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NEWS AND COMMENT

Arms Control: Demand for Decisions

Nuclear Weapons . . .

The Czech crisis and the delays and uncertainties associated with the impending change of administration in the United States clearly have lessened, though by no means eliminated, the prospects for early advances in nuclear arms control. When the nonproliferation treaty (NPT) was signed on 1 July by the United States, the United Kingdom, and the Soviet Union, the prospects for arms control had seldom looked better. As this important first step toward ratification of the treaty by its sponsors was being taken, President Johnson announced that the United States and the Soviet Union had agreed to begin, in the near future, talks on limiting and reducing strategic arms, including both offensive weapons and antiballistic missile (ABM) defense systems. The nonproliferation treaty itself, besides forbidding the nonnuclear states to receive or manufacture nuclear weapons, forbids the nuclear powers to assist such states in acquiring nuclear arms and, further, pledges these powers to negotiate to end the nuclear arms race.

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And CBW

Chemical and biological weaponry is a subject which has usually been discussed behind closed doors when it is discussed at all. Nonetheless, in the last 2 years, and especially in the past few months, there has been increasing public attention focused on CBW by officials in various governments and by scientists and other concerned citizens. Discussions of these weapons, however, often are unreported in the press, probably because CBW remains a mysterious and forbidding subject even to most editors and reporters.

On 18 November, the Canadian and Polish governments introduced a resolution at the United Nations requesting that the Secretary General, with the assistance of qualified consultant experts, prepare a report on the effects of the possible use of chemical, bacteriological and other biological weapons. The resolution contains the following sections: (a) that governments, national and international scientific institutions and organizations cooperate in the preparation of this report; (b) that the report be ready for transmission to

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Today, less than a half year later, the NPT itself may be in danger and the prospects of the United States and the Soviet Union's undertaking productive arms control talks seem highly uncertain. Although almost 80 nonnuclear nations have signed the treaty, only two of these signers—Canada and Sweden—are among the half dozen or so nations having a scientific and industrial base strong enough to give them the option to become members of the nuclear club. Japan, West Germany, Italy, Israel, and India, for example, have not yet signed.

It had been hoped that, whatever their reservations about renouncing the nuclear option or accepting international inspections and safeguards assuring the treaty's observance, most of these nations would promptly sign and ratify the NPT (India, however, had from the beginning stated that the treaty was discriminatory and unacceptable). That they have not done so is believed to be due in part to the fact that the United States itself has not ratified the treaty. So long as the United States is not fully committed under the treaty, other states may wonder how seriously the United States accepts its obligation to join with other member nations of the United Nations Security Council to take action in case a nonnuclear state is threatened with nuclear attack. The Security Council adopted a resolution establishing this obligation in June, anticipating the opening of the NPT for signature.

Johnson's Hopes Frustrated

President Johnson's hope of gaining early Senate ratification of the treaty was frustrated, of course, by the Soviet Union's invasion of Czechoslovakia in August. A number of Republican senators and some Democrats took the view—encouraged by Republican presidential nominee Richard Nixon—that, under the circumstances then prevailing, ratification would have indicated a callous disregard for the plight of the Czechs. In this view, the United States and other nations should not be entering into new treaties with the Russians at a time when the U.S.S.R. is showing its contempt for international law by violating Czech sovereignty.

In September the Conference of the Nonnuclear Weapons Nations, to which West Germany and a number of other European nations belong, adopted, by a vote of 79 to 0, a resolution calling on the U.S. and the U.S.S.R. to pursue missile limitation talks—this despite the Czech crisis. Nevertheless, the Czech situation, coupled with the unwillingness of the U.S. Senate to ratify the nonproliferation treaty promptly, provided a new reason (or excuse) for nations which had reservations about the treaty to delay acting on it. Currently, in the United Nations, nine nonnuclear nations—Japan, India, and Italy among them—are circulating a draft resolution which, while not challenging the treaty as such, calls for stronger security guarantees for nonnuclear states, and for elaborate means to allow such states to advance faster in peaceful use of the atom.

