

No 5 December 2004

**Science and
Nuclear Weapons:
Where do we go
from here?**

by Joseph Rotblat

The fifth of a series of occasional papers on defence and disarmament issues in memory of Frank Blackaby

Published by Abolition 2000 UK

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Printed by Pottle Press 07952 323528

ISBN 0-9540464-5-5

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Sir Joseph Rotblat: biographical details

Joseph Rotblat was born in Warsaw, 4 November 1908 and has been a British citizen since 1946. Educated at the Free University of Poland and the University of Warsaw, Poland, he also has degrees from the University of Liverpool (1950) and the University of London (1953). From 1933-1939 he worked at the Radiological Laboratory of the Scientific Society of Warsaw, eventually becoming Assistant Director of the Atomic Physics Institute of Free University of Poland. He came to the UK in 1939 and from 1939-1944 worked on the atom bomb, initially at the University of Liverpool and then in Los Alamos. From 1945-1949 he was Director of Research in Nuclear Physics at Liverpool University and from 1950-1976 Professor of Physics at St.Bartholomew's Hospital Medical College in London.

Following WWII he chaired the UK Nuclear Physics Committee Panel which developed emulsions which permitted the discovery of pi-mesons and the Cyclotron Panel which planned and built cyclotrons at Harwell and Liverpool. He is co-founder of the Atomic Scientists Association; and in 1955 was a signatory of the Russell-Einstein Manifesto. From 1957-1973 he was Secretary-General of the Pugwash Conferences on Science and World Affairs and editor of the Pugwash Newsletter, and from 1978-1988 Chairman of the British Pugwash Group. From 1988 he was President of the Pugwash Conferences internationally.

He helped found and became a member of the governing board of the Stockholm International Peace Research Institute (1966-1971). From 1984-1990 he was a member of the Management Group of the World Health Organisation mainly responsible for Reports on the Effects of Nuclear War on Health and Health Services.

He is a member of several national Academies of Science including the Polish Academy of Sciences, the American Academy of Arts and Sciences, the Czechoslovak Academy of Sciences, the Ukrainian Academy of Sciences, and a Fellow of the Royal Society of London. He was awarded the CBE in 1965, the Albert Einstein Peace Prize in 1992 and the Nobel Peace Prize in 1995.

Acknowledgments

Abolition 2000 UK thanks our generous sponsor; United World Education & Research Trust.

Preface

This is the fifth Blackaby Paper in the series commemorating the life and work of the late Frank Blackaby, sometime President of Abolition 2000 UK.

We are honoured that Professor Sir Joseph Rotblat agreed to prepare this paper for us, prior to the key 2005 Review Conference of the Nuclear Weapons Non-Proliferation Treaty. It is to be hoped that the paper will also go a little way to promote public awareness of the nuclear weapons problem, which is Prof. Rotblat's major current concern.

Peter Nicholls.

Claire Poyner.

Editorial Committee.

Science and Nuclear Weapons: Where do we go from here?

A Problem: the responsibility of science and scientists

Should scientists accept responsibility for the human and environmental consequences of their research? Those questions did not arise in the distant past, because there hardly were such consequences. Science had no role in the day-to-day life of people, or with a few exceptions, such as Archimedes and Leonardo da Vinci, in the security of states. Science was largely the pursuit of gentlemen of leisure.

The tremendous advances in pure science, particularly in physics, during the first part of the 20th century, and in biology, during the second half, have completely changed the relation between science and society. Science has become a dominant element in our lives. It has brought great improvements in the quality of life, but also grave perils: pollution of the environment, squandering of vital resources, increase in transmittable diseases, and above all, a threat to the very existence of the human species on this planet through the development of nuclear weapons.

Many thousands of scientists are still employed in Los Alamos or Livermore in the USA, Chelyabinsk or Arzamas in Russia, and Aldermaston in the UK. These establishments do pure and applied research for specific purposes, purposes that I see as the

negation of scientific pursuit: the development of new, or improvement of old weapons of mass destruction. Among these thousands there may be some scientists who are motivated by considerations of national security.

The vast majority, however, have no such motivation; in the past they were lured into this work by the siren call of rapid advancement and unlimited opportunity. Work in such laboratories is not only a terrible waste of scientific endeavour but a perversion of the noble calling of science. It should not be tolerated.

