I cannot overcome a feeling that, had President Roosevelt been alive, he would have chosen the demonstration route proposed by the scientists and would have attained the desired effect. That, of course, is immaterial. The scientist in his laboratory was invisible. He was unable to make his views effective in the first political decision called for by the now liberated djinn.

The Second Phase

The next chapter opened at once. Scientists organized a campaign to achieve international control of atomic energy. *The Atomic Age* is only a partial record of their attempts: "Let us create an international organization responsible for developing atomic energy, getting what good there is out of it, and at the same time for protecting the world from destructive use of it" (p. 57). So wrote J. Robert Oppenheimer who had been working with a board of consultants to the State Department. Oppenheimer dreamed of an entirely new kind of international outlet, an atomic development society whose law should be superior to the law of the land of the countries that might compose it. The proposal failed. A fellow scientist, Edward A. Shils, believed it was partly failure of American international tactics, partly uncertainty on the part of the Soviet Union, and partly mistaken policy on the part of the United States in its "prosecution of the Cold War" (p. 91) (as though the United States had much option in the matter). Summing up, Eugene Rabinowitch chiefly blamed American policy, which he considered too cold, realistic, and logical, and insufficient understanding of the Soviet Union: "Our best chance to succeed in our ultimate aims is to remain faithful to the imaginative, positive policies, such as our atomic energy control plan, and not to learn what is mistakenly called 'realism' in world politics" (p. 97).

In any event, international control of the atomic bomb was now out of the question and other formulae had to be sought.

Failure to reduce atomic weapons to international control led to—more ac-

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curately, was accompanied by—a series of efforts along other lines. Einstein proposed a world government. Four Soviet scientists courteously but promptly attacked this as a mere device for world domination by capitalist monopoly. Other scientists accurately pointed out the probability that the Soviet Union would presently acquire nuclear bombs of which the United States held a monopoly until 1949. Intensification of the problem was obvious as the United States and the Soviet Union determined to proceed with the development of hydrogen bombs. The issues raised presented themselves in moral terms. Hans Bethe proposed a unilateral pledge by the United States never to be the first to use the hydrogen bomb. (The atomic bomb now took second rank in the schedule of danger.) Others, Eugene Rabinowitch included, considered the United States foreign policy at fault in not stopping the development of the power contest with the Soviet Union right at the beginning—although neither Rabinowitch nor anyone else (lacking influence over Stalin's policies) could effectively suggest how this could have been done.

Bertrand Russell plunked for unilateral disarmament on the Western side, later coining the phrase "Better red than dead," ignoring the fact that for great numbers of people this limited alternative did not exist—they would be dead. By the mid-50's, the arms race was on in force. Scientists could only warn of the peril, sometimes going beyond the limits of demonstrable probability in doing so. Harrison Brown suggested the possibility that most countries would find themselves in possession of hydrogen bombs by 1963. Oppenheimer and Szilard suggested the complete overhaul of United States foreign policy, making some statements that in retrospect seem odd. ("Obsessed with our power struggle against the Soviet Union, and remembering that some of us have mistaken Chinese doctrinaire Communism for agrarian reform, we now insist on treating Cuban agrarian reformers as Communists.") As it became increasingly clear that atomic bombs could be exploded from long rockets, Szilard (1960) forsook the scientific sphere altogether and considered the gamesmanship of foreign affairs, the historical reasons for the two World Wars of our country, and the possibility of working out a *de facto* coexistence scheme between the United States and the Soviet Un-

ion. Under that cover, Szilard proposed a growing pattern of personal contact between Americans and Soviet citizens, an attempt to create a "world community of nations, in which the nations would be more interested in continued cooperation than in bringing about changes in the map by the threat of force" (p. 242). Others turned to the possibility of disarmament treaties and pacts for arms control.

A Psychological Approach

Charles Osgood thought mutual disarmament agreements desirable but unlikely and suggested a gradual unilateral "disengagement" (p. 275), meaning thereby the United States should take a small step towards disarmament and wait to see whether the Soviet Union reciprocated. (This is, at date of writing, a positive possibility.) As Rabinowitch noted, though disarmament seemed the first order of international business to everyone, no progress was being made.

