

International Cooperation in Science

By I. I. Rabi

The success of the Geneva Conference on the Peaceful Uses of Atomic Energy was in large part a result of the untiring efforts of the author, who led the way in its early planning. His account of the Conference was presented at the 25th Anniversary Banquet of the American Institute of Physics in New York City on February 1, 1956. Dr. Rabi is professor of physics at Columbia University.



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(United Nations photo)

SCIENCE, since it is an objective inquiry (rather, at least, as objective as human beings can be) into the nature of the universe, and of man and his place in the universe, is therefore universal in its appeal. I do not mean that everybody loves to study science. Unfortunately, this is very far from the case, but in every land irrespective of color, creed, and tradition there are people with the capacity and interest to join in this inquiry. Perhaps adventure would be a better word for it. The appeal of science lies very deep in men, because it expresses fundamentally the desire to explore, to understand, to know how things hang together, to get behind the superficial evidence of the senses, and, not least, to utilize this knowledge for human purpose.

Since the appeal is so universal, science, from its beginnings, transcended the limitations of the particular environment in which its devotees existed. Scientists from different countries communicated most freely, and engaged in joint efforts for the benefit of science as a whole. It was as a shining example for all to see of the power of the human spirit and of the brotherhood of man in science.

In recent years this natural flow back and forth across national and cultural boundaries has been interrupted by considerations of political and military expediency. From this science has suffered very greatly. Scientists all over the world have longed for a return to the traditional and natural communication which was so important to maintain the scientific spirit as a living force in the world and as a bond between men and between

nations. It is in this context that I wish to talk to you today about the Geneva Conference on the Peaceful Uses of Atomic Energy.

BEFORE I turn to this subject specifically I wish to recall to you two incidents in history which most clearly illustrate the respect which the scientific endeavor enjoyed in the minds of men in high authority.

The first is from our own history:

On March 10, 1779, Benjamin Franklin addressed a document which reads in part "To all Captains and Commanders of armed Ships acting by Commission from the Congress of the United States of America, now in war with Great Britain,

"Gentlemen, A Ship having been fitted out from England before the Commencement of this War, to make Discoveries . . . in Unknown Seas, under the Conduct of that most celebrated Navigator and Discoverer, Captain Cook; an Undertaking truly laudable in itself, as the Increase of Geographical Knowledge facilitates the Communication between distant Nations, in the Exchange of useful Products and Manufactures, and the Extension of Arts, whereby the common Enjoyments of human Life are multiply'd and augmented, and Science of other kinds increased to the benefit of Mankind in general; this is . . . to recommend to . . . you, that . . . in case the said Ship . . . should happen to fall into your Hands, you would not consider her as an Enemy, nor suffer any Plunder to be made of the Effects contain'd in her, nor obstruct her immediate Return to England. . . ."

In recognition of Franklin's services to Captain Cook's expedition, one of the gold medals struck in honor of Captain Cook was presented to Franklin and the Admiralty Board sent him a copy of the printed account of Cook's voyage.

You may recall that Franklin in addition to being a great scientist was also a great statesman and probably the greatest diplomat the United States ever had.

The second incident occurred during the Napoleonic Wars. To appreciate this fully you must recall the horror with which England regarded Napoleon and all his works, and the bitterness with which Napoleon regarded England as his implacable enemy.

Yet, "in October 1813, Sir Humphry Davy obtained permission from Napoleon to pass through France for a tour of the Continent with Lady Davy, the latter's maid and Mr. Michael Faraday. They arrived in Paris on October 27 and on November 2 he attended a meeting of the 'First Class' of the Institute of France. On December 13, 1813, he was elected with practical unanimity a Corresponding Member of the First Class of the Institute."

Nowadays some people would say that Napoleon did not understand intelligence and that Benjamin Franklin was clearly subversive.