Whether the treaty can regain its lost momentum may well depend on whether the Senate ratifies it within the next few months. President-elect Nixon has said he favors ratification, but whether he will push for it short of a satisfactory resolution of the Czech crisis is not clear. An aide has recently indicated that Nixon continues to feel that the United States should take Soviet behavior toward Czechoslovakia into account in timing its action on the treaty. Last week the Senate's Democratic Majority Leader, Mike Mansfield of Montana, was taking soundings on whether senators would be willing to act on the NPT in special session if President Johnson should call one before leaving office on 20 January. Presumably, no action on the treaty will be taken without Nixon's concurrence and cooperation.

As long as Nixon, out of concern for the Czechs or from other motives, refuses to press for action on a multilateral measure such as the NPT, he is not likely to pursue bilateral talks with the Soviets on missile limitations. In a television program on 1 December, Secretary of State Dean Rusk expressed the hope that missile talks could be initiated before the end of the Johnson administration, and he did not rule out the possibility of a summit meeting between Johnson and Soviet Premier Kosygin. But unless plans for the talks were acceptable to Nixon, they would hold little promise. Thus, there is the question of whether Nixon supports the negotiating positions the Johnson administration has developed.

Just what those positions are is, of course, highly classified information. But, it is clear that, despite some official rhetoric about the United States maintaining strategic superiority, administration officials realize perfectly well that the Soviets will not enter into an arms control agreement that leaves them at a strategic disadvantage. In fact, the working assumption among U.S. officials concerned with arms control problems is that any agreement reached will leave each side confident that its forces can ride out a surprise attack and deliver a devastating retaliatory blow.

For the two sides to have this capability amounts to a rough parity, even though U.S. and Soviet strength in particular categories of weapons may differ substantially. According to this view, the two superpowers are now approaching such a rough equality. Official Pentagon figures show that the United States has 1054 land-based intercontinental missiles, while the U.S.S.R. has about 900. The United States has the Soviet Union heavily outnumbered in intercontinental bombers and submarine-based missiles, but the Soviets have large forces of medium- and intermediate-range missiles targeted against points in Western Europe.

Nixon's Ambiguity

The "security gap" theme that Nixon touched upon in his campaign accords poorly with the parity concept, however loosely interpreted. "For us deliberately to let a [technologically and economically] weaker but basically expansionist nation achieve parity with us indicates an erosion of our commitment and will," Nixon said. "It encourages the Soviets to press eagerly on —to step up their drive for strategic superiority." On the other hand, in certain other, softer statements, Nixon seems to have left himself maneuvering room.

For example, shortly after his "security gap" speech, Nixon spoke on arms control and emphasized the need for a stable military balance and for each side to know the state of the other's military technology. Success in arms control, Nixon said, depends less on mutual trust than on mutual knowledge. "Today, as never before, sudden technological breakthroughs can rapidly alter the balance of power," he said. "Clearly, the cause of peace is not served by sudden and decisive changes in this balance, which generate fear, distrust, and misunderstanding." Nixon called for establishment of a "framework of consultation which will enable us, our allies, and our adversaries to cope with the onrush of technology in a cooperative way."

According to government arms con-

NEWS IN BRIEF

• **DDT IN THE DOCK**: A statewide ban on the use of DDT in any circumstance where it would pollute the "biosphere" is a possible result of hearings begun this week in Madison, Wisconsin. The Wisconsin Department of Natural Resources, which is conducting the hearings, has authority to ban the outdoor use of DDT where it would adversely affect fish and other wildlife. The hearings were requested in a petition from a citizens' group, but a scientific case against DDT is being made by the Environmental Defense Fund (EDF), a national organization of scientists concerned about pollution. EDF sees the Wisconsin case as an opportunity to set a national precedent on pesticide uses.

• **COLUMBIA LABS SHUTDOWN**: Columbia University plans in June 1969 to shut down Hudson Laboratories, a 17-year-old defense-supported underwater acoustics research center, which provides the Navy with information for antisubmarine warfare research. The Navy, which terminated its support of Hudson labs, told *Science* that it plans to reduce all classified work at colleges and universities and to rely on its own facilities; its acoustics research will be continued at the Naval Research Laboratories in Washington. Columbia University officials, who say the university cannot afford to keep the labs open by itself, also commented to *Science* that Columbia administrators "were edgy about doing this type of work" in light of student antimilitary demonstrations on campuses last spring. Since 1951, Columbia has relied almost totally on the Office of Naval Research to provide funds ($4.8 million in 1968) for the Hudson labs, located near Dobbs Ferry, N.Y.