Gradually the discussion concentrated in a much narrower area—possible agreements to control atomic tests, on the theory that everyone had an interest in avoiding the unpredictable results of atomic fallout. As the event proved, this was the one area—or, more optimistically, one of the very few areas—through which world practice, if not law, appeared possible. (In 1956, I myself in *Tides of Crisis* forecast such an agreement.) A treaty was reached between the United States and the Soviet Union in 1963. It was the first, and to date the only, tangible achievement in this field.

Scientists meanwhile were fighting a defensive action of their own. It had been, indeed is now, a settled conviction among scientists that there should be communications between them and their Soviet colleagues; indeed, that there should be discussions between Americans and Russians quite irrespective of the relations between their respective governments. Men of McCarthyite mentality considered this dangerous to American security, if not positively disloyal. The famous (and to me, inexcusable) loyalty trial of J. Robert Oppenheimer provided the *cause célèbre*, but plenty of minor harassment and persecution and bureaucratic stupidities were perpetuated. Some of the cases are discussed, brilliantly, in *The Atomic Age*. Every-

thing said about this ghastly witch-hunt is devastating and justified. Yet in the interest of historical accuracy, it must be noted that there were a few witches, that is, spies, and that among them in Great Britain and Canada, there were scientists. Temptation to discuss that phase is great, but it is secondary to the problem we have in hand.

Despite this, contact between American and Russian scientists was established. The so-called "Pugwash conferences" were organized and still continue. As Rabinowitch notes, political action on the grand scale attempted by scientists failed. But they did produce a spark of continuing discussion from which much may be expected.

New Prospective

And the scientist had learned something about himself. As a technician, he succeeded; as a politician, he failed. As an intellectual working outside his field of expertise, and with little more enlightenment than the rest of us, he had helped, stone by stone, to build approaches toward the next still unforeseeable phase. Paul Weiss, in a closing comment, sums it up: "It is a sobering experience for the scientist thus to acknowledge the finite boundaries of his reach. It takes humility and courage to live with partial answers, and it disturbs complacency. . . . With the exuberance of youth, science has often maintained not only that it is a cure-all for mankind's ills, but that it can prescribe ultimate goals to guide man's conduct. A mature science cannot condone such juvenile extremism . . . if it is to thrive and serve humanity, it must range itself among them as a partner, and not set itself on top as a ruler" (pp. 587–88).

Scientists in this and other fields have thus descended from their Olympian laboratories, seeking to use political forces. From them they hope to develop means of controlling the fantastic power, atomic and otherwise, they have made available to man. Purity of their motives is beyond question. Accuracy of their scientific forecasts has proved extremely high. Scientists now enjoy prestige surpassed only by that of the Church in its greatest days. Yet, politically, they failed, not only failed but found themselves regarded with an odd mixture of suspicion added to respect.

Why?

I suggest they had moved from a field in which their knowledge was as nearly complete as can be into a field about which most human beings know rather more than most scientists. Politics deals with the organization of power. The human race has had a long experience with power, and without understanding it, is nevertheless acutely aware of certain phenomena. Of these, the solutions proposed by scientists took little, if any, account. Let us consider a few.

World government, or a world under law which restrained atomic weapons, at least, was instinctively sought by scientists as their first solution. Now government of any kind, let alone government on a world scale, is perhaps the most amazing and the most mystifying achievement of men. To a historically trained mind, it is a major miracle that government was achieved and is maintained in any substantial area of the earth's surface. Successful government is not a thing in itself. Like white light, it is a mixture of many forces reaching a point of balance. Each component force is itself complex. One thinks, let us say, of France. The disparate races, traditions, customs, languages, and tribal mores, from which after centuries of bloody struggle France, as we know it today, emerged three centuries ago, presents a picture of unlimited complexity. Compound that aggregate of complexities in geometric progression as other nations in all stages of development are added to compose a world government, and the problem of nuclear fission or fusion becomes simple by comparison.

