

## HOW TO GET RID OF NUCLEAR WEAPONS

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*March 1, 1997*

*Biographical Note:* Dr. Rotblat's life work has been the Pugwash movement which was an important catalyst in halting the nuclear arms race. During World War II he began work on the Manhattan project but realizing the threat to humanity he resigned long before the bomb was dropped on Hiroshima.

The Vancouver Institute is famous in the world for bringing together both experts and the general public to discuss problems of great importance to all of us. The subject of my talk this evening, I think, is also of great importance to everybody. The actual theme of my lecture is HOW to get rid of nuclear weapons; but before we talk about the HOW, I think we should say a few words about the WHY.

Why should we get rid of nuclear weapons? For many people, including I guess the majority of this audience, the answer is obvious. But there are many others for whom the answer is not obvious and, among those, are the five nuclear weapons states who tenaciously cling to their nuclear arsenals. The bombs on Hiroshima and Nagasaki were the first, and so far the last, in which nuclear weapons were used in combat. But during the cold war both sides accumulated enormous arsenals of nuclear weapons. At one stage the stockpile of the United States alone was equivalent, in its destructive power, to more than one million Hiroshima bombs. I want you to ponder this for awhile. A million Hiroshimas. Enough to destroy not only our civilization but also to wipe out the human race completely. Indeed it is the characteristic of the nuclear age that for the first time in our civilization we have acquired the means to extinguish the human race in a single act.

Once again I ask you to ponder this fact. Many people have not believed it. Indeed, the scientists who worked on the bomb in the earliest days, 1939-1940, including myself, had a pretty good idea

about the destructive power of the bomb. We knew about the blast effect, the heat wave, even about the radioactive fallout. But we did not for one moment imagine that however destructive it was, it could bring the human race to an end. We did not think about this because we knew that to achieve this one would need a very large number of these nuclear weapons, maybe a hundred thousand. Even in our worst scenarios we did not believe that human society would be so stupid — or so mad — as to acquire such a large number of weapons for which we could see no purpose. But as it turned out, human society was that stupid. Within a short time we had accumulated that number of nuclear weapons. On several occasions we came very close to their actual use. It is much more by good luck than by good management that we have so far been able to avoid this ultimate catastrophe.

The danger has somewhat abated by now. We have now begun the process of gradual dismantling of nuclear arsenals. There is an agreement between the United States and Russia which comes under the name of the START Program (START I and II — START stands for strategic arms reduction) and you see in Figure 1 the programs for START I AND START II. This lists the number of strategic weapons (there are also other ones) and the numbers for the United States and for Russia. You see from this that by the year 2003 — the year in which the START program is to be implemented — the arsenals are to be reduced by a factor of three. However even when START II is implemented — or rather IF it is implemented, because the Russians have so far not ratified START II and they may not do it unless the problem of the expansion of NATO is resolved — we would still be left, at that time, with 22,000 nuclear warheads. The warheads include not only strategic ones but also tactical ones and ones in reserve. At present there is no talk of further reductions.

Worse than this is the fact that nuclear powers still believe that nuclear weapons are necessary for their security. As long as this belief is held, the nuclear weapons will stay in their arsenals. If they stay, they may be used; and we may again start up a nuclear arms race and return to the dangerous situation in which we lived for several decades. The threat to humankind will exist as long as nuclear weapons exist.

To the man in the street, nuclear weapons have always been something abhorrent. Instinctively he felt that something terrible could happen if they are about. From the beginning there was an attempt to liquidate them. The very first resolution of the United Nations General Assembly in January 1946 — a resolution which received unanimous approval from all states — established a commission whose mandate was the elimination of all atomic weapons and all other weapons of mass destruction. This kind of resolution has been repeated time and time again by the United Nations General Assembly. Later on it became also a legal commitment by the nuclear weapons states, with the coming into force in 1970 of the Nonproliferation Treaty (NPT). By now 186 states have ratified the NPT. That is, about 96% of all the United Nations states have agreed not to acquire any nuclear weapons. Among these are the five nuclear weapons states. Therefore, legally, they are obliged to get rid of their nuclear weapons. This was reaffirmed only two years ago (in 1995)