• **NOISE RESEARCH**: A report on noise shows that the federal government spent about $11 million for research on noise abatement and control in 1968. (The estimated 1969 expenditure is $25 million.) "Noise—Sound without Value," prepared by the Federal Council for Science and Technology, discusses the relation between noise and health, recommends steps for future noise control research; it may be obtained for 60 cents from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

trol specialists, if the United States and the Soviet Union fail to reach agreements taking advantage of the rough parity or balance of forces currently existing, the arms race may enter a dangerous and enormously costly new phase, of which the antiballistic missile is the harbinger.

The Soviet Union already has an ABM system deployed around Moscow, although this deployment, it is reported, is rather limited and is not now being extended to other cities. The United States also has decided to deploy an ABM system, one which, though described as a "thin" area-defense system designed to counter an eventual Chinese missile threat, could be expanded into a system intended to meet a Soviet attack. Nixon has indicated he favors a deployment oriented toward the Soviet threat.

In a speech in October, William C. Foster, director of the U.S. Arms Control and Disarmament Agency (ACDA), observed that, because the effectiveness of an adversary's defensive missiles cannot be precisely determined, there will be a tendency to compensate by procuring excessively large forces of offensive missiles. Some arms-control specialists worry, too, that, if large ABM systems are developed by the U.S. and the U.S.S.R., in times of crisis each nation may suspect the other of planning to strike first.

Military technology's most emphatic answer to the ABM is the multiple warhead, or "MIRV" (multiple independently targetable reentry vehicle), which is under development by both the United States and the Soviet Union. MIRV's can be launched from underground silos such as those from which U.S. missiles carrying single warheads would now be fired. Consequently, if an adversary deploys MIRV's, the task of judging the size of his missile force becomes much more difficult. Moreover, the accuracy of the MIRV reportedly will be such that these weapons, if either or both sides should possess them, might conceivably provide an incentive for one or the other party to attempt a preemptive first strike against his adversary's offensive missile forces.

Arms-control specialists tend to believe that Nixon will find the Soviets genuinely interested in curbing the arms race and its huge budgetary demands. The Soviet gross national product is less than half that of the United States, and, far more than is the case in the U.S., arms are produced at the expense of consumer goods. Further, as one official says, "I think the Russians are afraid we will start on a new round of strategic programs in a post-Vietnam-war period, and that, once these are begun, we might not be willing to negotiate arms control agreements." Persuading the Russians, with their long-standing aversion to foreign intrusion, to accept a missile-limitation treaty providing for on-site inspections is expected to be difficult; but for some agreements, existing intelligence techniques, such as the use of reconnaissance satellites, might be deemed an adequate safeguard against cheating.

Some officials in the outgoing administration say that the Nixon administration, faced with the urban problem and other costly domestic needs, will be no more immune from budgetary pressures than the leaders in the Kremlin are. It will not be long, these officials predict, before Nixon and his advisers see the logic of the situation: either arms-limitation agreements will be negotiated or the lid will be off the defense budget, to no purpose. "Superiority is not a real alternative," one official says. "At best you're on a kind of see-saw; first you're up, then down, and all the while arms costs are spiraling."

Nixon will inherit an elaborate set of policy-making machinery in the arms-control field. First, there is ACDA, a small, semiautonomous agency of about 200 employees situated within the Department of State. ACDA represents the U.S. in the annual round of arms-control talks at the Eighteen-Nation Disarmament Conference in Geneva and serves as the government's in-house lobby and center of initiative for arms control.

Though not as bold and aggressive as some arms-control advocates would like, the agency has tried to press the arms-control point of view, even when this conflicted with political or military objectives sought by potent forces within other agencies. For example, at one time ACDA was pressing hard for the nonproliferation treaty, against the desires of State Department people who were promoting the so-called "multilateral force" proposal to establish a nuclear-sharing arrangement in which NATO's nonnuclear powers could join.