I would like to see endorsement of this by the scientific community. I will go further and suggest that the scientific community should demand the elimination of nuclear weapons and, in the first instance, request that the five acknowledged nuclear powers honour their obligations under the Nuclear Non-Proliferation Treaty.

The basic human value is life itself; the most important of human rights is the right to live. It is the duty of scientists to see to it that, through their work, life will not be put into peril, but will be made safe and its quality enhanced. The problem is how this is to be achieved.

The Past

I am one of the scientists who helped develop nuclear weapons. I may be one of the last of that group, because my role in the development of nuclear weapons goes back to 1939, even before WWII began, while I was still in Poland. I already knew that when a uranium atom breaks up neutrons are emitted. It came to me that this can start a chain reaction in which a large amount of energy is released. Calculation showed that this can occur in less than a microsecond; a large amount of energy released in a short time means a mighty explosion. The idea of the atom bomb thus already existed in February 1939.

But it is not the job of a scientist to work on weapons of mass destruction, and therefore I tried to push it out of my mind. But nevertheless I had to worry. Much of the work leading towards fission was done in Germany. I knew that there would be a war and that Hitler was going to invade Poland. If Hitler also had the bomb, then of course he would win.

So on the one hand, it was against the ideals of science to work on a bomb; on the other hand, those ideals were endangered if Hitler were to prevail. So I fought this dilemma inside myself throughout the summer of 1939 by which time I was already in England. What should I do?

Eventually the decision was made for me by the outbreak of the war in September 1939. I decided, at that stage, that we ought to work on the bomb. But my idea was that we needed to work on the bomb in order that it should not be used. If Hitler had the bomb, the only way in which we could prevent him from using it would be if we also had it, and threatened retaliation. That was the argument I used at the time to still my conscience.

Towards the end of 1939, we began experiments in Liverpool, and we established that the bomb was feasible, but it required an enormous industrial effort to make it. Therefore, we decided to join the American team, the Manhattan Project. That is how I came to Los Alamos. I was there for less than a year. I came at the beginning of 1944, and left by the end of 1944.

As soon as I came there, I realised that my fear about a German bomb was unfounded, because of the enormous effort required. And by that time the war in Europe was showing that Hitler was defeated, and that the bomb would not be ready, and that Hitler would not have it in any case. So my being there was not really justified.

But I could not be certain that the Germans would not find a shortcut and still make the bomb. Therefore I kept on working, although I was very unhappy. But towards the end of 1944, I learned that the Germans had abandoned the project a long time before. I therefore resigned and came back to England.

The Los Alamos team regularly discussed the whole problem of the bomb and future world security. I think most scientists, those who initiated the work, like myself, had the same idea, that we needed the bomb in order to prevent its use.

Although by that time it was obvious that Germany was defeated without the threat of the bomb they felt, having gone so far, they would like to see whether all these theoretical calculations would really come out in practice. Some, at least, wanted to wait until the bomb was tested, and then leave the project. But by that time, after Japan had entered the war, many people had changed their views; they felt we may have to use the bomb to bring the war in the Far East to a rapid end. The

war psychology is that once we enter war, we lose our moral values and we are encouraged to kill people who were, in previous days, our partners and our friends. I believe that this applied even to Oppenheimer, who otherwise would have felt the same way as I did. This moral dilemma existed all the time, and is still going on up to this day.

Once you begin this game and work on this sort of work, then you lose some moral values. You become engrossed in dealing with gadgets and in inventing newer and newer gadgets.

The nuclear arms race was actually mostly a game between scientists on both sides. What it meant to the world was an accumulation of enormous numbers of warheads, well beyond any possible use. At one stage the US and USSR had more than 70,000 nuclear warheads, plus another 30,000 in reserve. This is at least 100 times more than any conceivable role for deterrent purposes. This is the problem: once you have started such a race, you cannot stop it.

