

The Danger of Thermonuclear War

By Andrei Sakharov
Summer 1983

AN OPEN LETTER TO DR. SIDNEY DRELL

Dear Friend:

I have read your two splendid lectures—the speech on nuclear weapons at Grace Cathedral, October 23, 1982, and the opening statement to Hearings on the Consequences of Nuclear War before the Subcommittee on Investigations and Oversight. What you say and write about the appalling dangers of nuclear war is very close to my heart and has disturbed me profoundly for many years now. I decided to address an open letter to you, feeling it necessary to take part in the discussion of this problem, one of the most important facing mankind.

In full agreement with your general theses, I will express certain considerations of a more specific nature which, I think, need to be taken into account when making decisions. These considerations in part contradict some of your statements and in part supplement and, possibly, amplify them. It seems to me that my opinion communicated here in open discussion can prove of interest in view of my scientific, technological, and psychological experience, acquired in the period when I took part in work on thermonuclear weapons, and also because I am one of the few independent participants in this discussion in the U.S.S.R.

II

I fully agree with your assessment of the danger of nuclear war. In view of the critical importance of this thesis, I will dwell on it in some detail, perhaps repeating what is already well known.

Here, and later on, I use the terms "nuclear war" and "thermonuclear war" nearly interchangeably. Nuclear weapons mean atomic and thermonuclear weapons; conventional weapons mean any weapons with the exception of three types with the capability of mass destruction—nuclear, chemical, and bacteriological weapons.

A large nuclear war would be a calamity of indescribable proportions and absolutely unpredictable consequences, with the uncertainties tending toward the worse.

According to data from United Nations experts, by the end of 1980 the world's overall supply of nuclear weapons consisted of 50,000 nuclear charges.[1] The total power of these charges (most of which are in the 0.04- to 20-megaton range) amounts to 13,000 megatons according to the experts' estimates. The figures you have presented are not in conflict with those estimates. In this regard you mention that the total power of all the explosives used in the Second World War did not exceed six megatons (three megatons, according to the estimates with which I am familiar). However, when making this comparison one must take into account the greater relative efficacy of smaller charges with the same total power, but that does not alter the qualitative conclusions about the colossal destructive power of the nuclear weapons that have been amassed.

You also cite data according to which the U.S.S.R. at the present time (1982) has 8,000 thermonuclear charges deployed and the United States 9,000.[2] Many of these charges are warheads on ballistic missiles, and many of these are multiple independently-targetable reentry vehicles (MIRVs). It should be noted that the basis of the U.S.S.R.'s arsenal (70 percent, according to statements by TASS) consists of gigantic land-based missiles (in silos) and somewhat smaller intermediate-range missiles, on mobile launchers. Eighty percent of the U.S. arsenal consists of submarine-based nuclear missiles, much smaller but less vulnerable than silo-based missiles, and also of strategic bombers carrying nuclear bombs, some of which are apparently very powerful. It is doubtful whether masses of aircraft could penetrate Soviet territory deeply—but a more precise assessment of their capabilities must take the possibilities of cruise missiles into account; these would probably be able to penetrate the enemy's air defense systems.

Currently, the most powerful American ICBMs (I am not speaking of the planned MX) possess several times less throw-weight than the principal land-based Soviet missiles.[3] The American ones carry fewer MIRVs, and the yield of their warheads is less. (It is assumed that when dividing the throw-weight of a missile among several warheads—let's say ten—the aggregate yield of the multiple warheads is less than the yield of a large single warhead on the same missile. But MIRVs greatly increase the ability of one side to attack compact targets on the other. MIRVs are also highly destructive against targets spread out over a wide area such as large cities. The aggregate yield may be less than that of a large single warhead, but the destructiveness will remain high because of the multiple blasts spread out over the area. I have dwelt on these details since they may prove of substance in further discussion.)

