

Building the Bomb



*Michele Ernsting
interviews
Joseph Rotblat*



*Bertrand Russell
and Joseph Rotblat*

In the first of her two programmes for Radio Netherlands, Michele Ernsting interviewed Professor Sir Joseph Rotblat, Nobel Laureate, President of Pugwash, and lifelong campaigner for nuclear disarmament. Professor Rotblat's own comments are featured in regular type, whilst edited sections and archival materials are printed in italics.

'Anything one man can imagine other men can make real.' Jules Verne probably never knew how right he was when he wrote those words. Most of the things he wrote about, submarines and spaceships, were indeed made real by other men. He also inspired other inventions he could never even dream of. At the start of the last century the notion of a weapon so powerful that it could destroy humanity was beyond comprehension. Just over 40 years later, it would become reality with the building of the first atomic bomb. 'The Gadget' as it was nicknamed by its creators would rapidly shift the balance of power on the planet and create a dangerous new race for military supremacy.

And what about its creators? What kind of person would choose to work on such a monstrous project. It's easy to think they were men without conscience prepared to release the power of a split atom in exchange for personal power and fame. But in reality many joined the project convinced they could help keep this destructive genie in its bottle. One of them was Joseph Rotblat, one of the youngest scientists involved in the so-called Manhattan Project in Los Alamos, New Mexico. At 98 his body and mind remain extraordinarily limber. Among other activities he still works for Pugwash, an organisation of eminent scholars which he helped found over 50 years ago to counter the nuclear arms race. In 1995 he and Pugwash were awarded the Nobel Peace Prize. In the first of two programmes on the history and impact of nuclear weapons, Joseph Rotblat explains how, against his conscience, he was drawn into building the bomb.

Rotblat: My nature is not to distrust, just the opposite. My nature is to believe fundamentally in the goodness of man. I always start off with the assumption that man is good. It's only when I have bitter experience showing me that they are not good that I criticise but mainly my approach is positive.

At this point, the producer cuts in the sound of thunder and heavy weapons...

Rotblat: To a certain extent it goes back to one's personal history. In my case you have to go a long way back to my early childhood which was a very unhappy one. This was mainly because most of my childhood was occupied with the First World War, which started when I was about five in Poland where I was born, and went on to 1920. My childhood was filled with the terrible things which happened during the war. My personal experience was of hunger and disease and cruelty and everything else which you can imagine that is negative about human nature, which shows itself in such a war. It's not surprising that I am anti-war. At that same time I also began to be interested in science by reading science fiction, mainly by Jules Verne. Science fiction fired my imagination and I could see in this the great potential of science. I began to see the fiction melting into reality. Being a young child still, I came to a conscious decision: there is suffering because there is a need to survive and then there is science which opens up enormous possibilities. Therefore I felt I would like to be a scientist to use my science to help mankind. In other words, from the very beginning I started not as a pure scientist just interested in knowledge; I also felt it should have a purpose as well and that purpose is to help mankind.

I had enormous difficulty in becoming a scientist. I almost didn't become one because circumstances were all against me. I was simply unable to get a proper education. In Poland if you want to go to a university you have to go to a gymnasium, a secondary school. You end up with a certificate but of course gymnasium was a full-time job and as a result of the war, my family and I found ourselves in such circumstances that I had to begin working for a living at quite an early age. So I did not have proper school teaching at all. Then I began to teach myself in the evenings, and of course my teaching was a bit lop-sided because my main interest was in physics from the very beginning, so I paid much more attention to physics than to other subjects. Fortunately I found out that there existed another high school, the Free University of Poland in Warsaw which, as the name implied, did not require a certificate. Moreover, the teaching was in the evenings so it was just made for me. I could continue earning a living and still attend school.

As it happened, the man who took me under his wing was one of the most outstanding physicists in the field of radioactivity and nuclear physics. Nuclear physics just came into being at that time. Until then it was mostly radioactivity. Radioactivity was discovered in France by a Polish woman physicist, Marie Curie, and then they decided to set up a radiological laboratory in Warsaw. She had too many things going on in Paris so she sent two of her best students to take over, and one of them was my professor at the Free University of Poland.

