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 km^2 area, and of creating thermal radiation effects in a 300–500 km^2 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. Sakharov 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

KADANOFF

VELTMAN

BIRD

LEGGETT

in the Apollo program; he has served on government advisory panels supervising the missions to the Moon and has played an instrumental role in arranging for the first scientific research on lunar samples. The MacArthur Chair will enable him to continue his work on the application of thermodynamic methods to geologic systems, the study of geologic and lunar processes using isotopic effects as a tracer in nature, and other applications of chemical physics to problems in the earth sciences.

Kadanoff will use the MacArthur Chair to continue his work at the University of Chicago. He is a condensed-matter theorist who came to Chicago in 1978, after teaching at Brown University and the University of Illinois, Urbana. While perhaps best known for his contribution to the development of scaling concepts which underlie the renormalization group, his research interests have included superconductivity and critical phenomena. At present, he is working on the dynamics of chaos. He is the director of the Materials Research Laboratory at the University of Chicago and serves on the Board of Governors for Argonne National Laboratory.

For the University of Illinois, the MacArthur Chair represents a way of enhancing the long-range development of its physics department. Getting Anthony Leggett to accept the Chair was described by one spokesman as a "coup." In August, Leggett, who had been a professor in the School of Mathematical and Physical Sciences at the University of Sussex in England, was to join the faculty in Urbana. His current research interests include testing the foundation of quantum theory and investigating theories of condensed matter, especially as these theories apply to superfluidity and superconductivity. Recognized for his contributions to low-temperature physics, Leggett has predicted the nuclear magnetic resonance properties of both normal and superfluid He^3, as well as the properties of superfluid phases in He^3.

In September of 1984, Isadore Singer will rejoin the Mathematics Department at MIT, holding its first MacArthur Chair. Singer has been at the University of California, Berkeley, since 1977. Francis Low, provost of MIT, told us that he was pleased to have the opportunity to woo Singer back. Singer is expected to continue working in his current interests, which include differential geometry and global analysis, particularly as they relate to quantum field theory.

Martinus Veltman came to the University of Michigan at Ann Arbor from the Institute of Theoretical Physics at Utrecht, in the Netherlands, to hold the MacArthur Chair in Physics. He is recognized as a leading field theorist, having contributed to the quantum theory of gravitation and the understanding of spontaneous symmetry breaking. His work in computing has had a large influence on particle physics; he developed an algebraic manipulator to convert gauge theories and Feynman rules to amplitudes and cross sections for specific particle reactions that enabled theorists to make calculations that would otherwise have been impractical. As a teacher he has influenced a generation of theorists, including Gerard 't Hooft and Peter van Nieuwenhuizen. He serves as a member of the policy-making committee for CERN.

WASSERBURG

The University of Wisconsin, Madison, has decided to rotate the MacArthur Chair at five-year intervals. The first person to hold it is R. Byron Bird, a professor in the Chemical Engineering Department, whose main research interests include transport phenomena, polymer fluid dynamics, statistical mechanics and kinetic theory. He has also done work on the equation of state, the properties of gases and liquids, multicomponent diffusion and the molecular theory of gases and liquids. Bird, who has been with the University since he left Cornell in 1953, is using the support from the MacArthur Chair to continue his research in polymer physics and rheology.

"Given a finite sum of money, I believe our board has chosen well. The wisdom of our decisions is now in the hands of the institutions," Corbally said when he announced the awards. He also commented that the Foundation would watch the universities in the hope that the endowment will make a significant difference academically. —JC