The Present

What has happened since the fall of the Berlin Wall and the dissolution of the USSR at the end of the 1980s? We have to look reality in its ugly face. The peace dividend has been miniscule or non-existent. And the drive for the elimination of nuclear weapons is not going well; indeed, it is going very badly. The campaign to rid the world of nuclear weapons, pursued by Pugwash for 47 years, by PSR for 43 years, by IPPNW for 23 years, and by Abolition 2000 for 12 years, has not only come to a halt, but the use of these weapons may soon become a routine part of military strategy (cf. the recently disclosed US Nuclear Posture Review).

What is all the more worrying is the apparent loss of support from the general public. This is evident, for example, from the results of public opinion polls in the UK. In response to two questions:

- (1) What would you say is the most important issue facing Britain today?
- (2) What do you see as other important issues facing Britain today?

At one time, over 40 per cent put nuclear disarmament and nuclear weapons as the most important issues, but the percentage of such answers decreased rapidly, and ever

since the end of the Cold War it has remained very low. After the collapse of the Soviet Union, the great majority of people came to the belief that either the nuclear threat had disappeared altogether, or that the deterrent effect of existing nuclear arsenals would take care of the threat. Neither of these beliefs was justified, but obviously we have not succeeded in putting this over to the public.

A number of peace and anti-nuclear NGOs organisations deserve some credit for the fact that a nuclear war has been avoided so far. Mikhail Gorbachev told us so directly. A mutual pat on the back is quite in order occasionally, but we cannot rest on past successes. Our job has not been done, particularly that we now have to endure another four years of George W. Bush's policies; but, although the prospects are bleak, we must pick ourselves up and resume our campaign for the elimination of nuclear weapons. In this paper I urge the renewal of a mass campaign, and I propose that it be based mainly on legal and moral principles.

The revelations in the US Nuclear Posture Review shocked us: it abandoned the previous doctrine of nuclear weapons viewed as weapons of last resort, and spelt out a strategy which incorporates nuclear

capability into conventional war planning. It is a major and dangerous shift in the whole rationale for nuclear weapons. Actually, these revelations should not have come as such a surprise. They are obviously much influenced by the events of September 11th, but in reality they are an expression of the policy that has been pursued covertly by the United States ever since, or even before Hiroshima and Nagasaki, in contradiction to the official line of pursuing nuclear disarmament.

At the core of this hypocritical policy is the doctrine of nuclear deterrence discussed further below. Ironically, this concept was introduced by the scientists who initiated the atom bomb project. It took me a little

while to appreciate its fallacy.

Our aim was to prevent the use of the atom bomb by anyone; we hoped that the threat of using it in retaliation would do the trick. This might work with a rational leader, but some leaders are not rational. I believe, though I cannot prove it, that had Hitler possessed the bomb, the last order from his bunker in Berlin would have been to drop it on London, in the full knowledge that this would bring terrible retribution upon Germany, but in the spirit of his philosophy of *Götterdämmerung*.

We therefore need a different nuclear weapons policy, one which will lead to their abolition and worldwide destruction.

The immediate future

On the one hand, the US and other NATO governments feel obliged to pay lip-service to the policy of nuclear disarmament leading to the abolition of nuclear weapons, bowing to the pressure of world opinion expressed in resolutions adopted year after year by large majorities of the United Nations General Assembly.

This has led to the Nuclear Non-Proliferation Treaty (NPT), to which all but four members of the United Nations are now parties. Under the terms of the NPT, the 182 non-nuclear countries have undertaken not to acquire nuclear weapons, and the five overt nuclear states have undertaken to get rid of theirs.

There was some ambiguity in the formulation of the relevant Article VI of the NPT, which provided the hawks with an excuse for the retention of nuclear weapons until

general and complete disarmament had been achieved. But - again under pressure of public opinion - this ambiguity was removed two years ago in a statement issued after the 2000 NPT Review Conference. This statement, signed by all five recognised nuclear-weapon states, contains the following:

“...an unequivocal undertaking by the nuclear weapon states to accomplish the total elimination of their arsenals leading to nuclear disarmament to which all States parties are committed under Article VI.”

Thus, the United States and the other official nuclear states-China, France, Russia and the UK-are formally and unequivocally committed to the elimination of all nuclear arsenals. The creation of a nuclear-weapon-free world is a legal commitment by all signatories of the NPT.

The flawed doctrine of extended deterrence

On the other hand, there remains the de facto nuclear strategy of extended deterrence, which implies the indefinite existence of nuclear arsenals.