By that time I had already become established with a bit of standing in this field. I'd made several discoveries which drew the attention of people, but until then I was never out of Poland and I felt it was important to learn something of the world outside. So I managed to get a research fellowship for one year to go

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abroad and I received two invitations. One was from Paris, from Marie Curie's daughter, Irene, and her son in law, Frederik Juliot. He wrote and invited me to come and this was very attractive because I already had connections with this laboratory and apart from this, never having been out of Poland, the attraction of seeing Paris was of course quite great. The other invitation by contrast was to go to Liverpool. From what I had read about Liverpool, it was certainly not a tourist attraction at that time. And the other point that was somewhat important was that I did not know any English, only a little bit of French. All the arguments were against going to Liverpool. Nevertheless, I chose to go to Liverpool, and there was a good reason for it. In those days if you wanted to do good work in nuclear physics, you had to have an accelerator machine, something called a cyclotron. It was my ambition to build up nuclear physics in Poland and somehow get the resources to build a cyclotron. But I thought it would help me a great deal if I became an expert in cyclotrons. In those days James Chadwick was the head of the department at Liverpool University. He was himself a Nobel laureate, the man who discovered the neutron, a great physicist, and he was building a cyclotron in Liverpool, and I thought 'this is the right time to be there in Liverpool'. This is the reason why I chose Liverpool. I didn't know at that time that this decision would save my life.

The producer inserts an archival recording of Hitler's voice with this translation: 'Now we have armed to such an extent as the world has never before seen . . . I have spent billions in the last five years and the German people must now know what the purpose of that was...'

Rotblat: It was in February 1939 when I read a paper in (the science journal) *Nature* by Meitner and Frisch about the discovery of fission. They simply described that when you hit a uranium atom with neutrons, it splits up into two parts. It occurred to me that more neutrons should be emitted during this process. It so happened at that time I was doing research on the scattering of neutrons by uranium. Purely by chance I was working with uranium and neutrons. It didn't take me very long to set up an experiment to look for these neutrons and, indeed, I found them. Having made this observation, I could see straightaway the implications. I could see that this opened the way to the release of energy from the nucleus because the new neutrons could produce further fissions, more energy, and a chain reaction which would build up to a very large release of energy.

But then, of course, it also occurred to me that if all this energy came out in a very short time, you have a huge amount of energy, a huge explosion, the atom bomb. The idea of the atom bomb occurred to me already at that time. This was in February 1939. However, as soon as I hit on this idea I decided to forget about it. I consider myself to be a humanitarian scientist, so the idea of working on a weapon was quite beyond me. It's not my business at all. This is the reason why I tried to put it out of my mind. But I couldn't because I was afraid that other

scientists might not have the same moral scruples. I was particularly worried about the German scientists, because if an idea becomes ripe then many scientists will have it, and indeed this observation about the emission of neutrons was made by many others including Joliot and Curie who were ahead of me in this discovery. So I was afraid that the German scientists might also have this idea and working under Hitler they might make the bomb, and I knew it was going to be war, we knew Poland was going to be invaded. So I was afraid that Hitler would win the war if he had the bomb. Nevertheless I still felt it's not my job to do it. This was a terrible time for me; probably the worst time in my life, when I had this quandary, this dilemma. But eventually as often happens in life, external circumstances dictate what you should do if you can't make up your mind yourself. What happened this time was the outbreak of the war. War broke out on the 3rd of September 1939 with the invasion of Poland, and then Britain came in. Within a few weeks Poland was overrun. The whole German might was revealed and I became convinced that if, in addition, Hitler also had the bomb then he was bound to win the war. And this was something which I could not accept because it would be the end of democracy.

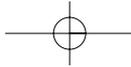
The producer adds further archival recording of Hitler with this translation: 'I told my friend Goering, create an air force which will protect Germany against any force or any attack in the world. Have the best tanks and the best anti-aircraft in the world.'

It is followed by an archival recording of British Prime Minister Neville Chamberlain saying: 'I am speaking to you from the Cabinet Room at 10 Downing street. This morning the British Ambassador in Berlin handed the German Government a final note stating that unless we heard from them by 11 o'clock that they were prepared at once to withdraw their troops from Poland, a state of war would exist between us. I have to tell you now that no such undertaking has been received and that consequently this country is at war with Germany.'

Rotblat: I developed, at that time, a rationale for working on the bomb. And the rationale was the concept of nuclear deterrence; the same concept which keeps nuclear weapons in existence up to this day. I thought that if the bomb can be made, and if Hitler had the bomb, then the only way to prevent them from using it against us would be if we also had the bomb, and threatened to retaliate. That's the reason why I felt we needed to make the bomb. Not to be used – and this is very important – from the very beginning when I came to the project, my idea was always that the bomb should never be used. We need it to prevent its use, to prevent Hitler from using this bomb against us. And this is why I started to work on the project.