You cite the estimates of the international journal of the Royal Swedish Academy, according to which an attack on the principal cities of the Northern Hemisphere by 5,000 warheads with a total power of 2,000 megatons will kill 750 million people as a result of the shock wave alone.[4]

I would like to add the following to that estimate:

1. The overall number of long-range nuclear weapons possessed by the five nuclear powers is three or four times greater than the figure used in the Swedish estimate and their overall power is six to seven times greater. The accepted average number of casualties per missile—250,000 people—cannot be considered an overestimate if one compares the accepted average power of a thermonuclear charge of 400 kilotons with the power of the 17-kiloton explosion at Hiroshima and the number of victims from its shock waves, no fewer than 40,000.
2. An extremely important factor in the destructive capability of nuclear weapons is thermal radiation. The fires at Hiroshima were the cause of a significant portion (up to 50 percent) of the fatalities. With the increase of the charges' power, the relative role of thermal radiation increases. Therefore, this factor significantly increases the number of direct casualties.
3. During an attack on especially dense, compact enemy targets (like silo-based missile launchers, command points, communication centers, government institutions, shelters, and other of the more important targets) it must be assumed that a significant portion of the explosions will be ground-level or low. In such cases there inevitably will be "traces," bands of dust fallout raised by the explosion from the surface and "impregnated" by the products of uranium fission. Therefore, although the direct radioactive effect of a nuclear charge takes place in a zone where everything alive is, in any case, annihilated by the shock wave and by fire, its indirect effect—through fallout—proves very substantial. The area contaminated by fallout so that the total dose of radiation exceeds the safety limit of 300 roentgens is, for a typical one-megaton nuclear charge, thousands of square kilometers!

During the ground-level test of the Soviet thermonuclear charge in August 1953, tens of thousands of people were evacuated beforehand from the zone where fallout was possible. People were only able to return to the settlement of Kara-aul in the spring of 1954! In war conditions an orderly evacuation is impossible. Hundreds of millions will flee in panic, often from one contaminated zone into another. Hundreds of millions of people will inevitably become the victims of radioactive irradiation, the mass migrations of people will make the chaos, the deterioration of sanitary conditions and the hunger all the greater. The genetic consequences of irradiation will threaten man as a biological species and all animal and plant life on the Earth.

I entirely agree with your basic idea that mankind has never encountered anything even remotely resembling a large nuclear war in scale and horror.

No matter how appalling the direct consequences of nuclear explosions, we cannot exclude that the indirect effects will be even more substantial. The indirect effects could be fatal for modern society, which is extraordinarily complex and thus highly vulnerable.

The general ecological consequences are just as dangerous, although by virtue of the complex nature of ecological interdependencies, forecasts and estimates are extremely difficult here. I will mention some of the problems discussed in the literature (in your talks, in particular) without assessing their seriousness, although I am certain that many of the dangers indicated are entirely real:

1. Continuous forest fires could destroy the greater part of the planet's forests. The smoke involved would destroy the transparency of the atmosphere. A night lasting many weeks would ensue on Earth followed by a lack of oxygen in the atmosphere. As a result, this factor alone, if real, could destroy life on the planet. In less pronounced form, this factor could have important ecological, economic, and psychological consequences.
2. High-altitude wartime nuclear explosions in space (particularly the thermonuclear explosion of ABM missiles and the explosion of attacking missiles whose purpose is to disrupt enemy radar) could possibly destroy or seriously damage the ozone layer protecting Earth from the sun's ultraviolet radiation. Estimates of this danger are very imprecise—if the maximal estimates are true then this factor is sufficient to destroy life.
3. Disruption of transportation and communication could prove critical in the complex modern world.
4. No doubt there will be a (complete or partial) disruption in the production and distribution of food, in water supply and sewage, in fuel and electric service, and in medicine and clothing—all on a continent-wide scale. The public health-care system will be disrupted, sanitary conditions will revert to a medieval level and may become even worse than that. It will be impossible in practice to provide medical assistance to the hundreds of millions who have been wounded, burned, or exposed to radiation.
5. Hunger and epidemics in a context of chaos and devastation could take more lives than the nuclear explosions would take directly. It is also not out of the question that, along with the "ordinary" diseases which will inevitably spread far and wide—influenza, cholera, dysentery, typhus, anthrax, plague, and others—entirely new diseases could arise as the result of the radiation-caused mutation of viruses as well as especially dangerous forms of the old diseases against which people and animals would have no immunity.
6. It is especially difficult to foresee mankind's maintaining any social stability in conditions of universal chaos. Great gangs will kill and terrorize people and struggle among themselves in keeping with the laws of the criminal world: "You die today, I'll die tomorrow."