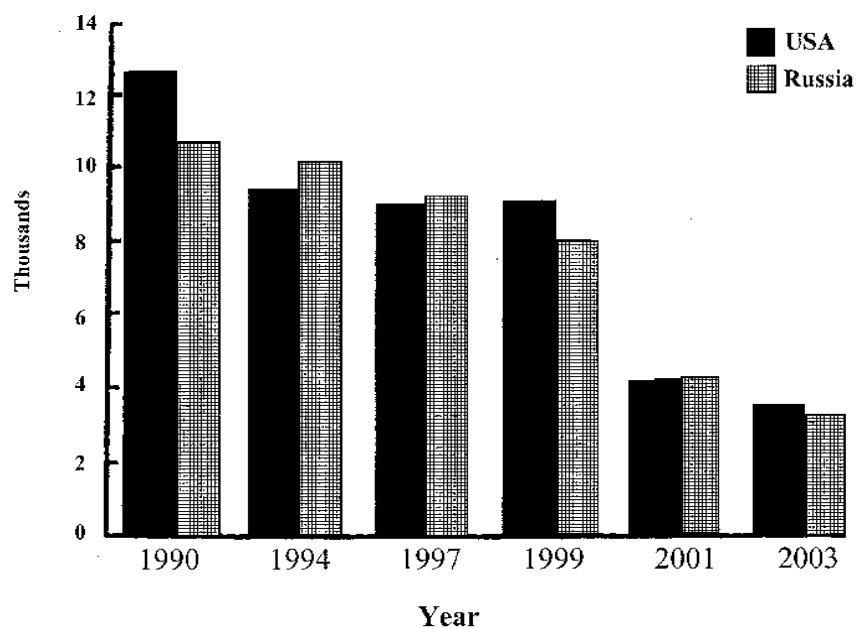


FIGURE 1

when the NPT was extended indefinitely. After twenty-five years the question had arisen as to whether or not the treaty should be extended — many people thought it should not. It was agreed to extend it indefinitely, but the nuclear powers had to reaffirm their commitment, as stated in Article 6 of the NPT, to proceed in good faith on effective measures for achieving nuclear disarmament.

And yet the policies of the nuclear states are in direct contradiction with this commitment. They still believe that nuclear weapons are needed for their security, and primarily they want the nuclear weapons as a deterrent — a deterrent not only against a nuclear attack, but also against any other form of aggression with any other weapons, even with conventional weapons. In other words, they want the nuclear weapons as a deterrent against any kind of war.

Now this attitude, the deterrent argument, is a carry-on of the state of mind which existed during the four decades of the Cold War. Many people believe that it was nuclear weapons which deterred the Soviet Union from attacking the West, that it was thanks to nuclear weapons that we avoided a Third World War. Since the end of the Cold War many western historians have acquired access to former secret documents of the Soviet Union and they found nothing to support this position. In any case, the Cold War is over and the Soviet Union no longer exists; the ideological struggle between the East and West has come to an end. But the mentality and mind set of the Cold War period survived. This is the policy of the nuclear weapons states. If you talk to them about getting rid of nuclear weapons, they don't listen, stating that this is a fanciful idea of a fringe group and there is no need to pay any attention to it.

However, things are changing. The nuclear weapons states are now forced to listen to those who advocate the elimination of nuclear weapons. I have seen it, in my own experience in Pugwash. When the Cold War was over, we started a project on the creation of a nuclear-weapons-free world. The result of this project was a book entitled: *A Nuclear-Weapons-Free World: Is it Desirable, Is it Feasible?* We started the project in 1990 and published the book in 1993. Many people thought at the time that I was just talking nonsense. Even in Pugwash many of my colleagues thought that this

goal would never be realized. It has been a great satisfaction to me to see the changes in attitude. The very sceptics who were so much against the idea have come around and they are now enthusiastic supporters of the idea of a nuclear-weapon-free world. This book has now been published in many languages, including all of the languages of the nuclear weapons states, and it is available in paperback. I think that it did play a role in changing the views of many people. We now have people in very high positions — in the United States, senior military officials, political leaders, etc. — who have come around to the idea that we should eliminate nuclear weapons.