Since the end of the Cold War, the actual US nuclear strategy has been increasingly orientated towards the use of nuclear weapons, along the lines originally advocated by General Groves.

Immediately after the end of the Cold War, the US policy, supported by many NATO countries, envisaged the use of nuclear weapons as a last resort only, which meant against an attack with nuclear arms. But the 1994 Nuclear Posture Review, under the administration of President Clinton, for the first time made explicit mention of the possible use of nuclear weapons in response to an attack with chemical or biological weapons.

The current US Nuclear Posture Review goes further still, and makes nuclear weapons the tool with which to keep peace in the world.

If this is the purpose of nuclear weapons, then they will be needed as long as disputes are settled by recourse to military confrontation, in other words, as long as war is a recognized social institution. Such a policy is unacceptable in a civilised society on many grounds: logical, political, military, legal, and ethical. In this paper I am mainly concerned with the last two, legal and moral, but I will deal briefly with the others.

US and NATO nuclear policy is self-defeating on logical grounds. If some nations - including the most powerful militarily - say that they need nuclear weapons for their security, then such security cannot be denied to other countries which really feel insecure. Proliferation of nuclear weapons is thus the logical consequence of this nuclear policy. The USA and its allies cannot prevent the acquisition of nuclear weapons by other countries while retaining

them for themselves. The policy of extended deterrence undermines the non-proliferation policy.

There is yet a further aspect of the logical argument which strikes at the very basis of deterrence. This is the assumption that both sides in a dispute think and behave rationally; that they are capable of a realistic assessment of the risks entailed in a contemplated action.

This would not be the case with irrational leaders. Even a rational leader may behave irrationally in a war situation, facing defeat; or may be pushed into irrational action by mass hysteria, or when incited by religious fanaticism or nationalist fervour. Deterrence would certainly not apply to terrorists, who have little respect for human life on either side of a conflict.

The policy of extended deterrence is unacceptable on political grounds. It is highly discriminatory in that it allows a few nations - in practice, one nation - to usurp to themselves certain rights, such as policing the world by imposing sanctions on nuclear proliferators, or directly threatening them with military action: such action should be the prerogative of the United Nations. Indeed, it defies the very purpose of the United Nations, an organisation set up specifically for the maintenance of international peace and security.

The policy of extended deterrence also means a permanent polarization of the world, with some nations being offered protection by a powerful nuclear state; while others may either be "protected" by another nuclear state, or have no protection at all.

The policy is not credible on military grounds in relation to terrorist attacks. As the events of September 11th have shown, a major threat to security comes from terrorist groups, a threat which includes the use of all kinds of weapons of mass destruction, including nuclear ones.

The thousands of nuclear weapons still in the arsenals are useless against terrorists for the simple reason that terrorist groups do not usually present an identifiable target. At the same time, the very existence in the world of nuclear weapons, or nuclear-weapon-grade materials, increases the threat, because these materials may be acquired by the terrorists.

Extended deterrence is unacceptable on legal grounds. The United States, together with 187 other nations, that is 98 per cent of the UN membership, have signed and ratified the Nuclear Non-Proliferation Treaty (NPT). After the clarification at the 2000 NPT Review Conference, the situation is perfectly clear: the policy of extended deterrence, which requires the indefinite retention of nuclear weapons, is in direct breach of the legally binding NPT. It is a *sine qua non* of a civilised society that nations fulfil their legal commitments and adhere to international treaties.

But above all, the nuclear deterrent is not acceptable on ethical grounds. The whole concept of nuclear deterrence is based on

the belief that the threat of retaliation is real, that nuclear weapons would be used against an act of aggression; otherwise, the bluff would soon be called.

An advocate of deterrence must also show convincingly that he or she has the kind of personality that would enable them to push the button and unleash an instrument of wholesale destruction, harming not only the alleged aggressor but mainly innocent people, and potentially imperilling the whole of our civilization.

It is terrifying to think that among the necessary qualifications for leadership is the readiness to commit an act of genocide, because this is what it would amount to in the end.