The U.S. negotiating position for the prospective missile-limitation talks was not, of course, prepared by ACDA alone. It was developed, subject to President Johnson's approval, within the in-

teragency group known as the Committee of Principals, which is made up of the director of ACDA and other top-ranking officials concerned with the national security. These include the secretaries of state and defense, the chairman of the Joint Chiefs of Staff, the director of the Central Intelligence Agency, the chairman of the Atomic Energy Commission, and two White House aides, the Special Assistant for National Security Affairs and the President's Science Adviser. Inevitably, given the diversity of interests and viewpoints represented, much pulling and hauling goes on, as for example between the ACDA and the Joint Chiefs on questions such as the extent to which on-site inspections are necessary.

Maintaining a reasonable continuity in arms-control planning may be a problem, for most of the present members of the Committee of Principals and many of their top assistants will be leaving the government with the change of administration. Presumably, however, many of the people in the committee's working group will be remaining, at least for a time.

This policy-making machinery, though cumbersome, appears to be fairly well regarded by ACDA people and other officials who must use it. Of overriding importance, of course, is whether the President himself takes a strong interest in arms-control issues, and whether he and his ACDA director are in close rapport. Also, as one official remarks, "the President needs a Secretary of Defense who can take a broader view of the national security than the military chiefs of staff, and who doesn't simply pass the buck on to the White House."

Science Adviser's Role

During the Eisenhower and Kennedy years the President's Science Adviser (who doubles as chairman of the President's Science Advisory Committee) played more of a role in developing arms-control policy than President Johnson's adviser, Donald Hornig, has. To some extent this is due to the development of expertise and initiative in other agencies, especially ACDA, which was created in 1961, partly at the urging of Jerome Wiesner, President Kennedy's Science Adviser.

Leaders of two groups having arms control as their dominant concern—Cameron B. Satterthwaite (a physicist at the University of Illinois), chairman of the Federation of American Scientists, and William Doering (a Harvard chemist), board chairman of the Council for a Livable World, wish the Science Adviser and PSAC would again become more a center of initiative in the arms-control field. On 3 December, Lee A. DuBridge, 67, president of Caltech, was appointed science adviser. And another academician, Henry A. Kissinger, head of Harvard's International Seminar and Defense Studies Program, has been named national security affairs adviser.

Whatever Nixon's policies on arms control, the U.S. Senate will continue to play a major role in this field, because of its constitutional power to ratify treaties and because of the influence, positive and negative, of individual senators and of committees such as those on foreign relations and armed services. Three of the senators most articulate in support of arms control—Wayne Morse of Oregon, Joseph Clark of Pennsylvania, and Ernest Gruening of Alaska—have been defeated and will not return to the Senate in January. On the other hand, several of the new senators just elected, such as Harold E. Hughes of Iowa, Thomas F. Eagleton of Missouri, Charles McM. Mathias, Jr., of Maryland, and Alan M. Cranston of California, are expected to back arms-control measures.

In fact, support in the Senate for arms control may be growing, as the substantial (though insufficient) backing Senator John Sherman Cooper of Kentucky got in his recent effort to stop the proposed ABM deployment gave witness. But the cold-war hardliners, such as Senator Richard B. Russell of Georgia (chairman of the Armed Services Committee) and Senator Strom Thurmond of South Carolina, are still present in strength, and could make trouble for any new arms-control agreement, particularly if it failed to provide for on-site inspection and verification.

In sum, the prospects for arms control, while less favorable now than they were last July, are not altogether discouraging. Insofar as progress in this field depends on the United States, Nixon's attitude is the crucial determinant, and on it may rest the fate of the nonproliferation treaty and the proposed missile-limitation talks. The Czech crisis—coming when Nixon himself, as the newly chosen Republican nominee, was calling for an era of East-West negotiation—has without doubt created a dilemma.