Michele Ernsting: What are your thoughts in hindsight about that?

Rotblat: It didn't take me long to realise the folly of my argument about nuclear deterrence. I already could see quite early that this was wrong. That's

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because deterrence works with rational people. If you listen to reason it can work. But Hitler was not rational. I was convinced that the argument of deterrence wouldn't have worked with Hitler. But it was much later before I realised this.

At this point we hear an archival recording of British Prime Minister Winston Churchill saying: 'Is not this the appointed time for all to make the utmost exertions in their power? If the battle is to be won we must provide our men with ever increasing quantities of the weapons and ammunition they need. We must have and have quickly, more airplanes, more tanks, more shells, more guns. There is imperious need for these vital munitions. Our task is not only to win the battle but to win the war.'

Rotblat: We began the work in England and by 1940-41 we established the scientific feasibility of the bomb. We established that it will work. But we also came to the conclusion that in order for it to work it would require a very big technological effort. And therefore we more or less came to a halt in 1941 because Britain, during the war, could not afford to undertake this huge enterprise. But then one of our colleagues from Britain who went to America for something different, he talked to American friends, scientists, about our findings. And this opened the way to Americans. All of a sudden they realised they had to do something about this. And as it happened, soon afterwards, Pearl Harbor came, America went into war and of course their views changed completely. They began to start the work in 1942.

We now hear an archival recording of President Franklin D. Roosevelt saying: 'I ask that the Congress declare that since the unprovoked and dastardly attack by Japan on Sunday December 7th 1941, a state of war has existed between the US and the Japanese empire.'

Rotblat: Now at that stage the Americans felt they would like to have the collaboration of the British scientists because they knew we had done so much work already which helps them. Anyhow, I find myself one of the people who were invited by the Americans to come and join them.

Los Alamos in New Mexico was certainly an extraordinary place. From my point of view as a young scientist it was almost like a paradise. Having always been used to difficulties – no access to expensive apparatus – here you find yourself in a place where money didn't matter at all! If you wanted a cyclotron, which for me was the acme of achievement, you just write out a chit! Another aspect was that you find yourself talking to people whom you only read about before, your heroes, such as Niels Bohr. You sat down to lunch and talked to Nobel laureates. For me as a young person it was very, very important. From this point of view, of course, I was very happy and normally I would have been very happy to work in such an environment.



Nevertheless, I was very unhappy from the very beginning. I was unhappy because it didn't take me long to realise how difficult it would be to make the bomb, and what an enormous effort it would require to make materials for the bomb. And I thought to myself that, if the United States with all its technical might and not being bombarded, that if it should still take such a long time for the US, then for the Germans to do it under the conditions which they were in, with air raids day and night and so on, I thought straightaway it's quite out of the question that the Germans will ever make it. Then I thought, if the Germans will never make it, what am I doing here? I'm here only because I was afraid the Germans would use the bomb against us. And if I can see now, this is not going to happen, then why should I be here? Nevertheless, I still stayed on, and the reason was because this was something new, a new discovery. And with something new, you don't know what other channels may lead to it, and I thought maybe the Germans will have found a shortcut and I could not exclude this. It was a remote possibility but I could not exclude it, and this is the reason why I felt I should stay on. But nevertheless I was unhappy. Because I was still doing something that I didn't want to do.

Michele Ernsting: What was the turning point when you decided you couldn't go on?

Rotblat: The turning point was later in 1944. Chadwick, the head of the British mission went to Washington, but from time to time he would come to visit us in Los Alamos. One day in November 1944 he came to Los Alamos and he told me that he just received intelligence that the Germans had given up their (atomic) project. In fact they gave it up a long time before, which we didn't know. So when he told me this, I had definite proof that the Germans were not working on this, I told him straightaway, I'm leaving the project.

Michele Ernsting: What was the reaction? You must have been one of the biggest security risks in the United States at that time.