Of course, our experience of social upheaval and war demonstrates that mankind possesses unexpected reserves; people's vitality in extreme situations surpasses what could have been imagined a priori. But even if mankind were able to preserve itself as a social body, which seems highly unlikely, the most important social institutions—the foundation of civilization—would be destroyed.

In sum, it should be said that all-out nuclear war would mean the destruction of contemporary civilization, hurl man back centuries, cause the deaths of hundreds of millions or billions of people, and, with a certain degree of probability, would cause man to be destroyed as a biological species and could even cause the annihilation of life on earth.

Clearly it is meaningless to speak of victory in a large nuclear war which is collective suicide.

I think that basically my point of view coincides with yours as well as with the opinion of a great many people on earth.

III

I am also in complete agreement with your other conclusions. I agree that if the "nuclear threshold" is crossed, i.e., if any country uses a nuclear weapon even on a limited scale, the further course of events would be difficult to control and the most probable result would be swift escalation leading

from a nuclear war initially limited in scale or by region to an all-out nuclear war, i.e., to general suicide.

It is relatively unimportant how the "nuclear threshold" is crossed—as a result of a preventive nuclear strike or in the course of a war fought with conventional weapons, when a country is threatened with defeat, or simply as a result of an accident (technical or organizational).

In view of the above, I am convinced that the following basic tenet of yours is true: Nuclear weapons only make sense as a means of deterring nuclear aggression by a potential enemy, i.e., a nuclear war cannot be planned with the aim of winning it. Nuclear weapons cannot be viewed as a means of restraining aggression carried out by means of conventional weapons.

Of course you realize that this last statement is in contradiction to the West's actual strategy in the last few decades. For a long time, beginning as far back as the end of the 1940s, the West has not been relying on its "conventional" armed forces as a means sufficient for repelling a potential aggressor and for restraining expansion. There are many reasons for this—the West's lack of political, military, and economic unity; the striving to avoid a peacetime militarization of the economy, society, technology, and science; the low numerical levels of the Western nations' armies. All that at a time when the U.S.S.R. and the other countries of the socialist camp have armies with great numerical strength and are rearming them intensively, sparing no resources. It is possible that for a limited period of time the mutual nuclear terror had a certain restraining effect on the course of world events. But, at the present time, the balance of nuclear terror is a dangerous remnant of the past! In order to avoid aggression with conventional weapons one cannot threaten to use nuclear weapons if their use is inadmissible. One of the conclusions that follows here—and a conclusion you draw—is that it is necessary to restore strategic parity in the field of conventional weapons. This you expressed somewhat differently, and without stressing the point.

Meanwhile this is a very important and non-trivial statement which must be dwelt on in some detail.

The restoration of strategic parity is only possible by investing large resources and by an essential change in the psychological atmosphere in the West. There must be a readiness to make certain limited economic sacrifices and, most important, an understanding of the seriousness of the situation and of the necessity for some restructuring. In the final analysis, this is necessary to prevent nuclear war, and war in general. Will the West's politicians be able to carry out such a restructuring? Will the press, the public, and our fellow scientists help them (and not hinder them as is frequently now the case)? Can they succeed in convincing those who doubt the necessity of such restructuring? A great deal depends on it—the opportunity for the West to conduct a nuclear arms policy that will be conducive to the lessening of the danger of nuclear disaster.

In any case, I am very glad that you (and earlier, in another context, Professor Panofsky) have spoken out in favor of strategic parity in the area of conventional weapons.[5]

In conclusion, I should stress especially that a restructuring of strategy could of course only be carried out gradually and very carefully in order to prevent a loss of parity in some of the intermediate phases.