For the United States to join now with the Soviet Union in making new treaty commitments, and, especially, to engage in bilateral arms-control talks, may invite the suspicion that the two superpowers are tacitly, and cynically, recognizing each other's "spheres of influence." But being confronted with a hard choice does not spare Nixon the duty of decision. If he should decide that the urgency of suspending the arms race must be given precedence over other foreign policy considerations, this might prove easier, politically, for him than it would for someone with a well-established record as a proponent of arms control and détente. For, as one official observed, "No one will accuse Nixon of being soft on communism."—LUTHER J. CARTER

DuBridge Named Science Adviser

Lee A. DuBridge, president of California Institute of Technology since 1946 and a prominent nongovernmental figure in the arena of national science policymaking since World War II, has been named Science Adviser to the President in the Nixon Administration.

Speculation on the top science post ended Tuesday when Nixon appeared with DuBridge at Nixon's New York headquarters and the president-elect announced the appointment. DuBridge told newsmen that expanding federally sponsored basic science would "certainly be my first concern."

It was known that DuBridge, 67, planned to retire soon from the Caltech presidency. He indicated Tuesday that he has been able to advance the date of his retirement and will soon begin working full-time for the new administration.

DuBridge, a physicist, earned his Ph.D. at the University of Wisconsin. From 1940 to 1945 he was director of the M.I.T. Radiation Laboratory, which made key contributions to radar development and provided many postwar leaders in science from among its alumni.—J.W.

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the General Assembly at an early date, if possible by 1 July 1969; (c) that governments give the report wide distribution through various media of communication so as to acquaint public opinion with its contents; and, finally, (d) calls for observance by all states of the Geneva Protocol of 1925 prohibiting the use of poisonous gases and bacteriological methods of warfare and invites all states to accede to the Geneva Protocol. In 1966, the Canadians and Poles were successful in obtaining UN passage of their resolution for a study by the Secretary General of the effects of nuclear weapons, a study which proved helpful in the negotiations on the nuclear nonproliferation treaty.

It is somewhat difficult for a nation to express disapproval of such a study and the chances seem good for its passage. The resolution has 19 cosponsors and is based on the foundation of a 28 August recommendation by all the states participating in the Eighteen Nation Committee on Disarmament at Geneva. Therefore, the idea of a study on the effects of the use of these weapons already has the backing of several of the nations doing CBW research and production, including the United States and the Soviet Union. (Seventeen of the 18 nations on the committee endorsed the recommendation; the other member, France, does not attend committee meetings.)

British Proposal

Part of the activity on chemical and biological warfare this year relates to the proposal of the British government in August to establish a new international "Convention for the Prohibition of Microbiological Methods of Warfare" to supplement but not supersede the 1925 Geneva Protocol. The Geneva Protocol calls for "the prohibition of the use in war of asphyxiating, poisonous or other gases and of bacteriological methods of warfare" but does not deal with research or production. Under the terms of the British proposal, nations would:

- Declare microbiological warfare under any circumstances to be "contrary to international law and a crime against humanity" and would never engage in such warfare under any circumstances.
- Ban the production of microbiological agents for hostile purposes.
- Destroy any stocks of microbiological agents or ancillary equipment which are intended for use in hostilities.
- Ban research work aimed at producing microbiological agents and ancillary equipment intended for warfare.

In their working paper, British disarmament representatives made several arguments in explaining why they felt that the 1925 Geneva Protocol is "not an entirely satisfactory instrument," which include: (a) Many nations are not parties to the Protocol and of those that are parties, many, including the United Kingdom, have reserved the right to use such weapons against nonparties, and against Protocol violators and their allies. (b) There is no consensus on the meaning of the term "gases" and there has been disagreement on whether nonlethal gases are covered by the Protocol. (c) The term "bacteriological" in the Protocol is not sufficiently comprehensive to include the whole range of microbiological agents. (d) There may be doubt about the Protocol's applicability in hostilities which do not amount to war in its technical sense.

The British position is that it would be extremely difficult to secure a new agreement banning the use of chemical agents because such agents have been used on a large scale in the past, are regarded by some states as necessary for future use, and because nations would be reluctant to give up their rights to research and manufacture such chemical agents. On the other hand, according to the British argument, the use of microbiological warfare has never been established and is "generally regarded with even greater abhorrence than chemical methods." [The British plan seems to have stemmed from a tide of anti-CBW criticism in Britain this year (*Science*, 21 June); there are knowledgeable observers who question how hard the British government plans to push its proposal.]

