The Bomb and Civilization (1945)

It is impossible to imagine a more dramatic and horrifying combination of scientific triumph with political and moral failure than has been shown to the world in the destruction of Hiroshima. From the scientific point of view, the atomic bomb embodies the results of a combination of genius and patience as remarkable as any in the history of mankind. Atoms are so minute that it might have seemed impossible to know as much as we do about them. A million million bundles, each containing a million million hydrogen atoms, would weigh about a gram and a half. Each hydrogen atom consists of a nucleus, and an electron going round the nucleus, as the earth goes round the sun. The distance from the nucleus to the electron is usually about a hundred-millionth of a centimetre; the electron and the nucleus are supposed to be so small that if they could be crowded together it would take about ten million million on end to fill a centimetre. The nucleus has positive electricity, the planetary electron an equal amount of negative electricity; the nucleus is about 1850 times as heavy as the electron. The hydrogen atom, which I have been describing, is the simplest of atoms, but the atom used in the atomic bomb is at the other end of the scale.

Double Clear /

The Atomic Bomb.

by Bertrand Russell

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Uranium, the element chiefly used in the atomic bomb, has the heaviest and most complex of atoms. Normally there are 92 planetary electrons, while the nucleus is made up of about 238 neutrons (which have mass without electricity), 238 positrons (which have positive electricity and very little mass), and 146 electrons, which are like positrons except that their electricity is negative. Positrons repel each other, and so do electrons; but a positron and electron attract each other. The overcrowding of mutually attracted and expelled particles in the tiny space of the uranium nucleus involves enormous potentially explosive forces. Uranium is slightly radioactive, which means that some of its atoms break up naturally. But a quicker process than this is required for the making of an atomic bomb.

Rutherford found out, about thirty years ago, that little bits could be chipped off an atom by bombardment. In 1939, a more powerful process was discovered: it was found that neutrons, entering the nucleus of a uranium atom, would cause it to split into two roughly equal halves, which would rush off and disrupt other uranium atoms in the neighbourhood, and so set up a train of explosions so long as there was any of the right kind of uranium to be encountered.

Ever since the beginning of the war, the Germans on the one side, and the British and Americans on the other, have been working on the possibility of an atomic explosive. One of the difficulties was to make sure that it would not be too effective: there was a fear that it might

destroy not only the enemy, but the whole planet, and naturally experiments were risky. But the difficulties were overcome, and now the possibility, which scientists have foreseen for over forty years, has entered into the world of practical politics. The labours of Rutherford and Bohr, of Heisenberg, and Schrödinger, and a number of other distinguished men, the ablest men of our time, and most of them both high-minded and public-spirited, have borne fruit: in an instant, by means of one small bomb, every vestige of life throughout four square miles of a populous city has been exterminated. As I write, I learn that a second bomb has been dropped on Nagasaki.

The prospect for the human race is sombre beyond all precedent. Mankind are faced with a clear-cut alternative: either we shall all perish, or we shall have to acquire some slight degree of common sense. A great deal of new political thinking will be necessary if utter disaster is to be averted.

For the moment, fortunately, only the United States is in a position to manufacture atomic bombs. The immediate result must be a rapid end to the Japanese war, whether by surrender or by extermination. The power of the United States in international affairs is, for the time being, immeasurably increased; a month ago, Russia and the United States seemed about equal in warlike strength, but now this is no longer the case. This situation, however, will not last long, for it must be assumed that before long Russia and the British Empire will set to work to make these bombs for themselves. Uranium has suddenly become the

most precious of raw materials, and nations will probably fight for it as hitherto they have fought for oil. In the next war, if atomic bombs are used on both sides, it is to be expected that all large cities will be completely wiped out; so will all scientific laboratories and all governmental centres. Communications will be disrupted, and the world will be reduced to a number of small independent agricultural communities living on local produce, as they did in the Dark Ages. But presumably none of them will have either the resources or the skill for the manufacture of atomic bombs.

There is another and a better possibility, if men have the wisdom to make use of the few years during which it will remain open to them. Either war or civilization must end, and if it is to be war that ends, there must be an international authority with the sole power to make the new bombs. All supplies of uranium must be placed under the control of the international authority, which shall have the right to safeguard the ore by armed forces. As soon as such an authority has been created, all existing atomic bombs, and all plants for their manufacture, must be handed over. And of course the international authority must have sufficient armed forces to protect whatever has been handed over to it. If this system were once established, the international authority would be irresistible, and wars would cease. At worst, there might be occasional brief revolts that would be easily quelled.

But I fear all this is Utopian. The United States will not consent to any pooling of armaments, and no more will

Soviet Russia. Each will insist on retaining the means of exterminating the other, on the ground that the other is not to be trusted.

If America were more imperialistic there would be another possibility, less Utopian and less desirable, but still preferable to the total obliteration of civilized life. It would be possible for Americans to use their position of temporary superiority to insist upon disarmament, not only in Germany and Japan, but everywhere except in the United States, or at any rate in every country not prepared to enter into a close military alliance with the United States, involving compulsory sharing of military secrets. During the next few years, this policy could be enforced; if one or two wars were necessary, they would be brief, and would soon end in decisive American victory. In this way a new League of Nations could be formed under American leadership, and the peace of the world could be securely established. But I fear that respect for international justice will prevent Washington from adopting this policy.

In view of the reluctance of mankind to form voluntarily an effective international authority, we must hope, and perhaps we may expect, that after the next world war some one Power will emerge with such preponderant strength as to be able to establish a peaceful hegemony over the rest of the globe. The next war, unless it comes very soon, will endanger all civilized government; but if any civilized government survives and achieves supremacy, there will again be a possibility of ordered progress and the utilization of science for happiness rather than for

destruction.

One is tempted to feel that Man is being punished, through the agency of his own evil passions, for impiety in inquiring too closely into the hidden secrets of nature. But such a feeling is unduly defeatist. Science is capable of conferring enormous boons: it can lighten labour, abolish poverty, and enormously diminish disease. But if science is to bring benefits instead of death, we must bring to bear upon social, and especially international, organization, intelligence of the same high order that has enabled us to discover the structure of the atom. To do this effectively we must free ourselves from the domination of ancient shibboleths, and think freely, fearlessly and rationally about the new and appalling problems with which the human race is confronted by its conquest of scientific power.