IV

As I have understood them, your further thoughts on nuclear weapons per se amount to the following:

It is necessary to conduct a balanced reduction of the nuclear arsenal, and a first stage in this process of nuclear disarmament might be a mutual freeze on the currently existing nuclear arsenals. I will quote you: "Decisions in the area of nuclear weapons should be based simply on the criterion of achieving a reliable deterrent and not on other additional demands relating to nuclear war since, generally speaking, such demands are not limited by anything and are not realistic." This is one of your central theses.

For talks on nuclear disarmament you propose that one quite simple—and, within the limits of the possible, fair—criterion for assessing nuclear strength be worked out. As that criterion you propose taking the sum total of the number of delivery vehicles and the total number of nuclear charges which can be delivered (probably one should assume the maximal number of certain standard or conventional charges which can be delivered by a given type of missile with a corresponding division of the usable weight).

I will begin by discussing that latter proposal of yours (made jointly with your student, Kent Wisner).[6] This proposal seems practical to me. Your criterion takes into account delivery vehicles of various throw-weights by assigning them various weight factors. This is very important—the assigning of an equal weight factor to both the small American missiles and the large Soviet missiles was one of the points for which I, at one time, criticized the SALT I Treaty (while in general viewing the very fact of the talks and the concluding of the Treaty in a positive light). Here, in distinction to criteria using the power of the charge, as a rule not published officially, the number of deliverable charges is easy to determine. Your criterion also takes into account the fact that, for example, five missiles each carrying one warhead have a significant tactical advantage over one large missile carrying five warheads. Of course, the criterion you propose does not encompass all the parameters like distance, accuracy, or degree of vulnerability—they will have to be allowed for supplementarily or, in some cases, not taken into account so as to facilitate agreements.

I hope that your (or some analogous) criterion will be accepted as the basis for negotiations both on intercontinental missiles and (independently) on medium-range missiles. In both cases it will be much more difficult than it now is to insist on unfair conditions in the agreements and possible to move from word to deed more swiftly. Most likely, the very acceptance of your (or an analogous) criterion will require a diplomatic and propaganda struggle—but it's worth it.

V

From this relatively specific question I will move to one more general, more complex and controversial. Is it actually possible when making decisions in the area of nuclear weapons to ignore all the considerations and requirements relevant to the possible scenarios for a nuclear war and simply limit oneself to the criterion of achieving a reliable deterrent—when that criterion is understood to mean an arsenal sufficient to deal a devastating blow in response? Your answer to this question—while perhaps formulating it somewhat differently—is positive and you draw far-reaching conclusions.

There is no doubt that at present the United States already possesses a large number of submarine-based missiles and charges carried by strategic bombers which are not vulnerable to the U.S.S.R. and, in addition, has silo-based missiles though they are smaller than the U.S.S.R.'s—all these in such amounts that, were those charges used against the U.S.S.R., nothing, roughly speaking, would be left of it. You maintain that this has already created a reliable deterrent—independently of what the U.S.S.R. and the United States have and what they lack! Therefore, you specifically consider the building of the MX missile unnecessary and similarly consider irrelevant the arguments which are advanced in support of developing it—the U.S.S.R.'s substantial arsenal of intercontinental missiles with large throw-weight which the United States does not have; and the fact that Soviet missiles and MX missiles have multiple warheads so that one missile can destroy several enemy silos during a missile duel. Therefore you consider it acceptable (with certain reservations) for the United States to freeze the nuclear arsenals of the United States and the U.S.S.R. at their current numerical levels.[7]

Your line of reasoning seems to me very strong and convincing. But I think that the concept presented fails to take into account all the complex realities of the opposition that involves two world systems and that there is the necessity (despite your stance) for a more specific and comprehensive unbiased consideration than a simple orientation toward a "reliable deterrent" (in the meaning of the word as formulated above, i.e., the possibility of dealing a devastating retaliatory strike). I will endeavor to explain this statement.