Rotblat: The reaction was extraordinary! Yes, I'll never forget this. I told (Chadwick) I was going to resign. He said 'well, okay'. He didn't agree with my motives but he respected my views. He said he would tell the intelligence people about my decision to leave. I met him the following day and I could see straightaway from his face that something was terribly wrong. Gradually it came out, bit by bit, that the Americans believed I was a spy, a Soviet spy. What they imposed on me was that I should not tell my colleagues about the reason why I was leaving the project, because they were afraid it might affect the morale of people if I told the others. And since I was a bit naughty and I did not quite observe the regulations, I don't like regulations, they had something on me. They could have arrested me if they wanted to, strictly speaking. I had no contact at all with my colleagues. I couldn't write to them because my letters were censored, so I didn't know anything from December 1944 until August 1945 about what had been happening on the project...

The producer cuts in the sound of an atomic detonation...

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Then we hear a recording of US President Harry Truman saying: 'The world will note that the first atomic bomb was dropped on Hiroshima, a military base. We won the race of discovery against the Germans. We have used it in order to shorten the agony of war; in order to save the lives of thousands and thousands of young Americans. We shall continue to use it until we completely destroy Japan's power to make war.'

Rotblat: This is when I heard it for the first time, when the BBC announced the destruction of Hiroshima.

Michele Ernsting: And your reaction?

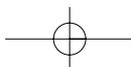
Rotblat: Shock, fear. Oh it's a terrible time because I still hoped. First of all, I thought maybe it wouldn't work at all. Everything was pure speculation. There was a chance that it wouldn't work, but it did work. Then I hoped, even if it did work, it wouldn't be used against civilian populations. But they did. I was shocked. There was the fear about further developments.

At this point, the producer interposes an archival recording of one of the pilots who dropped the bomb saying: 'In this particular case that bomb had 53 seconds from the time it left the airplane till the time it exploded, that's how long it took it to fall from the bombing altitude, 53 seconds. And this gave us adequate time to make the turn. Now we had just made the turn and rolled out in level flight when it seemed like someone had grabbed a hold of my airplane and gave it a real hard shake, because the shockwave had come up. This was something I was glad to feel because it gave me a moment of relief after all having worked on that bomb for well over a year, you know that 53 seconds time while I'm turning the airplane I'm wondering is it or is it not going to work? And of course the shock wave hitting us was an indication it had worked. Therefore I felt success had been achieved.'

Rotblat: I could see what was going to happen. I was convinced by Niels Bohr. I often talked with him. And he foresaw what would be the consequence of America's dropping the bomb, rather than trying to bring in the Soviet Union to try to collaborate on nuclear energy. There will be an arms race. You could foresee that the Russians wouldn't stand idle. They would also develop the bomb and then we all knew about the hydrogen bomb already. From (Niels Bohr) I knew about the forthcoming arms race and this made me very worried about the future.

We hear a recording of American General Douglas MacArthur saying: 'The Soviet Union will not necessarily mesh its actions with our moves. Like a cobra, any new enemy will more likely strike whenever it feels that the relativity of military and other potentialities is in its favour on a world-wide basis.'

Rotblat: And this is why I decided I must do something, to stop this from happening.



Michele Ernsting: Could you see this was the beginning of a completely different world?

Rotblat: I must say that yes, we could foresee this, but I did not think that it would reach a stage where it could threaten the existence of the human race. I knew it could destroy a city but I thought, to threaten the human race, one would need a very large number of these bombs, a hundred thousand of them. And I could not imagine for one moment why we should need a hundred thousand bombs. For what purpose? Even in 1945 I still did not believe it would reach that stage, yet it did happen. Within a few decades we had built up this number of weapons and the human race did become threatened.

Here the producer inserts a recording of US President John F. Kennedy saying: 'Nuclear weapons are so destructive and ballistic missiles are so swift that any substantially increased possibility of their use or a sudden change in their deployment may well be regarded as a definite threat to peace. For many years both the Soviet Union and the United States, recognising this fact, have deployed strategic nuclear weapons with great care, never upsetting the precarious status quo which insured that these weapons would not be used in the absence of some vital challenge. We will not prematurely or unnecessarily risk the course of worldwide nuclear war in which even the fruits of victory would be ashes in our mouths. But neither will we shrink from that risk at any time it must be faced.'

Michele Ernsting: Since the first atomic bomb was built, nuclear powers have repeatedly upset the delicate balance of 'mutually assured destruction' as it later came to be known. We continuously return to the brink, though we have seen clearly what lies beyond it. And despite international agreements to disarm, many countries continue to expand their nuclear stocks with the United States leading the way.



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