I'll just give a few names: of the eight in Table 1, four are military leaders all of whom have been Commanders-in-Chief, and four are political leaders, three of whom have been Secretaries of State. I shall quote two of them. One is Robert McNamara who was Secretary of Defense at the fateful time of the Cuban Missile Crisis in 1962. He said: "the indefinite combination of human fallibility and nuclear weapons carries a high risk of a potential catastrophe." Even more remarkable than Robert McNamara, who has been working against nuclear weapons for quite a long time, is General Lee Butler who until very recently was Commander-in-Chief of the United States Air Command and was responsible for all the air force and navy nuclear deterrent. He came around completely and is now enthusiastically for the elimination of nuclear weapons. He said:

**TABLE 1** - U.S. Personalities for a NFWF

General Andrew Goodpaster  
General Charles Horner  
General Larry Welch  
General Lee Butler  
Secretary Melvin Laird  
Mr. Paul Nitze  
Secretary Les Aspin  
Secretary Robert McNamara

We are still too rigidly conditioned by an arms control mentality deeply rooted in the cold war. We fall too readily into the intellectual trap of judging the goal of elimination against current political conditions. We forget too quickly how seemingly intractable conflicts can suddenly yield under the weight of reason or with a change of leadership.

In addition, we have had a number of groups — respectable bodies, particularly in the United States — which have carried out studies and have come to the same conclusion. I will mention the Henry L. Stimson Center in Washington which carried out a comprehensive study and came to the conclusion that we must eliminate nuclear weapons. Soon there will be a report coming out from CISAC, the Committee on International Security and Arms Control of the U.S. National Academy of Science, with a similar conclusion. We had a press release by sixty-one generals and admirals from seventeen countries and, of course, we had the decision of the International Court of Justice which said that the nuclear weapons states must resume immediately their efforts to get rid of nuclear weapons.

But, perhaps, the most important of these studies was the one carried out by the so-called Canberra Commission set up by the Australian Government as a direct result of the Pugwash book, as was told to me by the Australian Minister of Foreign Affairs, Garnet Evans, at the time. The Commission was set up by the Labour Government under Prime Minister Paul Keating. Soon afterward he lost the election, but the new Conservative Government, under Prime Minister John Howard, endorsed the mandate given to the Commission.

The mandate was very simple. It asked the Commission “to develop ideas and proposals for a concrete and realistic program to achieve a world totally free of nuclear weapons.” There were seventeen commissioners from twelve countries, but they acted as individuals — they were not delegates or representatives of their governments. You probably recognize a number of names in Table 2. I have already mentioned Robert McNamara and Lee Butler. From

**TABLE 2:** The Members of the Canberra Commission

1. Ambassador Celso Amorim, Brazilian Ambassador to the UN.
2. General George Lee Butler, Ret., former Commander in Chief of US Strategic Command.
3. Ambassador Richard Butler, Australian Ambassador to the UN and Chairman of the Commission.
4. Field Marshal Lord Michael Carver, former British Chief of Defence Staff.
5. Captain Jacques-Yves Cousteau, French oceanographer and ecologist.
6. Ambassador Jayantha Dhanapala, Sri Lankan Ambassador to the US. Chaired the 1995 Nuclear Non-Proliferation Treaty Review and Extension Conference.
7. Ambassador Rolf Ekeus (Sweden), Head of the UN Special Commission on Iraq.
8. Ambassador Dr. Nabil Elaraby, Egyptian Ambassador to the UN.
9. Professor Ryukichi Imai, former Japanese Ambassador to the Conference on Disarmament. Counsellor to the Japan Atomic Power Company.
10. Ambassador Qian Jiadong, Deputy Director General of the China Center for International Studies.
11. Dr. Ronald S. McCoy, Chairman of the Malaysian Chapter of International Physicians for the Prevention of Nuclear War.
12. Mr. Robert McNamara, former US Secretary of Defense.
13. Professor Robert O'Neill (Australia), Professor of History and War at Oxford University.
14. Mr. Michel Rocard, former Prime Minister of France.
15. Professor Joseph Rotblat (UK), winner of the 1995 Nobel Peace Prize. President of the Pugwash Conferences on Science and World Affairs. Worked on the atom bomb during World War II in Liverpool (UK) and Los Alamos (US).
16. Professor Ronald Sagdeev (Russia), former President Gorbachev's Science Advisor.
17. Dr. Maj Britt Theorin (Sweden), former Chair of the UN's Commission of Experts on Nuclear Weapons. President of the International Peace Bureau. Member of the European Parliament.