In this last decade since the end of the war, despite the rising realization of the importance of applied science to the national economy and to the national military posture, the position of science in the esteem of the layman in government or in the universities, and in the ordinary public mind, is lower than it has ever been in this century. Scientific knowledge and scientists are regarded as national assets to be increased and preserved for the value in increasing the military strength of the country, in multiplying its resources and the conveniences and amenities of life and generally raising the standard of living. No one quarrels with these worthy applications of knowledge.

What disturbs and frightens the scientist is the increasing tendency to treat science and the scientist as a commodity with all the appropriate export and import regulations which relate to important strategic materials. The great drive now going on to increase the number of scientists and engineers takes on the appearance of stockpiling of tungsten or copper. The aids to scientific education stem more from the fear that Russia will surpass us than from an interest in scientific knowledge and a concern for the general vigor and health of the scientific endeavor and the preservation of a strong scientific tradition. It certainly does not stem from a desire of the public to know more about science and the visible and invisible world.

The impact of scientific thought on the culture of our times becomes less and less even as science advances to greater pinnacles of understanding and discovery. As the importance of science in the country increases, its dignity seems to be diminishing. There is hardly anybody in this room who has not had the frustrating experience of trying to explain what science

is about to laymen, whether in government or in the universities, or to the ordinary, educated professional or business man. Such is the spirit of the time that it is difficult if not impossible to communicate the feeling of dedication and reverence which we physicists have for our discipline. They do not seem to understand our emotional commitment to expand and deepen our understanding of nature, nor does the quest seem to be particularly important to them except under the aspect of the conquest of nature.

This situation as I present it may seem to some to be exaggerated but few will deny that it has a large element of reality. I will not try this evening to examine the causes or suggest what we could possibly do to bring the public to understand and feel the meaning of science as it appeals to the scientist. It is an important task because we are in some danger of losing the interest of the brightest spirits of the rising generation without which the scientific tradition cannot continue to flourish.

I reluctantly leave this topic to touch on a brighter scene, the Geneva Conference on the Peaceful Uses of Atomic Energy which took place last summer.

TO my mind the most important result to be hoped for from the Geneva Conference on the Peaceful Uses of Atomic Energy is that it would mark the first significant step for a return to free and open communication between scientists and other men of learning in all parts of the globe. A return to such freedom is bound to result in a lessening of tensions in international relations, and point to ways of realizing a more hopeful future for all mankind.

I now turn to the Conference itself. It was such an unprecedented event that a little historical background is in order. The suggestion for this Conference arose out of President Eisenhower's historic address to the United Nations Assembly in which he proposed an international agency which would serve as a common international pool for nuclear materials and technical information. All member nations could contribute to and draw from this pool under suitable arrangements which are still under study in the United Nations. This proposal of President Eisenhower's received very favorable comment in the world press at that time. It was therefore natural for the United States to suggest that a scientific conference be held in which scientific information could be exchanged in an atmosphere free from political propaganda and intrigue.

I had the honor of being appointed Chairman of the Committee of one to get this project underway. The project had the strong backing of President Eisenhower, the State Department, and of Mr. Lewis L. Strauss, the Chairman of the U. S. Atomic Energy Commission. To my surprise the initial reception of this idea by scientists in this country and in Europe which I visited twice in the summer and fall of 1954 was even less than lukewarm. There was a hopeless feeling that the conference could not succeed, that it would be regarded as a propaganda stunt, that the Soviets would

not join, that the papers presented at the Conference would be of inferior quality because of atomic secrecy and that in general more harm than good would come of it.

However, by persistence and persuasion and by presenting an attractive list of topics the British, Canadians, and the French were won over to the general idea. In December 1954 the conference proposal was approved in a resolution in the General Assembly of the United Nations by a vote of 60 nations, including the Soviets, with none opposed. The task of arranging the Conference was given to the Secretary General of the UN, Mr. Hammarskjöld, and seven countries (the US, the USSR, the United Kingdom, France, India, Canada, and Brazil) were asked to send representatives to form an Advisory Committee to the Secretary General to arrange the agenda, the rules of procedure, and the details of the Conference. I had the honor of representing the United States in this unique Committee of seven scientists over which Mr. Hammarskjöld presided. It turned out that the representatives were six physicists and one chemist. The Secretary General represented the nonscientific world and carried his role most ably.