Furthermore, by acquiescing in this policy, not only the national leader, but each of us, figuratively, keeps our finger on the button; each of us is taking part in a gamble in which the survival of human civilization is at stake. We rest the security of the world on a balance of terror. In the long run this is bound to erode the ethical basis of civilization.

The longer term future

We all crave a world of peace, a world of equity. We all want to nurture in the young generation the “culture of peace,” which we keep on proclaiming.

But how can we talk about a culture of peace if that peace is predicated on the existence of weapons of mass destruction? How can we persuade the young generation to cast aside the culture of violence, when they know that it is on the threat of extreme violence that we rely for security?

Despite the apparent setback with the recent US presidential election, I do not believe that the people of the world would accept a policy that is inherently immoral and is bound to end in catastrophe, a policy that implies the continued existence of nuclear weapons.

But the resolutions for nuclear disarmament, passed every year by large majorities in the General Assembly, are completely ignored by the nuclear-weapon states, which in practice means the United States government. In saying this, I distinguish between the US government and the US people, because I am convinced that the latter share, with the great majority of people all over the world, an abhorrence of the use of nuclear weapons.

There is a general assumption that new nuclear weapons cannot be developed and made militarily usable without their being tested. Hence, the great importance of the Comprehensive Test Ban Treaty (CTBT), signed by President Clinton, but ratification of which was rejected by the Senate.

Initially, this was thought to be rather petty vengeance against the President, which would soon be rectified, but since then it has emerged that the main reason was the perceived need for further testing of new, or modified old warheads.

Retention of a nuclear arsenal necessitates an infrastructure to ensure the safety and reliability of the warheads in the stockpile, as well as the capability to resume testing at short notice.

An adequate core of scientists and engineers has to be employed to carry out these tasks. This was the origin of the Stockpile Stewardship Management Program which began in 1994, with a budget later increased to more than \$5 billion. The Stewardship Program includes the task to “maintain nuclear weapon capability; develop a stockpile surveillance engineering base; demonstrate the capability to design, fabricate and certify new warheads.” This brief is broad enough to allow the scientists to do almost anything as long as it does not openly entail nuclear testing and actual production of new nuclear warheads. Considering the role which scientists played in the nuclear weapons establishments during the Cold War, it is a fair assumption that they will go to the limit of their brief.

There is a danger that new nuclear testing will be undertaken, when the US Administration decides that this would be in the interest of the United States.

There are also persistent rumours that work in Los Alamos has resulted in the development of new warheads. Most of the military research in the national laboratories, Los Alamos, Livermore, Sandia, is carried out in secrecy, making it impossible to say how reliable these rumours are, but they seem credible. In particular, work is already in progress to develop a new nuclear warhead of a very low yield, with a shape that will give it very high penetrating power into concrete, a “bunker-busting mini-nuke”.

The main worry about this bomb is the political impact. Were it radiologically “clean”, and its explosive yield within the range of that of conventional explosives, then the distinction between the two types of weapon will be blurred. The chief characteristic of a nuclear weapon is its enormous destructive power, which classifies it as a weapon of mass destruction, unique even in comparison with the other known weapons of mass destruction, such as the chemical or biological. This has resulted in a taboo about the use of nuclear weapons in combat, a taboo that has held out since Nagasaki.

But if at one end of the spectrum a nuclear bomb can be manufactured which does not differ quantitatively from ordinary explosives, the qualitative difference will also disappear, the nuclear threshold will be crossed, and nuclear weapons will gradually come to be seen as a tool of war, even though their main characteristic, of potentially endangering the existence of the human race, will still remain. The Nuclear Posture Review makes this a real possibility; the situation has therefore become even more dangerous.

We should exploit the perceived failures of US unilateralism in our efforts to put the elimination of nuclear weapons back on the agenda. No Man is an Island, particularly in a world which - thanks largely to the fantastic progress in technology - is becoming more and more interdependent, more and more transparent, more and more interactive.

Inherent in these developments is a set of agreements, ranging from confidence-building measures to formal international treaties; from protection of the environment to the clearance of mine fields; from Interpol to the International Criminal Court; from ensuring intellectual property rights to the Declaration of Human Rights. Respect for, and strict adherence to, the terms of international agreements are at the basis of a civilised society. Without this,

anarchy and terrorism will reign, the very dangers the coalition was set up to prevent.

