

LEO SZILARD
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Most of you know what one bomb did to Hiroshima and, if you care to do so, you can figure out for yourselves what one bomb would do to New York or San Francisco. You may, however, be fairly certain that no one will drop just one bomb on either of these cities. Atomic bombs are cheap to produce in quantity and they will be produced in quantity if they are produced at all. To nations which have the industrial equipment, the cost of such bombs will be not more than the cost of medium size bomber planes. They may cost one or two million dollars apiece.

Thirty million people live in this country in cities of over 250,000 and that means that thirty million people may die in one single sudden attack. Another thirty million people live in metropolitan areas and will be in danger of their lives in case of war. If we leave our cities as vulnerable as they are at present, a strong army and a strong navy will not help us much in such a contingency. It is possible to make the United States much less vulnerable, but in order to do so, we would have to relocate thirty to sixty million people. We would have to house these people in new cities which would form a sprawling network across an area of about three thousand square miles. Such a relocation would be difficult to organize, but from a purely economic point of view, it would be possible to carry it out. At the cost of about twenty billion dollars per year, such a gigantic relocation could be accomplished in ten years. Moreover, on the basis of such a ten years' plan, it could be carried out without an appreciable drop in the standard of living during the transition period. With conditions in the world being what they are, some of us would be quite willing seriously to consider this kind of military defense except for the doubt in our minds

that by dispersing of our cities we might defend ourselves against the weapons of the past rather than the weapons of the future.

It is not easy for the human mind to grasp the meaning of the atomic bomb. Those of us who worked on this bomb at Chicago had no time to think about it very much until rather late in the war, when the danger that the Germans might drop such bombs on us existed no longer. In March, April, and May of 1945, we began to see more and more clearly what this bomb would mean to the world--what it would mean to the world in general and to our part of the world in particular. About that time we went to much trouble trying to convey to the government the conclusions which we had reached.

When the bomb was finally dropped at Hiroshima and the President proclaimed this event to the world, ~~he~~ summed up Hiroshima by saying that we had gambled two billion dollars and won. We knew then that we had failed to get our message across.

Since Hiroshima the scientists have made progress in the art of getting messages across to the Government and to the public. Today the men who negotiate on the control of atomic energy on behalf of the United States are fully aware of the facts which are involved. If these men should fail us now, it will not be due to lack of information, but rather to the difficulty which everyone must experience if he has to adjust his thinking to facts which are as new as the facts connected with atomic energy. If these men should fail us now, it may also be due to lack of public support or lack of public pressure exerted in the right direction. And public support or public pressure will be lacking because the people of this country have not been told the whole story and have not fully understood what they have been told. At present the people of the United States are far from understanding their

own position in the world. Those of us who were engaged in this work during the war are not free to tell you what we know, but we are free to quote to you statements which have been made by others in public. Recently John J. McCloy, now president of the world bank, spoke before the annual convention of the National Association of Life Underwriters. McCloy, formerly Assistant Secretary of War, had served as a member of the Lilienthal Committee of the State Department. This is what McCloy said. I quote: "From firsthand information given to me by the scientists whose prophecies were uncannily accurate during the course of the war, there can be little doubt that within the next ten years, to be conservative, bombs of the power equivalent of one hundred thousand to two hundred and fifty thousand tons of TNT can be made, something over ten times more powerful than the bomb dropped on Hiroshima. And if we can move to the other end of the periodic table and utilize hydrogen in the generation of energy, we would have a bomb somewhere around one thousand times as powerful as the Nagasaki bomb. I have been told by scientists who are not mere theorists but who actually planned and made the bomb which was exploded in New Mexico that, given the same intensive effort which was employed during the war toward the production of that bomb, we were within two years' time at the close of the war of producing a bomb of the hydrogen-helium type, i.e., a bomb of approximately one thousand times of the power of the present bombs."

Now bombs of the Nagasaki type act by the blast which they cause. One single bomb of this type destroys many of the buildings of a city. Bombs of this type produced in sufficient quantities could very well destroy all of the buildings of all of our major cities. But clearly if giant bombs could be made and used against us, they would not be used to destroy the buildings of our cities.

They would be dropped off the Pacific coast and be permitted to disperse radioactive materials into the air. The prevailing winds would then carry these materials clear across the continent. If such bombs were used against us, the cities would remain undamaged, but the men and women inside of the cities would not remain alive. From the vantage point of the physicist, the outlines of such a war are gradually becoming visible, and as they do so, they take on more and more the shape of a catastrophe for which there is no precedent in the history of mankind.