The details of the meetings of this Committee are most interesting in themselves but I won't trouble you with them.

What finally resulted was an agenda close to the original US proposals which covered twelve days of fifty-six sessions, many in parallel, and a set of rules of procedure which excluded all discussion of a political nature. The items ranged all the way from pure science in physics, chemistry, biology, and medicine, through the technology of nuclear power, the use of radioisotopes in industry, and the economics and organization of a nuclear energy economy.

As soon as it became clear that the Conference would indeed be held, and under such significant auspices, the whole mood changed. When the invitations went out to American scientists to submit papers for the US Government to present, over 1000 papers were submitted within a very short time. There was apparently a strong sentiment latent in American scientists for international cooperation which was awaiting some concrete way of expressing itself. Apathy turned to enthusiasm and the US finally presented about 500 papers to the Conference. Similar attitudes appeared in other countries in different parts of the world including those within the Soviet Orbit.

Of the 84 countries invited to participate in the Conference over 70 sent delegations. About 1400 official delegates and about an equal number of observers without the privilege of participation in the discussions attended the sessions. The Conference lasted from August 8th to August 20th. One of the unique features of this Conference was that it was a scientific conference but every member was an official delegate from his country. The Conference was entirely open to the Press and indeed it was very well reported in this country, in Europe, and indeed all over the world. The President of

the Conference was Dr. Homi Bhabha, a distinguished physicist from India and the Chairman of the Atomic Energy Commission of India. The representatives on the Advisory Committee of the other six countries were Vice Presidents.

All papers submitted to the Conference were reviewed by a UN Secretariat Committee of twenty scientists from many different countries for scientific content and freedom from political propaganda. Of over a thousand papers submitted, about four hundred were selected for actual oral presentation in brief, and for discussion. All the papers and the discussions will be published in the four languages of the UN. The English publication will run to 16 volumes.

This gives you an idea of the magnitude and scope of the Conference.

At this point I want to mention a few names of people whose contributions to the Conference were most vital. Professor Walter Whitman of MIT was the Conference Secretary General. He succeeded in converting himself for the period of the preparation of the Conference, and during the Conference itself, into an impartial United Nations official. The organization of the Conference, its mechanics, and the selection of papers fell on his shoulders and that of his staff. In spite of the short time available to set up an effort of this magnitude in a distant country, the result exceeded all reasonable expectation.

In this country Dr. George Weil, assisted by Dr. Paul McDaniel and a very effective staff, succeeded in about five months in getting the papers for the US effort for this Conference written and reviewed by competent scientists and in getting up a most interesting exhibition which did the United States a lot of credit. Dr. Robert Charpie sparked the whole bold idea of getting a working reactor built and set up in Geneva. This proved to be a most popular exhibit and about 60 000 people saw an operating reactor in the two weeks in which it was displayed. There are many others too numerous to mention. Altogether it was an effort to which we can well point with pride.

NOW I will give some impressions of the results of the Conference. The atmosphere was amazingly friendly and intimate. The papers on the whole were excellent. Even where material was presented which was not very new, the richness of the presentations gave one a new and integrated perspective of the technical situation. It was clear that other countries besides the US had excellent programs. Those countries which were not advanced in the art and science of atomic energy benefited by learning what the present situation is, and what promise atomic energy holds for them in the future. Such knowledge is of vital importance in their own national planning. We learned about the Soviet thinking in this field and of the vast scope of their atomic energy enterprise, second only to our own. We met their scientists and found them to be extremely capable and with the same problems, and what is more important, with the same attitudes toward

science as our own. For the Soviet delegates it was a tremendous experience since most of them had never been outside Russia nor met the Western scientists with whose work they were thoroughly familiar.