Precisely because an all-out nuclear war means collective suicide, we can imagine that a potential aggressor might count on a lack of resolve on the part of the country under attack to take the step leading to that suicide, i.e., it could count on its victim capitulating for the sake of saving what could be saved. Given that, if the aggressor has a military advantage in some of the variants of conventional warfare or—which is also possible in principle—in some of the variants of partial (limited) nuclear war, he would attempt to use the fear of further escalation to force the enemy to fight the war on his (the aggressor's) own terms. There would be little cause for joy if, ultimately, the aggressor's hopes proved false and the aggressor country perished along with the rest of mankind.

You consider it necessary to achieve a restoration of strategic parity in the field of conventional arms. Now take the next logical step—while nuclear weapons exist it is also necessary to have strategic parity in relation to those variants of limited or regional nuclear warfare which a potential enemy could impose, i.e., it is really necessary to examine in detail the various scenarios for both conventional and nuclear war and to analyze the various contingencies. It is of course not possible to analyze fully all these possibilities or to ensure security entirely. But I am attempting to warn of the opposite extreme—"closing one's eyes" and relying on one's potential enemy to be perfectly sensible. As always in life's complex problems, some sort of compromise is needed.

Of course I realize that in attempting not to lag behind a potential enemy in any way, we condemn ourselves to an arms race that is tragic in a world with so many critical problems admitting of no delay. But the main danger is slipping into an all-out nuclear war. If the probability of such an outcome could be reduced at the cost of another ten or fifteen years of the arms race, then perhaps that price must be paid while, at the same time, diplomatic, economic, ideological, political, cultural, and social efforts are made to prevent a war.

Of course it would be wiser to agree now to reduce nuclear and conventional weapons and to eliminate nuclear weapons entirely. But is that now possible in a world poisoned with fear and mistrust, a world where the West fears aggression from the U.S.S.R., the U.S.S.R. fears aggression from the West and from China, and where China fears it from the U.S.S.R., and no verbal assurances and treaties can eliminate those dangers entirely?

I know that pacifist sentiments are very strong in the West. I deeply sympathize with people's yearning for peace, for a solution to world problems by peaceful means; I share those aspirations fully. But, at the same time, I am certain that it is absolutely necessary to be mindful of the specific political, military, and strategic realities of the present day and to do so objectively without making any sort of allowances for either side; this also means that one should not proceed from an a priori assumption of any special peace-loving nature in the socialist countries due to their supposed progressiveness or the horrors and losses they have experienced in war. Objective reality is much more complicated and far from anything so simple. People both in the socialist and the Western countries have a passionate inward aspiration for peace. This is an extremely important factor, but, I repeat, itself alone does not exclude the possibility of a tragic outcome.

VI

What is necessary now, I believe, is the enormous practical task of education so that specific, exact, and historically and politically meaningful objective information can be made available to all people, information that will enjoy their trust and not be veiled with dogma and propaganda. Here one must take into account that, in the countries of the West, pro-Soviet propaganda has been conducted for quite a long time and is very goal-oriented and clever, and that pro-Soviet elements have penetrated many key positions, particularly in the mass media.

The history of the pacifist campaigns against the deployment of missiles in Europe is telling in many respects. After all, many of those participating in those campaigns entirely ignore the initial cause of NATO's "dual decision"—the change in strategic parity in the 1970s in favor of the U.S.S.R.—and, when protesting NATO's plans, they have not advanced any demands on the U.S.S.R. Another example: President Carter's attempt to take a minimal step toward achieving balance in the area of conventional arms, i.e., to introduce draft registration, met with stiff resistance. Meanwhile, balance

in the area of conventional arms is a necessary prerequisite for reducing nuclear arsenals. For public opinion in the West to assess global problems correctly, in particular the problems of strategic parity both in conventional and in nuclear weapons, a more objective approach, one which takes the real world strategic situation into account, is vitally needed.

VII

A second group of problems in the field of nuclear weapons about which I should make a few supplementary remarks here concerns the talks on nuclear disarmament. For these talks to be successful the West should have something that it can give up! The case of the "Euromissiles" once again demonstrates how difficult it is to negotiate from a position of weakness. Only very recently has the U.S.S.R. apparently ceased to insist on its unsubstantiated thesis that a rough nuclear parity now exists and therefore everything should be left as it is.