Britain there is Field Marshall Lord Carver; from France the former Prime Minister Michel Rocard; Ambassador Rolf Ekeus who is very well known as the person in charge of the effort to get rid of all kinds of weapons of mass destruction in Iraq. Among them, they cover a wide range of backgrounds and professions: ethnic, cultural, geographical, and political. You have here a lot of knowledge and talent, experience and expertise. The remarkable thing about this Commission is that it reached a unanimous conclusion. It is amazing that it was unanimous when you consider the backgrounds of these people — many prima donnas! You would expect them to have different views; but the differences were considered to be secondary to the main objective which was the judgment for the elimination of nuclear weapons. I quote Lee Butler, who said: “A judgment which now has become a deeply held conviction that a world free of the threat of nuclear weapons is necessarily a world devoid of nuclear weapons.”

The Commission starts off with a one-page statement which I feel is very important. I would like to read out several quotations from it. It starts out by saying:

The destructiveness of nuclear weapons is immense. Any use would be catastrophic. Nuclear weapons pose an intolerable threat to all humanity and its habitat, yet tens of thousands remain in arsenals built up at an extraordinary time of deep antagonism. That time has past, yet assertions of their utility continue.... Nuclear weapons are held by a handful of states which insist that these weapons provide unique security benefits and yet reserve uniquely to themselves the right to own them. This situation is highly discriminatory and thus unstable. It cannot be sustained. The possession of nuclear weapons by any state is a constant stimulus to other states to acquire them. The world faces threats of nuclear proliferation and nuclear terrorism. These threats are growing. They must be removed.

It concludes with the statement:

The opportunity now exists, perhaps without precedent or recurrence, to make a new and clear choice to enable the world to conduct its affairs without nuclear weapons and in accordance with the principles of the Charter of the United Nations. A nuclear weapons free world can be secured and maintained through political commitments, and anchored in an enduring and binding legal framework.

This last sentence brings me from the WHY to the HOW: how are we going to achieve a nuclear-weapon-free world? The first thing which the Committee recommends is, perhaps, the most important; namely, a commitment by the nuclear weapons states. These states should commit themselves unequivocally to the elimination of nuclear weapons and agree to start work immediately on the practical steps for this achievement. This commitment should be made at the highest political level. After stating this commitment, the Committee goes on to state recommendations which can be carried out immediately. We have six such steps which could almost be started tomorrow. The first two take nuclear forces off alert and remove warheads from the delivery vehicles. They are more of a military nature. What they are intended to do is to reduce the danger of accidental or unauthorized use of nuclear weapons. This danger still exists and this step can be taken immediately, even unilaterally, by either side. Next they call for the end of deployment of non-strategic nuclear weapons. We still have a number of tactical nuclear weapons in existence and they can again be very easily removed. If this were done, it would mean that no longer would nuclear weapons be used as an instrument of war. The fourth recommendation is intended to bring an end to nuclear testing. We do not have a comprehensive nuclear test ban treaty — because India is opposed to it for various reasons — nevertheless, the United Nations General Assembly has agreed and 140 nations have signed a nonproliferation treaty, including all five nuclear weapons states. Although it is not

ratified, I believe that there will be no more nuclear testing by the nuclear powers. The fifth recommendation asks for immediate negotiations to further reduce the nuclear arsenals and this will go beyond START II to START III. This is rather important because, paradoxically, if Russia were to implement START II it would have to *increase* its number of nuclear warheads! They don't have the single-headed warheads which are required by this treaty. They would have to build new weapons which is, of course, nonsense. The only way to solve this problem is to go immediately to START III and to reduce the nuclear weapons by a further factor of two or three, to the level of the other nuclear weapons states: Britain, France and China. The last recommendation asks that they agree to a no-first-use undertaking.