Realities of World Government

As a single element, take the elementary fact that in the scientist's view, world government is essential to development and control of the further use of atomic weapons. This means that some man or group of men, located somewhere beyond the control of nation states, must have that power. The group will be composed of men. Of necessity they will have the strengths, frailties, idealisms, heroisms and ambitions, the possessiveness, and the fears, generated by vast power. These men might have the duty of safeguarding the human race. They also would control the power to destroy it. The electorate of the United States, the peoples of other countries, the ef-

fective political forces in all countries, were expected to turn over their destinies, their safety, the lives of their children, and their race to this blueprint. Is it really remarkable that every government in the world hesitated? Scientists, of course, could have no answer to these dangers. Their own faith in their own governments when they themselves were affected—for example, in the case of regulations governing their loyalties and security—was anything but high. As the essays collected in *The Atomic Age* demonstrate, men who, rightly, were dubious about committees of Congress, with power of subpoena, and about bureaucracy in the State Department, with power to give or withhold visas, were nevertheless prepared to assume that some species of international government or control could safely be entrusted with power of life and death over peoples.

I happen to believe that the old dream of world government will gradually become reality. It will be the task of decades or centuries. Scientists were right in thrusting it forward. All of us are right in working for it. Yet few political scientists or historians, familiar with development of institutions, make the mistake of believing that world government in whole or in part could have evolved in short enough time to control the peril which the scientists with ample reason feared.

As world government or in more limited form supranational control over atomic weapons faded, scientists turned toward obtaining agreement between the United States and the Soviet Union. In the Pugwash conferences, they are indeed working toward that end now. There, they were on sounder ground. Agreement between the Soviet Union and the United States is a consummation devoutly to be desired. Unhappily, if nothing more than that were involved, the thing might even have been done. But the Soviet Union and the United States are not the only, indeed not even the largest, blocs of humanity involved. When (as was the case until late in the 1950's) power is polarized around two great countries, all countries and peoples lying between are in massive danger. Agreement between the two major powers cannot be reached without tacit if not open understandings about the fate of the peripheral and interstitial nations. Scientists decided, on no substantial evidence, that the Soviet Union had ceased to be

"expansionist." Their undertone of condemnation of the American policy of "containment" ignored without mention the fact that many, many millions of people were protected in their existing national, social organizations by that policy. To be blunt, they were protected by it from invasion by foreign armies.

Annihilation by Politics

Now the fact happens to be that international politics is capable of killing, maiming, and injuring very nearly as many individuals in a relatively short space of time as atomic bombs themselves. (One thinks of five million Ukrainians starved out in a few months by a conscious policy of Stalin and of at least twice as many more condemned to a hideous life in Russian concentration camps.) The Cuban "agrarian reformers" mentioned by Szilard have a modest score: the dead are perhaps only 40,000 or 50,000, but there are already a half-million exiles from that small country. No doubt it is very shortsighted or naughty of Poles or Hungarians, of Germans, Cubans, or Venezuelans, of Gaullist France or West Germany, faced with that danger, to be positively uncooperative. Yet, just possibly, their point of view needs consideration. Perhaps they ought (as Neville Chamberlain urged on Czechoslovakia in 1938) to accept with resignation the fact that they or some of them should be offered as sacrifice on the altar. This is what Bertrand Russell, perhaps unintentionally, was inviting many to do when, with atomic "logic," he urged "Better red than dead." Such a proposal meant that massacres of class war were preferable to the danger of atomic war. The millions who were likely to die, as they did in the Soviet Union, in China, and in the Iron Curtain countries, could hardly be expected to see that as a solution for them.

More in practical vein was the proposal of contact and exchange of views. I happen to believe in the policy of "dialogue" between the holders of atomic weapons. On the whole, I have more faith in it when it is primarily conducted between private citizens of the respective countries rather than between diplomats. But as the Pugwash and like conferences go forward, as the world learns more about the implications of atomic science, atomic scientists will learn more of the compli-

cations of the world situation, and the concerns of some millions of human beings who can be as well and truly killed by bad policy as by hydrogen bombs. Knowledge of the devastation potential of a hydrogen bomb does not automatically bring with it realization of the devastation potential of a totalitarian government on the march.

Aspects of Power

A third note may be apposite. The scientists, rightly, could think of no solution save that of reorganization of power in one form or another. None can quarrel with this; no one else has thought of any other. But it so happens that power is itself a mystery whose exploration has scarcely even been intellectually organized. Historical data indicate its external effect—what it has done to peoples in the past—and historians are still considering whether this experience affords any basis for prediction about the future. The internal effect of power—what it does to the power-holder—is still a matter of conjecture. (In our generation, the world has seen several power-holders whose power-burden seems to have reduced them to a condition of psychotic unbalance, if not to positive madness.) No scientific data yet exists with respect to optimum location of power, the most practical method of assuring that power located, accepted, and organized for beneficial purposes will long continue to be used for that purpose.