Now, the next welcome step would be the reduction of the number of missiles—which must include a fair assessment of the quality of missiles and other means of delivery (i.e., the number of charges deliverable by each carrier, its range and accuracy, and its degree of vulnerability—the last being greater for aircraft and less for missiles;[8] most likely, it would be expedient to use your criterion, or analogous ones). And what is absolutely at issue here is not moving the missiles beyond the Urals but destroying them. After all, rebasing is too "reversible." Of course, one also must not consider powerful Soviet missiles, with mobile launchers and several warheads, as being equal to the now-existing Pershing I, the British and French missiles, or the bombs on short-range bombers—as the Soviet side sometimes attempts to do for purposes of propaganda.

No less important a problem is that of the powerful silo-based missiles. At present the U.S.S.R. has a great advantage in this area. Perhaps talks about the limitation and reduction of these most destructive missiles could become easier if the United States were to have MX missiles, albeit only potentially (indeed, that would be best of all).

A few words about the military capabilities of powerful missiles: they can be used to deliver the largest thermonuclear charges for destroying cities and other major enemy targets—while for exhausting the enemy's ABM systems there will most likely be a simultaneous use of a "rain" of smaller missiles, false targets and so on. (Much is written about the possibility of developing ABM systems using super-powerful lasers, accelerated particle beams, and so forth. But the creation of an effective defense against missiles along these lines seems highly doubtful to me.) We present the following estimates to give an idea of what a powerful missile attack on a city would be like. Assuming that the maximal power of an individual charge carried by a large rocket would be of a magnitude of 15-25 megatons, we find that the area of complete destruction of dwellings would be 250-400 square kilometers, the area affected by thermal radiation would be 300-500 square kilometers, the zone of radioactive traces (in case of a ground-level explosion) would be 500-1000 kilometers long and 50-100 kilometers wide!

Of equal importance is the fact that powerful MIRVed missiles could be used to destroy compact enemy targets, in particular, similar silo-based enemy missiles. Here is a rough estimate of an attack of that type on launch sites. One hundred MX missiles (the number proposed by the Reagan Administration for the first round of deployment) could carry one thousand 600-kiloton warheads.

Considering the ellipse of concentration[9] and the hardness assumed for the Soviet launch sites, each of the warheads has, according to the data published in the American press, a 60-percent probability of destroying one launch site. During an attack on 500 Soviet launch sites, with two warheads targeted for each site, 16 percent will remain undamaged, i.e., "only" 80 missiles.

A specific danger associated with silo-based missiles is that they can be destroyed relatively easily as a result of enemy attack, as I have just demonstrated. At the same time, they can be used to destroy enemy launch sites in an amount four to five times larger than the number of missiles used for the attack. A country with large numbers of silo-based missiles (at the present time this is primarily the U.S.S.R., but if the United States carries out a major MX program, then it too) could be "tempted" to

use such missiles first before the enemy destroys them. In such circumstances the presence of silo-based missiles constitutes a destabilizing factor.

In view of the above, it seems very important to me to strive for the abolition of powerful silo-based missiles at the talks on nuclear disarmament. While the U.S.S.R. is the leader in this field there is very little chance of its easily relinquishing that lead. If it is necessary to spend a few billion dollars on MX missiles to alter this situation, then perhaps this is what the West must do. But, at the same time, if the Soviets, in deed and not just in word, take significant verifiable measures for reducing the number of land-based missiles (more precisely, for destroying them), then the West should not only abolish MX missiles (or not build them!) but carry out other significant disarmament programs as well.

On the whole I am convinced that nuclear disarmament talks are of enormous importance and of the highest priority. They must be conducted continuously—in the brighter periods of international relations but also in the periods when relations are strained—and conducted with persistence, foresight, firmness and, at the same time, with flexibility and initiative. In so doing, political figures should not think of exploiting those talks, and the nuclear problem in general, for their own immediate political gains but only for the long-term interests of their country and the world. And the planning of the talks should be included in one's general nuclear strategy as its most important part—on this point as well I am in agreement with you!

