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The Atomic Bomb [1945]

"The Bomb and Civilization", Russell's first known comment of any kind on the atomic bomb, appeared in the Glasgow *Forward*, 39, no. 33 (18 Aug. 1945): 1, 3 (B&R C45.14). Russell never reprinted the article, and it has remained largely unknown, even to histories of the anti-nuclear movement such as Wittner *1993*. *Forward*, which had previously published Russell, supported the Independent Labour Party.

The atom-bombing of Hiroshima on 6 August 1945 destroyed four square miles of the city. Three days later Russell was at work on this article. We know this because midway he remarks that he has just learned of the explosion of the second atomic bomb, over Nagasaki. (The bomb had been dropped at about 2 a.m. GMT [Weintraub *1995*, 482].) At this point he abandons the exposition and history of atomic theory to dwell on the danger to civilization posed by the new weaponry, and immediately states: "The prospect for the human race is sombre beyond all precedent." This is in contrast to the guarded optimism of Paper **48**, finished a few days prior to the nuclear attack on Japan and probably, as a consequence, withdrawn from publication.

It is unknown whether, at the time of writing, Russell knew of the Manhattan project, although he may have been cognizant of physicists' pre-war curiosity about producing an atomic explosion. How then did he know of the 1939 discovery and that scientists on both sides of World War II had been working on the problem? News sources may have carried this information in early days of the nuclear age.

The main outline and some details of his international policy for the next few years are visible, complete with an argument for forcing a world government and a prediction that the U.S. will not internationalize the atomic secrets.

Russell could not comment here on whether the A-bomb hastened the end of the war. Japan did not surrender until several days later, on 14 August. At the same time preparations were under way for a massive Allied land invasion. It remains uncertain whether it was the A-bomb or the prospect of the land invasion that brought Japan to surrender. It was "a common observation that Japan at war's end was vastly weaker than anyone outside the country had imagined—or anyone inside it had acknowledged" (Dower *1999*, 44).

The copy-text is a photocopy of the manuscript, which Russell titled "The Atomic Bomb". There is no evidence that he read proofs of the newspaper publication. The two versions have been collated. The substitution in the printed text of

"hear" for the manuscript's "learn" at 310: 6 was a misreading of Russell's hand. The variants are recorded in the textual notes.

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.

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 repelled 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 of 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.

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309: 6 **Atoms** In *The ABC of Atoms*, Russell writes in much the same detail and with the same figures about the minuteness of atoms (*1923*, 9–10). He predicted of nuclear research that "It is probable that it will ultimately be used for making more deadly explosives and projectiles than any yet invented" (*1923*, 11; quoted by Wood *1957*, 152).

309: 30 **Rutherford** Ernest Rutherford (1871–1937), New Zealand-born British physicist. He was Professor of Physics at McGill University from 1898 to 1907, when he left for Manchester. In 1919 he became director of the Cavendish Laboratory in Cambridge. He won the Nobel Prize for chemistry in 1908.

309: 31 **more powerful process** O. R. Frisch and Lise Meitner concluded that the results of experiments done by the German chemist, Otto Hahn, in December 1938 could only have been obtained as the result of nuclear fission. Frisch verified their assumption with experiments done in Copenhagen in January 1939.

309: 37–8 **Germans on the one side, and the British and Americans** German research was led by Werner Heisenberg. The British and Americans at first worked separately but during the Quebec Conference of August 1943 agreed to work together.

309: 43 **foreseen for over forty years** 1905 was the year of publication of Einstein's special theory of relativity. Wittner *1993* discusses H. G. Wells' *The World Set Free* (*1914*), which portrays a war fought with nuclear weapons.

310: 1 **Bohr** Niels Bohr (1885–1962), Danish physicist, worked with Rutherford at Manchester before returning to Denmark. He spent World War II in the United States. Russell got to know Bohr well on his 1935 Scandinavian lecture tour. Indeed, Bohr tutored Russell in quantum physics and indeterminism (Stevenson *2011*, 115, 117).