The traditional aim of foreign policy is to prolong the peace, that is, to lengthen the interval between two wars. But we physicists find it very difficult to get enthusiastic about such an objective. If we accepted the thought that it will be impossible to reach a state of permanent peace without first going through another world war, most of us would pray for an early rather than a late war.

The problem which faces the world today cannot be solved at the level of foreign policy. It will have to be solved one floor above the level of foreign policy. Moving on the level of foreign policy, we may hope to arrive at an agreement providing for general disarmament, and providing also for the control of atomic energy along the lines of the Barruch Plan. If this could be achieved, we would have averted the outbreak of a world war in the near future, but if we do not go further and go further very fast, we would not have done more than deferred the war (which will be all the more terrible the later it comes).

Russia and the United States have emerged from the last war as military powers far outranking all other nations. There will be no armed force under the United Nations in the foreseeable future that would be strong enough to enforce, short of war, the observance of obligations either against the United States or against Russia.

Moreover, there has arisen a rather peculiar relationship between the governments of these two countries. Since war between them is a potential possibility, these two governments consider it their duty to put their own nation in the position of winning that war, if there should be a war. The problem so formulated is obviously not capable of a solution which is satisfactory to both parties, and if the pursuit of such a non-existent solution will remain the sole purpose of the foreign policies of Russia and the United States, they will not be able to escape from the vicious circle in which they are caught at present.

A general agreement providing for disarmament and the control of atomic energy along the lines of the Barrach Plan would ease the present tension in the world. If such an agreement were in effect we could be fairly certain that secret violations would be promptly detected and would become visible for all the world to see. According to the Barruch plan all mining, refining and manufacturing of dangerous materials would be put in charge of an international agency called the Atomic Development Authority. But if this authority lives up to its obligations to promote the peace-time applications of atomic energy, 10 or 15 years from now a number of atomic power plants should be in operation all over the world, many of them on the territory of Russia.

How should these power plants be distributed between various nations? Should they be distributed according to economic needs? Or should they be distributed on the basis of military considerations? Is it possible to safeguard plants which are located on the territory of one of the major nations against seizure by the government of that nation? And if this cannot be done effectively, shall the United States exert her influence to keep at least the absolute number of these plants as low as possible while ~~that~~ *their* distribution is fixed by some sort of a quota agreement?

I believe the longer you think about the problems which would arise from such a situation, the more difficulties you will discover. As long as you have to go on the assumption that the consideration of maximum relative military strength will remain the sole or the predominant consideration, it will not be possible to resolve these difficulties. Maybe we can avoid war in the near future by agreeing to disarmament and control of atomic energy. But we will not reach a state of permanent peace unless we follow up this first step as fast as we can by creating an organized world community in which the incentives will be overwhelmingly in favor of continued cooperation rather than in favor of abrogation of existing arrangements. Only within the framework of an organized world community can this requirement be satisfied. Only if the United States takes the lead in this direction can a world community become a reality fast enough to enable us to reach safely a permanent solution of the problem of peace. But only if the problem is put squarely before the American people and if the American people understand their own position in the world can the Government of the United States exert leadership in this direction. As I see it, the American people will be faced with a crucial decision before long. This decision is not so much what amount of national sovereignty we are willing to give up. Undoubtedly more and more sovereignty will have to be given up as time goes on. But the main issue is not the issue of sovereignty. The main issue is whether we are willing to base our national policy on those higher loyalties which exist in the hearts and minds of the individuals who form the population of this country, but which do not as yet find full expression in our national policy. The main issue is whether we are willing to assume our share of responsibility for the creation of a world community and to mobilize for this purpose our material resources on an adequate scale.

What are our chances that the vicious circle in which Russia and the United States find themselves caught may be broken? And if it is broken, what are our chances of creating a world community fast enough to enable us to reach the ultimate solution of the problem of peace before we are overtaken by a catastrophe?

Most of us physicists believe that nothing short of a miracle will bring about such a peaceful solution. But a miracle was once defined by Enrico Fermi as an event which has a probability of less than ten per cent of occurring. This is just Fermi's way of saying that we tend to underestimate the likelihood of improbably events. And if there is one chance in ten of finding the right road and of moving along it fast enough to escape the approaching catastrophe, then I say let us focus our attention on this narrow margin of hope, for another choice we do not have. Obviously, the odds are heavily against us. But we may have one chance in ten of reaching safely the haven of peace. And maybe God will work a miracle if He gets a little help from all of us.

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Portland

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