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COVER Aerial photograph of the kelp forest fringing the rocky intertidal zone at Hopkins Marine Station on Monterey Bay, California. Infrared film renders the kelps red. Fish, living in this kelp forest, affect recruitment to the adjacent intertidal barnacle population showing that the dynamics of the two communities are coupled. See page 479. [Slide courtesy of the California Department of Fish and Game; print by R. Gilbert]

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Techniques and Strategies of Verification

In this issue of *Science* we publish a Policy Forum on one of the most important controversies of our time: the verification of arms control agreements. The format differs from that of previous Policy Forums in that the two participants were asked to answer specific questions rather than to present broad arguments. In the nomenclature of "hawks, doves, and owls," Sidney Drell would generally be identified as a dove, and Manfred Eimer would appear on the side of the hawks; both would qualify as owls because of their wisdom and extensive experience with arms control.

Not only is this Policy Forum likely to be informative to those who have an interest in, but little knowledge of, the techniques of verification, but it also illustrates an important principle of most public debates between experts—that there are basic areas of agreement as well as disagreement. Thus, both Drell and Eimer agree that construction of the Russian radar station at Krasnoyarsk violates the Antiballistic Missile Treaty; that the trustworthiness of treaty signatories is crucial, regardless of the military significance of a violation; that the asymmetry between the closed society of the Soviet Union and the largely open society of the United States puts special burdens on arms control verification; that the United States should not be involved in a disinformation strategy; that the Standing Consultative Commission can effectively resolve ambiguities but not deliberate violations; and that a proportionate response is the appropriate strategy for a confirmed treaty violation. This consensus is significant because it indicates a measure of stability and professionalism within this important area of national policy. Most negotiations that surface with great public clamor during the tenure of one president are actually the result of years of preparation involving several presidents and quite different public political images.

That there are areas of agreement does not imply that the disagreements are unimportant or minor. For example, Eimer states that the encryption of missile tests and the new Soviet SS-25 missile are clear violations of the Strategic Arms Limitation Talks II, whereas Drell considers them possible violations in view of allegedly imprecise data and the ambiguity of the treaty wording. Eimer concludes that the Soviets have a bad record on compliance and Drell argues that they have a satisfactory record. The disagreement here depends on how each interprets the seriousness of the deviations. Ultimately arms control will rely to some extent on deductions of the intentions and behavior of human beings as well as on differing interpretations of the evidence.

The analyses by these two experts points up the difficulties that will be faced in the future. Control of nuclear weapons has two main goals: the promotion of peace by removing the temptation to use nuclear weapons, and the limitation of the cost of an armament program. The advent of a mobile missile, which the Soviet Union and the United States are both developing and which many say may be a more cost-effective and feasible alternative than the Strategic Defense Initiative for preserving second strike capability, will certainly make arms control and verification of compliance more difficult. As both experts state, cooperation between the superpowers will be helpful as we enter this era of new weapons and new strategies. For example, on-site inspection may involve important political changes in two superpowers who eye each other with deep suspicion; it is the modern equivalent of an exchange of ambassadors in the era of large infantries and cavalries.

If we must choose between saving money and preventing war, it is clear that we must choose the latter. But there are scenarios in which preventing war and lowering costs can both be achieved if tough political decisions on verification can be made. There is hope that world leaders will recognize the mutual advantages of imaginative departures from past practices. If that hope becomes a reality, then the techniques of verification and a citizenry enlightened in its application will be an important first step toward a safer world.

—DANIEL E. KOSHLAND, JR.