VIII

The third group of problems which should be discussed here is political and social in nature. A nuclear war could result from a conventional war, while a conventional war is, as is well known, a result of politics. We all know that the world is not at peace. There are a variety of reasons for this—national, economic, and social reasons, as well as the tyranny of dictators.

Many of the tragic events now occurring have their roots in the distant past. It would absolutely be wrong to see only Moscow's hand everywhere. Still, when examining the general trend of events since 1945 there has been a relentless expansion of the Soviet sphere of influence—objectively, this is nothing but Soviet expansion on a world scale. This process has spread as the U.S.S.R. has grown stronger economically (though that strength is one-sided), and in scientific, technological and military terms, and has today assumed proportions dangerously harmful to international equilibrium. The West has grounds to worry that the world's sea routes, Arab oil, and the uranium, diamonds, and other resources of South Africa are now threatened.

One of the basic problems of this age is the fate of the developing countries, the greater part of mankind. But, in fact, for the U.S.S.R., and to some degree for the West as well, this problem has become exploitable and expendable in the struggle for dominance and strategic interests. Millions of people are dying of hunger every year, hundreds of millions suffer from malnutrition and hopeless poverty. The West provides the developing countries with economic and technological aid, but this remains entirely insufficient due largely to the rising price of crude oil. Aid from the U.S.S.R. and the socialist countries is smaller in scale and, to a greater degree than the West's aid, military in nature and bloc-oriented. And, very importantly, that aid is in no way coordinated with world efforts.

The hot spots of local conflicts are not dying but are rather threatening to grow into global wars. All this is greatly alarming.

The most acutely negative manifestation of Soviet policies was the invasion of Afghanistan which began in December 1979 with the murder of the head of state. Three years of appallingly cruel anti-guerrilla war have brought incalculable suffering to the Afghan people, as attested by the more than four million refugees in Pakistan and Iran.

It was precisely the general upsetting of world equilibrium caused by the invasion of Afghanistan and by other concurrent events which was the fundamental reason that the SALT II agreement was not ratified. I am with you in regretting this but I cannot disregard the reasons I have just described.

Yet another subject closely connected to the problem of peace is the openness of society and human rights. I use the term the "openness of society" to mean precisely what the great Niels Bohr meant by it when introducing it more than 30 years ago.

In 1948, the U.N.'s member states adopted the Universal Declaration of Human Rights and stressed its significance for maintaining peace. In 1975, the relationship of human rights and international security was proclaimed by the Helsinki Final Act, which was signed by 35 countries including the U.S.S.R. and the United States. Among those rights are: the right to freedom of conscience; the right to receive and impart information within a country and across frontiers; the right to a free choice of one's country of residence and domicile within a country; freedom of religion; and freedom from psychiatric persecution.

Finally, citizens have the right to control their national leaders' decision-making in matters on which the fate of the world depends. But we don't even know how, or by whom, the decision to invade Afghanistan was made! People in our country do not have even a fraction of the information about events in the world and in their own country which the citizens of the West have at their disposal. The opportunity to criticize the policy of one's national leaders in matters of war and peace as you do freely is, in our country, entirely absent. Not only critical statements but those merely factual in nature, made on even much less important questions, often entail arrest and a long sentence of confinement or psychiatric prison.

In keeping with the general nature of this letter, I refrain here from citing many specific examples, but must mention the fate of Anatoly Shcharansky, who is wasting away in Chistopol Prison for the right to be visited by his mother and to write to her,^[10] and Yuri Orlov who, now for a third time, has been put for six months in the punishment block of a Perm labor camp, after having been beaten unmercifully in the presence of a warden.

In December 1982 there was an amnesty to honor the U.S.S.R.'s sixtieth anniversary but, just as in 1977 and in the preceding amnesties, there was a point made of excluding prisoners of conscience. So distant is the U.S.S.R. from the principles it proclaims, a country which bears such great responsibility for the fate of the world!