I find the last recommendation perhaps the most important of all. Should the nuclear weapons states agree to this — that they will never be the first to use nuclear weapons — it will mean a real breakthrough. It will mean that the only purpose of nuclear weapons is against a nuclear attack and not for anything else. The Basic doctrine will have been changed. If the only purpose of nuclear weapons is to deter a nuclear attack, then if all agree not to have nuclear weapons, there would not be any need of them. Logically it could follow that once this is agreed then we can continue to their total elimination. I want to remind you that although this recommendation came out from the Canberra Commission just now, we had already in 1991 the CISAC Committee of the U.S. National Academy of Sciences saying that “nuclear weapons serve no purpose beyond the deterrence of their use by other nuclear weapons states.” I want to remind you that among the members of CISAC was a former Secretary of Defense of the United States, although he did not say this when he was in office.

The problem then is how do we get rid of nuclear weapons? There were various views expressed to the Canberra Commission. I want to present to you my own views. The Stimson Report said that there should be four phases before we go down to zero. Each phase is conditioned by certain other happenings, not necessarily in the nuclear field. For example, there should be regional security ar-

rangements, and this would put it off for a very long time. The Canberra Commission did not take this view; it did not link the elimination of nuclear weapons with any other security requirements.

I believe that we should proceed toward nuclear disarmament in a continuous process. What needs to be done is to begin by deciding to have a treaty — or convention — by which it will become unlawful to possess or acquire any nuclear weapons. Such a convention could be modelled on the Chemical Weapons Convention which will come into force next month, in April, even though the United States has not yet ratified it. I now want to read out the first article of the Chemical Weapons Convention (CWC) which should be a model for the Nuclear Weapons Convention (NWC). It says in part:

Each State Party to this Convention undertakes never under any circumstances: (a) To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone; (b) To use chemical weapons; (c) To engage in any military preparations to use chemical weapons; (d) To assist, encourage or induce in any way, anyone to engage in any activity prohibited to a State Party under this Convention.

If you replace the word “chemical” by “nuclear,” then this is the way I would like to see the NWC. What is the answer of the nuclear weapons states? This is the crux of the matter. Having lost the argument for the retention of nuclear weapons, because the logic of the Canberra Commission is unassailable, they have now shifted ground. They say: “it cannot be done; even if we wanted to do it.” The argument which they use, expressed in very simple terms, is that the genie is out of the bottle! What they mean by this is that nuclear weapons cannot be disinvented. We cannot erase from our memories how to make nuclear weapons. Therefore, even if we all agree to eliminate nuclear weapons we cannot guarantee that at some time in the future some country will not build up an arsenal of nuclear weapons secretly and then use it to blackmail another country or the

rest of the world. “Therefore,” they say, “we cannot do it.”

Of course, nuclear weapons cannot be disinvented. This is a fact; but this is not a sufficient argument to keep them. There are many undesirable or even dangerous consequences of the advances of science and technology and yet we manage to deal with them. The best example is, in fact, the CWC. Chemical weapons can also not be disinvented; in fact, it is much easier to reintroduce chemical weapons than nuclear weapons. Yet, all the nations have agreed now to have a chemical weapons convention and we are also going to have a biological weapons convention. Of course it is true to say that nuclear weapons are in a somewhat different category because of their enormous destructiveness. For this reason, we will need more precautions than in the case of chemical or biological weapons. This is why the problem is more difficult — I don’t deny it — but it can be tackled.

There are special conditions attached to a convention to eliminate nuclear weapons. I mention two prerequisites of such a convention — universality and openness — which do not exist in the case of the other types of weapons. By universality I mean that once a number of nations have agreed on the elimination of nuclear weapons, then this should be binding on every country, even if it is not a party to the Convention. I do not believe that we will have agreement to eliminate nuclear weapons and yet allow a single country to have them. This would never be accepted. Therefore once, for example, the Conference on Disarmament in Geneva agrees by consensus to such a convention, the United Nations Security Council should declare that it applies to all states, that the possession of nuclear weapons is a crime against international law. The second point is openness. Once again, it would be absurd to think that we will have a treaty to eliminate nuclear weapons and yet allow certain establishments to carry out nuclear weapons experiments in secret. This would never be agreed to. The condition for openness means that all the present nuclear weapons research laboratories like Los Alamos and Livermore, Cheliabinsk and Arzamas, Aldermaston and so on, will either have to close down or convert into peaceful research carried out in the open.