Tydings' CBW Statement

Nonetheless, this year's British initiative on the control of microbiological weapons has had some political effects in the United States. Partly motivated by the British proposal, Joseph D. Tydings, Maryland's senior U.S. Senator, made a speech a few weeks ago calling for an effective international agreement to control chemical and bacterial weapons. Since most Congressmen never talk about CBW (probably because they know little, if anything, about the subject), such a suggestion from any Congressman is surprising. It is even more surprising that it came from a Maryland Senator. Maryland is a small state but it contains the nation's major CBW research installations—Fort Detrick (biological) and Edgewood Arsenal (chemical)—and these two installations have great economic importance to the small cities in which they are located. It is even more surprising that Tydings delivered his address at the dedication of a new laboratory at the Edgewood research facility.

Bearding the CBW lion in its den, Tydings argued that, while the United States was spending about a third of a billion dollars annually to develop chemical and bacterial weapons, it was allocating only $100,000 to scientific and diplomatic efforts to limit development, production, testing, and use of such weapons by other nations. Tydings argued that the United States should have been spending more on such scientific and diplomatic efforts, and that perhaps "our own government has been negligent in warning of the dangerous reality of this kind of warfare and the need to develop defenses and international controls against it." Tydings said that the last 2 years had seen the use of lethal gases by Egyptian forces against the people of Yemen and that 13 nations, including not only the superpowers but also "such nations of demonstrated international irresponsibility as Egypt and South Africa," have publicly announced since World War II that they are developing chemical and germ warfare weaponry. While calling for the maintenance of the nation's CBW capacity, Tydings also argued that CBW control "must be given the same priority as nuclear weapons control." An aide comments that Tydings plans to give emphasis to his CBW efforts in the next session of Congress.

Last year, some of Tydings' fellow Senators held a hearing at which CBW was discussed for a time during a more general discussion of disarmament issues. At that hearing of the arms control subcommittee of the Foreign Relations Committee, Senator Stuart Symington (D–Mo.) suggested another hearing which would be solely devoted to CBW, a proposal which was accepted by subcommittee chairman Albert D. Gore (D–Tenn.) and by Vermont's George D. Aiken, the committee's ranking Republican. Although no date has yet been set, Gore, in a telephone interview, indicated that he was still considering this idea, as well as hearings on other arms control subjects such as the development of the ABM

system. Gore said, however, that he first wanted to give the new president an opportunity to show where he stood on such issues.

Although the United States signed the Geneva Protocol of 1925, it was never ratified by the Senate. At present, there is some discussion in the Senate and the Administration to the effect that it might be useful to resubmit this Protocol for Senate ratification. Judging from his past record, there is reason to believe that Foreign Relations Committee chairman J. William Fulbright (D–Ark.), in whose committee international agreements are initially considered, is sympathetic to the idea of CBW control. In October, an amendment requiring Administration reporting on CBW programs to relevant Congressional committees was passed by the Senate, but was later deleted from the defense appropriations bill in conference with the House.

Anti-Detrick Meeting

While there is some stirring among governmental figures on CBW, in both the United States and other nations, there also seems to be some increase in activity among private citizens. An example of such interest occurred on 19 November when the Mid-Atlantic committee on Fort Detrick, together with a student group, held a meeting on CBW at Hood College for Women in Frederick, Maryland, the city in which Fort Detrick is located. A surprisingly large crowd of about 350 attended the meeting, which featured two speakers, E. James Lieberman, a Washington psychiatrist, and Theodor Rosebury, a Chicago bacteriologist who worked at Detrick during World War II.

The crowd was composed of students, Frederick residents, travelers from the Washington area, and some Detrick scientists. Except for a couple of critical questions from the latter group, the audience seemed largely to approve of the remarks of the anti-CBW speakers. Both advocated transforming Detrick from a biological warfare center to a world center for infectious disease research. "Detrick is the biggest single aggregation of microbiological talent anywhere in the world," Rosebury asserted, "but nobody would try to justify Detrick's work on the things which its scientists published."