In the field of the utilization of atomic energy, it became clear at this Conference that atomic energy was the only hope of a long-term continuance of our industrial civilization. With the rapid growth of the utilization of electrical power most countries will be at the end of their resources by the end of this century, many of them long before this time. For example, Switzerland will have developed its hydropower resources to the end by 1975. Great Britain and Germany have to import coal even now. Some countries like India are so lacking in fuel that they cannot begin to raise their living standards to approach Western conditions without this source of energy. The United States is an exception in this and many other ways since our fuel resources are still vast although not endless. However, even in this country in regions where transportation of coal and oil are expensive, atomic energy will begin to play an important role in this generation. In countries like Brazil and other parts of the world where transportation is hardly developed, atomic energy is a vital necessity.

All in all, I have the impression that atomic energy is here to stay. It will be developed even if it is not initially economic because of the necessities of the immediate, or intermediate, range of the future. The subject has such a fascination of unplumbed possibilities that almost no country will fail to enter this field, which all feel to be in the stream of progress, regardless of expense. What the future of our industrial civilization would have been without this new energy source is hard to imagine. Certainly the underdeveloped countries would have no hope of ever enjoying a standard of living approaching that of the more favored portions of the globe. Even in the United States our progress would have ground to a halt after our expanding population had used up the cheaper sources of fuel such as coal, oil, and natural gas. Fortunately, if we survive the atom at all, power will remain plentiful for generations to come. It will not necessarily be cheap, or cheaper than at present. The important thing is that it will be available at all. We will then be able to conserve our coal for the important chemical uses for which it is almost indispensable.

The world-wide utilization of atomic energy which will certainly develop brings with it a host of problems of the most somber kind. A nuclear power installation necessarily produces material out of which atomic bombs can be made. The technology of bomb manufacture, which is now so secret, will gradually be rediscovered in many other countries. The world-wide use of nuclear energy therefore means the possibility of a world-wide possession of atomic weapons. It is my belief that the use of nuclear energy will spread so quickly, that we have only a short time to devise an international control agency, before it becomes too late. Atomic energy would then become an eternal

hazard to peace which would tend to destroy all its hopeful and beneficial features. The very fact that nuclear power means added military potential will cause most countries to develop nuclear power despite economic arguments, for the prestige and security values alone. We can all only urge our statesmen to press forward to devise ways to prevent this new hope for a better life for masses of mankind from becoming a curse involving misery and destruction.

I would like to close by going back to my original point with respect to the Geneva Conference. What did this Conference do to restore the old spirit of scientific cooperation? No scientific conference such as this Conference with its wide attendance and broad scope has ever taken place before. One has to go back to the period before the First World War to find a meeting in which scientists from what is now the region behind the Iron Curtain attended in such numbers.

I wish to read from a speech made over the Moscow Radio by Professor Vladimir Veksler, a prominent Russian scientist and the coinventor of the principle of the possibility of the synchrocyclotron. One of the largest of the machines is our own machine at Nevis. This speech was beamed to Hungary and picked up from the Hungarian. It is therefore to be considered as Soviet propaganda to Hungary. I will now read from Veksler's speech, which is at the same time an expression of an eminent scientist and Soviet propaganda to Hungary.

"The international scientific conference called in Geneva to deliberate on the peaceful uses of atomic energy was not only the first truly great international conference in the field of physics; we can certainly claim, as regards scope and significance, that it was a conference of scientists unique in history. The figures characterizing this conference of the scientists of 73 countries have been published on several occasions, and I do not wish to engage in repetition.



Walter G. Whitman, Secretary-General of the Conference (second from left), with George Weil of the USAEC and UN Secretary-General Dag Hammarskjöld. At right is Ahmed S. Bokhari, UN Undersecretary for Public Information.