This will create problems because there are other types of nuclear research which may go on secret; for example, industrial research. Sometimes even scientists try to carry out their work in secret to make sure that they get the Nobel prize and not their competing colleagues. But I am sure these problems can be overcome. Once we have agreed on this, what are the other conditions which we need to achieve such a convention? We need a safeguard system, a verification system to ensure that no country will cheat — that there will be no violation of the Convention. Because of the special role of nuclear weapons, we believe that there must be two verification systems, not one as in the other cases: a technological and a societal system. The technological system is similar to the one which has been applied to the Chemical Weapons Convention. It will be run by an international authority which will employ many experts in the field. Some people say that this should be the International Atomic Energy Agency (IAEA) in Vienna, while other people are unhappy with this. There are good reasons why the IAEA should be this authority and I shall come to this in a moment.

We already have a great deal of experience in the dismantling of nuclear weapons. At the present time the United States and Russia are dismantling their nuclear weapons at the rate of nearly two thousand warheads per year each. This is done by bilateral agreements between the United States and Russia but, in the future, these will have to become international agreements. To start with, for the dismantling of nuclear weapons we must have an inventory of all existing warheads, and this requires examination of all the documents relating to the manufacture of the warheads. Then you want to identify the warheads before they are dismantled, so they are not substituted by dummies. We can identify each warhead by its radiation which is almost like a fingerprint of each warhead. You then transport them to designated facilities where they are broken up into their components. The non-nuclear components are crushed or burned and, finally, you separate the nuclear materials and store them for future disposal.

This is where the problem begins: the disposal of plutonium or highly enriched uranium. The uranium problem is relatively easy

because all you have to do is to blend it with natural or depleted uranium and it then ceases to be nuclear weapons material. The United States, in order to encourage Russia to do the same, has agreed to buy 500 tons of highly enriched uranium for such treatment over the next twenty years. The problem is more difficult with plutonium because there is no isotope with which it can be diluted to prevent its use for nuclear weapons. Again, a study has been done by the U.S. National Academy of Sciences. There are many ways in which you can try to dispose of the plutonium but eventually they come down to two methods. One is called the spent fuel option. What they mean is that you make the plutonium into an oxide which you mix with uranium oxide and then you use the mixture as a fuel in a reactor. After “burning” for several years, when it comes out of the reactor the plutonium is mixed with the highly radioactive fission products. This acts as a barrier against the misuse of the plutonium. Nobody can steal it because of the immense radioactivity. The other method is not to go through this cycle but to blend the element with glass (called vitrification) and mix it with fission products so that again it is protected from theft. There are long discussions going on about which of these two methods to choose, and just now it has been decided to use both options in parallel because we do not know which will work best. Anyhow, the problem can be solved.

However, there is another very important problem which is very difficult to tackle. I have been talking so far about the plutonium from the warheads — the military plutonium. But the plutonium from civilian reactors must also be considered. Contrary to what the nuclear industry has been saying for a very long time, the plutonium which arises from civilian reactors is also material for nuclear weapons. The difference between reactor-grade plutonium and weapons-grade plutonium is very small. There is, of course, a difference; but nevertheless, one can make bombs from reactor-grade plutonium. Therefore, the disposal problem applies not only to the military plutonium, but also to the “peaceful” plutonium, and the problem is that there is much more of the peaceful plutonium. Table 3 lists the inventory in 1995 and you see that there are 270 tons of military plutonium but 914 tons from the civilian plutonium. Fur-

**TABLE 3** - Plutonium Inventory, 1995 (tonnes)**Military**

Weapon-grade	249	
Reactor-grade	<u>22</u>	
Subtotal		270

**Civilian**

In spent reactor fuels	755	
Separated in store	118	
Recycled	<u>41</u>	
Subtotal		914

thermore, every year about 70 tons of new plutonium is produced by the civilian reactors. This means that we must dispose of more than a thousand tons of plutonium and this places an enormous burden on the verification system. This is probably why the IAEA has been asked to look into this, because the IAEA has the responsibility to ensure that no plutonium from civilian reactors is stolen for weapons purposes. But their safeguard system has been shoddily lax, as has been shown on a number of occasions, and they have been asked to strengthen it. A new system has evolved, called “93 + 2”, and this system is very much more rigid. However, even with this system, the probability of detecting any violation or misuse of the plutonium is about 85%. That is a high percentage but, considering that it takes only a few kilograms of plutonium to make a bomb, it is not good enough! In other words, the technological safeguard system is not sufficient.