The Mid-Atlantic committee on Fort Detrick is a relatively small citizens group which was organized earlier this year. Most of its active members are women from the Washington, D.C., area. One of its members, Helen Alexander, worked as a telephone operator at Detrick for almost 10 years until, as she explained in an interview, her revulsion over Vietnam and the use of CBW caused her to resign. Judy Sugar, a Maryland housewife who is chairman of the committee, said in an interview that although the committee was not composed of scientists it welcomed scientific members and also planned further anti-Detrick activities.

One example of the growing interest in CBW was that a national NBC television crew filmed the meeting at Frederick for a program on CBW to be screened early next year. CBS television has already shown programs on CBW this year.

Two well-publicized books—*The Silent Weapons* by Robin Clarke, editor of the British monthly *Science Journal*, and *Chemical and Biological Warfare* by Seymour M. Hersh—have been published recently. Events in the United States, as well as those in Vietnam and Yemen, have also focused attention on CBW in recent months. These have included the death of some 6000 sheep in Utah after the testing of nerve gas at the nearby Dugway proving grounds (*Science*, 29 March and 26 April) and the allegation that earthquakes in the Denver area have been caused by the

Proposed ABM Sites Protested

Five physicists from Argonne National Laboratory are protesting the Defense Department's plans to build an antiballistic missile (ABM) site in the Chicago suburbs. These Argonne physicists urge that the Army build its missile bases in sparsely populated areas; they claim that an accidental explosion of an ABM missile would contaminate the entire Chicago area and kill a large fraction of its population within 24 hours. The Army, in turn, says that the danger of an accidental explosion at a Sentinel site is small.

The Argonne physicists—Stan Ruby, John Erskine, David Inglis, Richard Preston, and John Schiffer—began their protest on 15 November when they discovered that the Army, as part of the projected $5 billion Sentinel ABM system, had already started test drilling at five proposed sites in the Chicago suburbs. "Our primary concern," Ruby told *Science*, "is that [ABM] megaton weapons should not be located in cities. We have no evidence to indicate the risk of attack is so great that we have to take chances here." Besides fearing the effects of an accidental explosion, the Argonne physicists worry that the site would automatically make the city a military target for Soviet ICBM's. David R. Inglis says, "One Spartan missile site located in South Dakota could protect the whole Middle West. It is not necessary to locate the missiles near big cities." (Inglis says that the Spartan missile can operate at ranges up to 1000 miles, and the Sprint—which would protect ABM sites—has a range of about 40 miles.)

Argonne scientists are asking the Army, before investigating or acquiring any more land for the missile sites, to hold hearings, which would give civilian scientists the opportunity to state their reservations to proposed site locations. The Chicago physicists are joined by the Federation of American Scientists, which plans to take national action to alert congressmen, other scientists, and the public of Army drilling near urban areas. In a letter to Representative L. Mendel Rivers (D–S.C.), who is chairman of the House Armed Services Committee, Representative Sidney Yates (D–Ill.) said the opposition to such a site close to Chicago is "great." Yates has called for a thorough congressional investigation of sites proposed near urban areas, and has urged the Army to hold open public hearings in Chicago, which dissident civilian scientists could attend.

Chicago is just one of many large cities designated for ABM sites; others include Boston, Dallas, Detroit, New York City, Seattle, Los Angeles, and San Francisco. Protests were raised earlier by University of Washington physicists in Seattle and by a group of conservationists in Boston over proposed missile sites near those cities.—MARTI MUELLER

storage of poison gas byproducts in a deep well there.

In July, UN Secretary-General U Thant commented, "In my view, the development of the biological and chemical warfare materials is in a way far more serious than the development of nuclear weapons. When I say 'in a way' I have in mind the fact that the nuclear weapons are a rich man's property or a rich country's property—only the very rich and the super-rich can develop, manufacture, and maintain them. As far as biological and chemical warfare materials are concerned, it is in many ways not only the exclusive property of the rich, but they are easily accessible to the poor countries also. That is why they are far more dangerous." The question remains, however, whether the UN or any other group can secure the necessary international control before multitudes of countries face each other armed with the most lethal and the least discriminating kinds of chemical and biological weapons.