IX

In conclusion I again stress how important it is that the world realize the absolute inadmissibility of nuclear war, the collective suicide of mankind. It is impossible to win a nuclear war. What is necessary is to strive, systematically though carefully, for complete nuclear disarmament based on strategic parity in conventional weapons. As long as there are nuclear weapons in the world, there must be a strategic parity of nuclear forces so that neither side will venture to embark on a limited or regional nuclear war. Genuine security is possible only when based on a stabilization of international relations, a repudiation of expansionist policies, the strengthening of international trust, openness and pluralization in the socialist societies, the observance of human rights throughout the world, the rapprochement—convergence—of the socialist and capitalist systems, and worldwide coordinated efforts to solve global problems.

February 2, 1983

Andrei Sakharov

1 Editor's Note. "Charge" is a standard Soviet term-used frequently in arms control negotiations—embracing warheads on ballistic missiles and also armaments aboard bombers, which may be in bomb or missile form. There is a separate Russian word for warheads.

2 Editor's Note. These totals refer to the number of charges deployed on intercontinental ballistic missiles, submarine-launched ballistic missiles, and intercontinental-range bombers.

3 Editor's Note. The term "throw-weight" is normally defined as the weight of effective payload that can be delivered to an intended distance; effective payload may include penetration aids and navigational equipment as well as the nuclear charge itself. The term "yield" refers to destructive power, and the term "compact targets," as used in this paragraph, clearly refers to military targets in general and to specially hardened ICBM sites in particular.

4 Editor's Note. This estimate is contained in the publication of the Royal Swedish Academy, *Ambio*, Vol. XI, Nos. 2-3, 1982.

5 Editor's Note. The reference here is to Wolfgang K. H. Panofsky, Professor of Physics at Stanford and Director of the Stanford Linear Accelerator Center. Professor Panofsky notes that the statement accurately reflects his views.

7 Editor's Note. Professor Drell notes that maintaining the U.S. and Soviet nuclear arsenals at their present numerical levels is not the same as the kind of "freeze" usually discussed today-in that it would not preclude changes in the types of weapons within the numerical level. As to a strict "freeze" as usually discussed, Professor Drell's position, stated in his Grace Cathedral speech, is that "the freeze movement has been very helpful in creating . . . a constituency for arms control. Though I recognize some deficiencies of the freeze as literal policy, I support it and will vote for it as a mandate for arms control"

8 Editor's Note: The reference to greater relative vulnerability of aircraft vis-à-vis missiles apparently refers to vulnerability to defensive measures in the execution of a mission.

9 Editor's Note. This phrase is a literal translation from the Russian. It apparently refers to the shape and size of the area in which a given missile is likely to land in accordance with its accuracy characteristics. The comparable American term is "circular error probable," or "CEP," defined as the area within which a given missile has a 50-percent chance of landing. Such an area is in fact usually elliptical in shape rather than circular.

10 Editor's Note. At the time this Open Letter was written, Shcharansky was on a hunger strike, because he was denied all contact with his family. He has since been permitted an exchange of letters with his mother, and has ended his fast.

EDITOR'S NOTE

Dr. Drell's speech at Grace Cathedral (in San Francisco) is unpublished but available from him on request. His opening statement before the Subcommittee on Investigations and Oversight of the House Committee on Science and Technology is contained in the Committee's record of those hearings, *The Consequences of Nuclear War on the Global Environment*, September 15, 1982, p. 6. A more comprehensive statement of Dr. Drell's views will be found in his Danz Lectures, to be published by the University of Washington Press in June 1983 under the title *Facing the Threat of Nuclear Weapons*.

The Editor is grateful to Professor Drell and to Strobe Talbott for their help in refining the translation of technical terms, and in preparing the explanatory Editor's Notes, for which of course the Editor takes responsibility.

*Andrei Sakharov is the distinguished Soviet physicist, winner of the 1975 Nobel Peace Prize, currently in internal exile in Gorki. Among his works available in English are *Alarm and Hope* and *Collected Scientific Works*. This article was written for publication in response to the materials noted, which had been sent to him by Professor Drell of Stanford. The translation from the Russian was done by Richard Lourie and Efrem Yankelevich. Copyright (c) Andrei Sakharov.*