For this reason we propose an additional system which we call societal verification. As the name implies, in this system not just the experts, but everybody — each one of you — will be involved in ensuring that there is no violation of the convention. Considering the hazard from such a violation, it is the duty of every-



one to be a custodian of the Convention, to ensure the future existence of mankind. All of us have to be involved in this. It means that the Convention should contain a clause that will mandate every country to pass a national law which will make it the right and the duty of every citizen to notify the international authority about any suspicion of attempts to violate the international treaty.

A special role will be given to the scientific community because in order to make a bomb secretly, a country will have to have many scientists involved, will have to build a specialized laboratory, and will have to acquire specialized equipment. It will be very difficult for all this to go on without scientists getting to know about it — particularly if a registry of scientists is established, and it is known where scientists are working. This is why part of the societal verification will be assigned to scientists. Incidentally, this idea about societal verification applies not only to nuclear weapons, but in general. I believe that “whistle blowing” should become part of the ethos of scientists. If scientists finds out about such matters — and they usually do before other members of society — it is their duty to blow the whistle. Even now this is being done. There are several examples in Russia, and an outstanding example is Mordechai Vanunu in Israel who is serving an 18-year sentence as the price for whistle blowing. But if my suggestion for societal verification is implemented, there will be protection for whistle blowers from the laws of the country.

I am not sure that many of you in the audience will accept this idea. When put forward for the first time, many people react negatively. They don't believe it can work. But here too I have seen changes in the five years since I put out this idea; many people have come around to it. In any case, some basic elements of this societal verification are already contained in the Chemical Weapons Convention because it calls on each state party to adopt the necessary measure to ensure its integrity. Therefore we already have some agreement on such methods.

I believe that with these two systems — the technological and the societal verifications — the probability of any cheating on the treaty will be very, very small. It will very, very small, but not

zero. One can never obtain zero in this world. Therefore I say that a nuclear weapon free world will not be absolutely safe, but it will definitely be safer than the present one. We are aiming for a safer world.

Finally, all this depends on the political will of the nuclear weapon states. If the will is there, then all these problems will be overcome. Here we come to the great difficulty which I mentioned before, that their mind set is still based on the deterrence arguments. Actually these policies are not only a remnant of the Cold War but they go back a long time in the history of our civilization. Our security policies are still based on the Roman dictum: *Qui desiderat pacem, praeparet bellum* (Let him who desires peace, prepare for war). Throughout the centuries we have been following this dictum. We tried to get peace by preparing for war, and throughout the centuries we had war and not peace! With the onset of nuclear weapons it became even worse. Now the motto is: *Qui desiderat pacem, praeparet arma* (Let him who desires peace stay armed to the teeth!) Amazingly this motto is still held now.

Peace, of course, requires active efforts, planning and sacrifice, but not in the sense that the nuclear powers mean it: to keep nuclear weapons, to keep all arms. What I feel needs to be done is to change this dictum to read: *Qui desiderat pacem, praeparet pacem* (Let him who desires peace, prepare for peace.) This should be our guiding principle in the twenty-first century.

In conclusion, I want to come back to what Robert McNamara, who said:

If we dare to break out of the mind set that has guided the nuclear strategy of the nuclear powers for over four decades, I believe we can indeed “put the genie back into the bottle.” If we do not, there is a substantial risk that the twenty-first century will witness a nuclear holocaust.

This is a statement by a man who knows what he is talking about. Speaking as a representative of Pugwash, I feel that I should finish

with a quotation from the Russell-Einstein Manifesto of 1955:

There lies before us, if we choose, continual progress in happiness, knowledge and wisdom. Shall we instead choose death because we cannot forget our quarrels? We appeal as human beings to human beings: remember your humanity and forget the rest. If we can do so, the way lies open to a new paradise. If we cannot, there lies before you the risk of universal death.

As the sole survivor of the signatories of the Russell-Einstein Manifesto, I feel it my mission to keep reminding you about this message. Remember your humanity!

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