—BRYCE NELSON

Space: Europe Makes Move toward Setting Up a Central Organization

Bonn. With America's growing power in space activities very much on their minds, science ministers from 12 European countries gathered here last month for a summit conference aimed at putting strength and coherence into Europe's straggling space programs. If the American space establishment is any standard, they did not accomplish very much. But since the meeting opened in a funereal atmosphere—with Britain pleading for release from some expensive commitments—and ended with agreement to work toward creation of a single European Space Authority, it was, relatively speaking, a considerable success. Thus, many meetings hence, the outcome may be a NASA-style organization encompassing the six-nation European Space Vehicle Launcher Development Organization (ELDO), the ten-nation European Space Research Organization (ESRO), and the 12-nation European Conference on Telecommunications Satellites (CETS). Whether this will actually happen, and, if it does, whether it will involve anything more than organizational shuffling, is not at all certain. For at present European's space organization is in the puttering, fragmented stage that characterized U.S. efforts prior to Sputnik. ELDO, committed to a booster rocket beset with troubles, has a 4-year budget of $626 million, which does not go very far when the cost of space vehicles, launch facilities, and tracking networks are taken into account. ESRO, which is considered to be a strong, well-run organization, has extensive facilities of its own and last year had a budget of $50 million, a figure that approaches the big leagues in space science budgets. CETS is a paper organization. Meanwhile, France and Germany are together working on what they call the Symphonie Satellite, a space broadcasting system that satisfies Germany's eagerness to be in the forefront of European technological activities and France's desire to have sure access to a technology that is so useful for political purposes.

Though fear of U.S. technological superiority spurs the Europeans to cooperate and spend, there is lacking a Sputnik-type trauma to compel them to a great deal of cooperation and spending.

Nevertheless, concern about the "technology gap" is part of modern Europeanism, and it is especially true that many influential Europeans do not live comfortably with the realization that American technology is on the way to creating satellites for direct broadcast into home receivers. Present plans call for operating satellite communication systems through an international consortium, Intelsat, in which the United States will ultimately relinquish the majority role that it now holds. But most of the hardware and all of the launching facilities are American, and while there are no complaints about the manner in which they are now being shared, who is to say what might happen later, especially in view of the many surprises that have occurred of late in American political affairs?

It was against this background of concern about the U.S. and difficulty in doing anything about it that two closely related meetings were held here. The first, starting on 11 November, brought together the ministers of the six nations (Belgium, France, Germany, Italy, the Netherlands, and the United Kingdom) that comprise ELDO, the launcher development organization, which for years has been muddling along with a booster that is supposed to be capable of launching a 170-kilogram communications satellite. The first stage of the booster is a leftover from one of the great fiascoes of British military technology, the Blue Streak missile. The issue that Britain presented at the meeting was its previously announced desire to abandon the European launcher project, rely on American-produced rockets, and concentrate resources on space applications, particularly communications. Britain, which provides 27 percent of the ELDO budget, agreed to fulfill its commitment to support the program until 1971, and it offered to sell launchers on a commercial basis at least until 1976. But Britain made it clear that it preferred to get out now. The reason, according to Anthony Wedgwood Benn, the British Minister of Technology, was that his government had had enough of white elephants and now wanted to put its investments into ventures that would bring a proper return. When the British were asked to justify their confidence in the availability of American boosters, they pointed out that the U.S. had in the past made boosters available for European scientific payloads, and that international space cooperation had long been a durable feature of American foreign policy. Britain's ELDO partners, with France and Germany taking the lead, would have none of it. The conference resolved, with Britain abstaining, to proceed with development of the launchers, though on a scale designed to keep down the costs. How much Britain would have saved by getting out is difficult to compute. Some estimates put the amount at $20 to $30 million. But there is no doubt that the British very much wanted to get out and, in fact, in return for getting out, offered to increase their support for space applications by an amount exceeding the savings that might be had from dropping the launcher project.