In line with this we must demand that the US government with the support of its NATO partners immediately take the following steps:

- * to ratify the CTBT;
- * to abandon its plans for nuclear missile defence;
- * to reject any weaponization of space;
- * to take all its nuclear weapons off their alert status; and,
- * together with its NATO partners, to adopt a no-first-use policy as part of its commitment in accordance with Article VI of the NPT, to abolish nuclear weapons.

All this should prepare for the implementation of a commitment to nuclear disarmament, under the terms of the Nuclear Non-Proliferation Treaty.

The strongest argument for creation of a nuclear-weapon-free world should be based upon the moral objections to nuclear weapons. The use of nuclear weapons, and even the threat of using them, is generally viewed as highly immoral; a moral stand is completely incompatible with readiness to push the nuclear button. If the United States and its allies are to lead a campaign

based on moral principle, then they must renounce any use of weapons of mass destruction; and implement a policy of their total abolition to which all are committed legally.

A campaign for abolition based on moral principles will be seen as a fanciful dream by many. But the situation is grim; the way things are moving is bound to lead to catastrophe. If there is a way out, even if seemingly unrealistic, it is our duty to pursue it.

Arguments based on equity and morality may not cut ice with hardened politicians, but they can appeal to the common citizen.

If we can bring to the notice of the general public the grave dangers inherent in the continuation of current policies, while at the same time pointing out the long-term merits of policies based on equity and morality, we may succeed in putting the nuclear issue back on the agenda of public concern.

A colossal effort will be required, a sustained collective campaign by IPPNW, PSR, Pugwash, the International Network of Engineers and Scientists for Global Responsibility (INES), Abolition 2000, and many kindred organisations.

I hope that we shall all find the courage and the will to embark on this great task, to restore sanity in our policies, humanity in our actions, and a sense of belonging to the human race.

Bibliography

I. Web pages and related material

Joseph Rotblat (2000) "Interview With Professor Joseph Rotblat"
<http://www.gwu.edu/~nsarchiv/coldwar/interviews/episode-8/rotblat2.html>

The Official Web Site of The Nobel Foundation: the Peace prize
<http://nobelprize.org/peace/laureates/1995/index.html> See also
<http://almaz.com/nobel/peace/1995a.html>
Joseph Rotblat 1995 Nobel Laureate in Peace (1999 & 2003)

Pugwash Conferences, in Washington, DC, or pugwashdc@aol.com
"The Nuclear Issue: Pugwash and the Bush Policies"

Joseph Rotblat, President Emeritus, Pugwash Conferences 2003
<http://www.pugwash.org/reports/pac/53/rotblat.htm>
"The Nuclear Issue: Pugwash and the Bush Policies"
Joseph Rotblat, President Emeritus, Pugwash Conferences 2003

Joseph Rotblat RUSI TALK Wednesday January 8, 2003
"We are on a slippery slope, heading for disaster"
<http://www.guardian.co.uk/nuclear/article/0,2763,870939,00.html>
See also <http://www.pugwash.org/uk/publications.htm>

II. Books and articles

Rotblat, Joseph.(1985)"Leaving the Bomb Project", Bulletin of the Atomic Scientists, 41 (August 1985): 16-19. Joseph Rotblat's personal story.

J. Rotblat, J. Steinberger and B. Udgaonkar. (1993) Nuclear-Weapon-Free World: Desirable? Feasible? Boulder, Colorado: Westview Press. A Pugwash monograph which opened a significant debate on its theme. Also published in Russian, French, Chinese, Arabic, Swedish, and Japanese.

Rotblat, Joseph ed. (1998) Nuclear Weapons: The Road to Zero. Boulder, Colorado: Westview Press. Essays on the present situation and prospects for the future.

Rotblat, Joseph. (1972) Scientists in the Quest for Peace: A History of the Pugwash Conferences on Science and World Affairs, Cambridge, MA: MIT Press.

Rotblat, Joseph, ed. (1982) Scientists, the Arms Race and Disarmament. A UNESCO/Pugwash Symposium. London: Taylor & Francis. Esp. Joseph Rotblat's article, "Movements of Scientists against the Arms Race", pp. 115-157.

