

Sakharov speaks from exile on nuclear-arms issues

"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," begins Andrei Sakharov in an open 7000-word letter to Sidney Drell (SLAC). The complete text of the letter, translated by Richard Lourie and Efrem Yankelevich, was published in *Foreign Affairs* in June (Summer, page 1001). Sakharov, exiled in Gorky, was responding to Drell's recent public comments on nuclear war and nuclear weapons. Drell is a member of Jason—a group of top physicists who regularly consult for the Defense Department and Federal agencies—a longtime adviser to the government on issues of national security and arms control, and an outspoken supporter of arms control. (For a comprehensive presentation of his views, see "Facing the Threat of Nuclear Weapons," recently published by the University of Washington Press.) In particular, Sakharov addressed issues explored by Drell in his testimony in September before a House subcommittee about the technical capabilities of nuclear weapons and the resulting consequences of a nuclear confrontation (before the Subcommittee on Oversight and Investigations of the House Committee on Science and Technology) and to the general public (at Grace Cathedral in San Francisco in October) about how technological improvements to nuclear weapons lend urgency to disarmament talks.

Sakharov spends the first third of his letter agreeing with Drell about the horrors of nuclear war. In fact, his discussion of the direct and indirect effects of nuclear war adds weight to Drell's comments. Sakharov also refers, for example, to the recent estimate of the Royal Swedish Academy, "according to which an attack on the principal cities of the Northern Hemisphere by 5000 warheads with a total power of 2000 megatons will kill 750 million people as a result of the shock wave alone." He then adds to that estimate. The number of deaths would be greater, he says, because the overall number of weapons owned by the five nuclear powers is three to four times

Andrei Sakharov, physicist and winner of the Nobel Peace Prize in 1975, shown here in his Moscow apartment before he was sent into internal exile in Gorky.



more than the total used by the Academy for this estimate, and the effects of both thermal radiation and fallout would also be greater. So, he says, "it should be said that all-out nuclear war would mean the destruction of contemporary civilization, hurl man back centuries, cause the death 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."

Strategy. Because the use of nuclear weapons is suicidal, and because it is not possible to limit their use once the "nuclear threshold" has been crossed, "*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," Sakharov says. If the use of nuclear weapons is unacceptable, they cannot act as a deterrent for conventional weapons, which leads Sakharov to conclude that strategic parity of conventional weapons must be

restored, a conclusion Drell also draws.

What is meant by a deterrent, however? Sakharov asks, is it possible to "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?" Drell has said that the US has enough secure nuclear arms available on bombers and submarines, as well as ongoing modernization programs to assure the security and effectiveness of these systems, that a window of vulnerability is not created by the Soviet numerical advantage in silo-based missiles. This, and the absence of a survivable land-based scheme for them, leads Drell to conclude that neither the development nor the deployment of the MX is needed.

Sakharov disagrees. We must consider specific scenarios, he says. For example, will a country retaliate with nuclear weapons after being devastated? What advantage would they gain? If they will not retaliate, doesn't this scenario encourage an aggressor to assume or hope for capitulation? To avoid such potential advantages that promote the fighting of a nuclear war,

Sakharov believes that parity in each variant of nuclear arms must also be restored.

"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," he says.

In our hopes and efforts for peace Sakharov reminds us not to lose sight of the complexity of the "specific political, military, and strategic realities of the present day." According to Sakharov, the practical problem of getting objective information about these realities is complicated by pro-Soviet propaganda, including pro-Soviet elements in mass media in the West. In line with his belief that a balance in conventional arms is needed to effect a reduction in nuclear arms, Sakharov cites the resistance to President Carter's attempt to reinstate the draft as one instance of public opinion gone awry due to insufficient information.

Disarmament talks. To achieve the goal of reducing the number of missiles, including "not moving the missiles behind the Urals but *destroying* them," there must first be a fair assessment of the quality, not just the quantity of the missiles. In fact, Sakharov endorses a counting scheme proposed by Drell, which uses the aggregate total of launchers plus warheads to assess nuclear strength. Such factors as accuracy, range, and degree of vulnerability have to be taken into account at the disarmament talks. Thus, he says, "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." Similarly, as the Soviets have an advantage in silo-based missiles, Sakharov suggests that, "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)."

In addition, he says, "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."

(See page 17, this issue.) Thus the specific and substantial military capabilities of large silo-based missiles must be considered. Sakharov says that one large rocket can carry a charge of up to 15-25 megatons. If used on a city, such a charge is capable of totally destroying dwellings in a 250-400 km² area, and of creating thermal radiation effects in a 300-500 km² area and radioactive fallout over an area 500-1000 km long by 50-100 km wide. These rockets can also accommodate multiple reentry vehicles. As an example, Sakharov considers an attack on Soviet launch sites by the 100 MX missiles proposed by the Reagan Administration for the first round of deployment. These missiles could carry 1000 600-kiloton warheads. Sakharov refers to American data that take into account both accuracy and the known hardness of Soviet launch sites, and lead to the determination that there is a 60% probability of destroying one launch site. Thus during an attack on 500 Soviet sites, with two warheads for each site, he calculates that "only" 80 missiles would remain. This ability, to destroy three to four times more enemy missiles than are used, is destabilizing. Eliminating them is thus, for Sakharov, the top priority for arms talks. As the Soviets will not give up their advantage voluntarily, the West must come to the arms talks with something to give up. Thus he says "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."

Social and political problems, however, not technology, precipitate wars, whether conventional or nuclear, he says. The "relentless expansion of the Soviet sphere of influence," and the exploitation of developing countries both by the Soviets and the West are sources of concern for Sakharov. He notes the Soviet invasion of Afghanistan, not only for the cruelty of the confrontation itself and the implied danger of escalation to global war, but also as a "fundamental reason that the SALT II agreement was not ratified." Peace is connected to openness in society and to human rights. "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!" he says. Even factual information is not freely accessible in the Soviet Union and many citizens have been incarcerated for transmitting information. Sakharov cites the plight of Anatoly Shcharansky, in Chistopol Prison, and Yuri Orlov in a Perm Labor Camp, but he neglects to speak of himself. As of this writing, Andrei Sakharov and his wife, Yelena Bonner, had both suffered heart attacks. Sak-

harov was being denied permission to travel to Moscow for treatment. His wife refused hospitalization for her condition and returned to Gorky because she felt that her husband could not be left alone. To date, no arrangements have been made for them to be hospitalized together in Moscow. —JC

Six of the new MacArthur Chairs go to physicists

The MacArthur Foundation has given new awards to establish John D. MacArthur Chairs at nine graduate research universities. The endowment of \$1.2 million to each institution is estimated to yield up to \$200 000 annually. John E. Corbally, president of the Foundation, said that the endowments are being given only once to help maintain the caliber of teaching at these universities. The Foundation left the choice of the field and the duration of the chairs to the university presidents. The schools have now made their choices and are installing the chairholders. Of the nine institutions receiving awards, six have decided to establish chairs in physics or related fields. Six new appointments are: Gerald J. Wasserburg, Caltech; Leo Kadanoff, University of Chicago; Anthony J. Leggett, University of Illinois, Urbana; Isadore M. Singer, MIT; Martinus J. G. Veltman, University of Michigan; and R. Byron Bird, University of Wisconsin, Madison.

Wasserburg, a geophysicist of international stature, is perhaps best known for his work on a chronology for the formation of the solar system. He has specialized in analyses of interplanetary dust, meteorites, moon rocks and terrestrial materials. Since its beginning in the 1960s, he has been involved

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