310: 1 **Heisenberg** Werner Heisenberg (1901–1976), German physicist. With Max Born, he worked in quantum mechanics, proposing the uncertainty principle in the 1920s. He won the Nobel Prize for physics in 1932. Russell got to know him in Copenhagen in 1935 (Stevenson *2011*, 121 n.1), and made his acquaintance again at a meeting on 3 March 1948 at the Master's Lodge, Christ's College, Cambridge.

310: 2 **Schrödinger** Erwin Schrödinger (1887–1961), Austrian physicist. He won the Nobel Prize for physics in 1933 and left Germany for Oxford the same year. He spent World War II in Dublin. Russell and Schrödinger later corresponded.

310: 13 **surrender or by extermination** Emperor Hirohito decided to surrender on 10 August 1945, but the Japanese military did not agree to do so until 14 August. See Weintraub *1995*, Chap. 33.

310: 15 **month ago** This was a reasonable belief at the time, since contested. In early July 1945 Russia had as yet no Far Eastern military presence to speak of

but was overwhelmingly strong in Eastern Europe, Austria and East Germany. The United States was rapidly defeating the Japanese forces, except on the home islands, and was redirecting its troops from Europe to the planned invasion of Japan. Both had reached a peak of conventional weapons production. Thus in all factors considered together, they might have seemed equal in "war-like strength" before the explosion of America's plutonium test bomb on 16 July 1945. It was the distribution of that strength that was very unequal.

310: 18–19 **make these bombs for themselves** The U.S. Atomic Energy Act (1946; in effect 1 Jan. 1947) restricted the exchange of information on atomic energy, thus reducing Anglo-American cooperation, even though Roosevelt and Churchill had agreed on it. On 8 January 1947 Attlee and his cabinet secretly authorized the manufacture of a British atomic bomb. The first British atomic test was on 3 October 1952. The Soviets exploded their first atomic bomb on 29 August 1949. They had been working separately on a bomb and accelerated their programme after Potsdam.

310: 32 **control of the international authority** The Atomic Development Authority. See Papers **70**, **73** and **74**, where Russell discusses this. See also a previous annotation to "Control of Atomic Energy", where the Lilienthal plan is explained.

311: 10 **League of Nations** Although the United Nations did not come into existence until 24 October 1945, the founding San Francisco Conference had been over since 25 June and the Charter signed on the 26th. Russell, critical of the veto power of the Security Council, appears here to dismiss the U.N.

309: 32 neutrons CT] *above deleted* positrons
310: 6 learn CT] hear 45
310: 21–2 , if atomic bombs are used on both sides, it is to be expected that all large cities CT] *replaced* it is to be expected that all large cities on both sides
310: 35 over CT] *before deleted* to it
311: 15 *perhaps* CT] perhaps 45
311: 20 will again be CT] will be 45
311: 21 of the utilization CT] the utilization 45
311: 32 of CT] *written over* &

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The copy-text is a photocopy (RA REC. ACQ. 840) of the manuscript ("CT") in the Emrys Hughes papers, National Library of Scotland. It is foliated *1*, 2–8, seems to measure 211 × 268 mm., and is written in ink. An editorial hand rewrote several of Russell's words, in decipherment for the compositor. The same hand added fifteen paragraph breaks, which are ignored here. "45" is the publication, "The Bomb and Civilization", *Glasgow Forward*, 39, no. 33 (18 Aug. 1945): 1, 3. It has six section heads, also ignored here as not authorial.

309: 16–18 The hydrogen … scale. CT] *inserted in lighter ink at bottom of leaf*
309: 21 about CT] *inserted*
309: 26 repelled CT] expelled 45
309: 29 atomic CT] atom 45
309: 30 little CT] *inserted*
309: 31 off 45] of CT

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