Political scientists, while they do not pretend to know the answer, do know the difficulties. Physical scientists entering politics were, of course, out of the field of their precise competence. Their views were entitled to be considered on their merits, that is, were entitled to respectful hearing, examination, and appraisal exactly as are the views of any competent citizen. It is perhaps unfair to say that in some respects these views appeared naive. It is not inaccurate to say that some of them appeared uninformed. Scientists, not unnaturally, were as unaware of the implications of some of their proposed political solutions as most laymen are unaware of the scientific implications involved in their own simplistic impressions. Everything considered, it is a tribute to the recognized character of the scientists involved, to their growing capacity to apprehend

problems, and to the thinking of the informed public that their proposals got the hearings they got and made the limited progress they eventually did make.

The Future

The possibility can not be excluded that, at some future time, scientific means may be found by which atomic destruction may be prevented or aborted to the extent that peril will be reduced to acceptable proportions. Absent that fact, scientists, like the rest of us, must deal with the problems by other means, of which national and international political organization offers some possibilities. There may be other means as well. Max Born's concluding essay indicates that he too has been thinking about this. After all, destruction of the human race had been possible by chemical, biological means for two or three decades before the explosion at Alamogordo. Isidor Rabi has pointed out that killing men is so childishly simple that anyone can play that game.

It was honorable of scientists to enter the political arena. They are entitled to all support as they carry on. We really are waiting for the next generation of scientists to balance fantastic discoveries of the past two decades with discoveries (perhaps no less fantastic) capable of balancing them to a point where they are no longer to be feared. Meanwhile all of us have to seek institutions of politics, national and international, buying time for nature and knowledge to provide for her apparently inevitable balances. In that process, as Paul Weiss observes, scientists have no privileged position, no specialized knowledge, no right to expect that they alone in politics will be immune from opposition and attack. No group has qualifications which entitle them to expect that the human race will place its destinies exclusively in their hands.

The Atomic Age is a noble record of a series of noble and not unfruitful attempts. As in all such attempts, some proposals are possible, some are not; some are intelligent, some hysterical; some are absurd. As the record draws itself out, it is plain that, while the scientists have been educating the political public, the political public has been, in its turn, educating the scientists as well.

The Atomic Realm

Electron Scattering and Nuclear and Nucleon Structure. A collection of reprints with an introduction. Robert Hofstadter. Benjamin, New York, 1963. xiv + 690 pp. Illus. Paper, \$6.95; cloth, \$10.

I am told that quite often the blind, deprived of that most ubiquitous of the five senses, develop the remaining four—and especially the sense of touch—to such an extent as to accomplish astonishing things. They literally feel their way back into a detailed experience of the world. But for that vast fraction of the world which lies in the atomic realm, all mankind is blind. So, man has developed his sense of touch, supplementing his fingers of flesh and bone with fingers made of streams of waves—electromagnetic waves and de Broglie waves; and man has felt his way down and down into those secret regions where nature begins.

Rutherford led the way by making fingers of alpha particles, and found the atomic nucleus lying hidden in its vast cloud of electrons. Swiftly, men made other fingers of protons and deuterons and gamma rays—and felt the shape of the nucleus and sensed its lumpy insides. Someone, stricken with vocabularian paralysis, named this marvelous process with the colorless and mechanistic term *particle scattering*. Thus, one of modern man's most thrilling experiences in exploring his world is labeled with a name that repels, a negative kind of name, a divergent thing, a truism that conceals the deeper truth.

Robert Hofstadter and the Benjamin Press have struck a telling blow at this situation with their volume of reprints. Part of the title, *Electron Scattering*, is stated in smaller lettering on the title page and is eliminated completely from the cover. The *structure* of the nucleus and of the nucleon is thus emphasized. This emphasis is carried on through the volume in the author's selection of original papers from the literature. It begins with Dirac's paper of 1928 which gives a relativistic quantum electron theory and thus provides the guide with which newer and incredibly more sensitive fingers were soon to be constructed. Mechanical instructions given by Mott in the following year are contained in the second paper, and are sharpened by Guth