Officers of the Conference (left to right): W. B. Lewis (Canada), Francis Perrin (France), I. I. Rabi (US), Homi J. Bhabha (India), D. V. Skobeltsin (USSR), John D. Cockcroft (United Kingdom), and Bernardino de Mattos (Brazil). Dr. Bhabha served as President of the Conference, the others as Vice Presidents. (Photos courtesy United Nations)

"Not only physicists, research workers, and theoreticians went to Geneva, but also biologists, scientists of chemistry and medicine, and eminent engineers and technicians. The circle of topics discussed was, therefore, very wide, yet it centered around one principal problem: How to turn the vast source of energy latent in the nucleus of the atom more quickly and more productively to the benefit of mankind. It was of paramount importance that at the great conference an atmosphere was created that was at once friendly, free from superfluous officiousness, and characterized by objectivity worthy of such a serious scientific gathering.

"The debates were not confined to sessions of the special groups. In my opinion very fruitful conversations were held in the lobbies and in private within the narrow circle of experts from various countries. At the conference sessions the debates were very active and friendly in tone, which, however, did not preclude critical observations. It is to be noted with satisfaction that the scientists of the world easily found a common language; the significance of this fact is inestimable.

"The participants of the conference paid constant and great attention to contributions by Soviet delegates. In the course of our conversations my foreign colleagues repeatedly declared how impressed they were by the new data concerning the construction in the USSR of the vast accelerator of charged particles which is nearing completion and is intended for the production of protons of 10-billion-electron-volt energy. The press on several occasions reported on the foreign scientists' great appreciation of Soviet scientific and technical achievements in the field of the peaceful application of atomic energy.

"While noting with satisfaction the recognition accorded Soviet science at the Geneva Conference, I by no means wish to claim that the contributions of scientists of other countries or their exhibitions were less significant or interesting than ours. On the contrary, many were most successful.

"The value of the conference lay precisely in that it fostered the enrichment of knowledge on both sides in theory as well as in the field of experiments and technical practice. The vast scope of the conference, the variety of its subjects, and the multitude of the contributions heard there, make it impossible to present an exhaustive survey even of its most interesting parts.

"Thus, if I speak of the subject nearest to me, the accelerators of charged particles, I want first and foremost to point to the outstanding report presented by Ernest Lawrence, the eminent US expert on high-voltage accelerators—a new trend in this field.

"Our scientists and engineers were unanimous in their praise for the report of the US scientist, Dr. Zinn, on the boiling water reactor. Although various critical ob-

servations were made with regard to its application, my Soviet colleagues have valued that report highly together with many others. Most noteworthy were the exhibitions staged by the Western countries, and the US exhibition in particular.

"To sum up, there were many most valuable and interesting things for all the experts. The material of the conference is worthy of the most thorough study. Taken as a whole, the results of the 12 days of strenuous work show that the Geneva Conference demonstrated the need for frequent contact among the scientists of all countries. The conference has given a very great incentive for mutual exchange of views and will undoubtedly promote the more rapid advance of science and technology.

"Altogether, I consider the Geneva Conference a tremendous success. It has opened up splendid perspectives toward the peaceful utilization of atomic energy. The conference stood in the center of world attention and, in my opinion, played a most important role. The wide publicity given to the work of the conference has moved world public opinion.

"It has strengthened the atmosphere of mutual understanding and good will born in every country following the Four Power Conference in Geneva. The official support and the messages addressed to the conference by the leaders of the Great Powers have laid emphasis on the possibility and necessity of wide international cooperation for the sake of peaceful aims and general prosperity."

If this speech delivered as propaganda to Hungary is representative of the impression of the Russian scientists, as I know it is of ours, I am quite satisfied with the results of this Conference in reestablishing the world-wide community and communion of scientists. Let us hope that the spirit which was generated by this Conference will have its effects in the future. It shows that men separated by political and geographic barriers nevertheless can combine in a common human endeavor, that the living tradition of science cannot be killed even by two generations of totalitarian oppression.

I now have more hope than I ever had before that the spirit of science will continue to be a bond that unites scientists of all countries. In our continued struggle for the freedom of communication between scientists and of freedom of movement of scientists from one country to another we are engaged in a noble effort, we are fighting to realize the highest aspirations of mankind and for peace and mutual understanding between men and nations. It is a good cause.

