

of new scientific knowledge that will open new paths of research, both fundamental and applied. We are looking for new scientific knowledge that is in advance of its time and that may be obscured among the mass of current publications. We are looking for new ideas in science at all levels of scientific method, not just at the lower levels represented by observation and experimentation.

When a scientist is looking for scientific information of this kind, he must *look*. He should not be satisfied to have anyone else do his looking for him, beyond the point of indicating the source of the sort of information he requires. He may say that he does not have time. If he is involved in fundamental research he must find the time, even if it means working on only one thing at a time. For no one can do his looking for him. No one else has the background, the learning, the attitude of mind necessary for recognizing

and grasping the meaning of the information when it comes along. The documentalist and the librarian must design systems to make it easier for the scientist to do his own looking. But they should never interpose themselves between the scientist and the written word. He must read the material himself.

All of the systems, both conventional (that is, library solutions) and nonconventional (documentation solutions), suffer from the weakness that too much attention is paid to means, too little to ends. Nine hundred and ninety-nine separate rules to "clarify" entry still do not make library books easy to find. Hardware belongs in a hardware store until we are intellectually capable of using it—and this has not happened yet. The specific problems to be solved in any kind of retrieval system are still the basic philosophical ones: What is the best way to organize knowledge? How can the

system devised accept constant and unlimited changes in this knowledge? How do we show the overlapping, inter-related, multidimensional nature of modern knowledge? Solutions to these problems are vital to successful dissemination of scientific information, particularly of the type necessary for further major advances. In the quest for such solutions, let us, above all, keep in mind what we are looking for—and then make it easier to find.

#### References and Notes

1. This definition of scientific method is used as a matter of convenience. For an interesting discussion of some of the problems to be faced in defining scientific method, see M. Black, in *Science and Civilization*, R. C. Stauffer, Ed. (Univ. of Wisconsin Press, Madison, 1949), pp. 67-95.
2. M. Black, *Critical Thinking* (Prentice-Hall, New York, 1947), pp. 304-363.
3. R. H. Shryock, *American Medical Research: Past and Present* (Commonwealth Fund, New York, 1947), p. 1.
4. G. Lockemann, *J. Chem. Educ.* **36**, 220 (1959).
5. P. Allen, *Americans and the Germ Theory of Disease* (University Microfilms, Ann Arbor, Mich., 1949).

## News and Comment

### Test Ban: Prospects for Agreement May Be Dim, But in Cuban Aftermath They Appear Brighter

It has been said that anyone who was not thoroughly frightened by the Cuban missile episode just simply did not know the facts. The facts, of course, are best known to President Kennedy and Premier Khrushchev, and, while they fortunately are among the most steely nerved of the species, it is evident that their "eyeball to eyeball" confrontation has stimulated some serious thoughts about defusing the Cold War. These thoughts, it is clear, were not lacking before, but just as nothing promotes fire safety like a charred hospital, the Cuban affair has provided the incentive for reopening seemingly meaningful talks on what has come to be considered the first step toward arms control—the nuclear test ban.

The foundation for these talks was laid in the Kennedy-Khrushchev correspondence that brought the missile crisis to an end. Khrushchev wrote that it was urgent to think about disarmament issues beyond Cuba, Kennedy responded that he agreed, and shortly thereafter, preparations began for the resumption of the test ban talks, which had recessed in deadlock last fall.

The talks, which got under way 14 January in New York, shifted to Geneva last week, amid reports that the prospects range from dismal to promising. Such reports have been par for the course during the 5-year history of test-ban negotiations, and, since the former appraisal has turned out to be the case, optimists are to be regarded with skepticism. There are, however, substantial indications that things are now moving along, and however dim the prospects

may be, it appears that they are a lot brighter than ever before. The evidence lies not only in relaxations of both the Soviet and American positions, but also in Republican rumblings and the beginnings of an administration effort to cultivate public opinion in anticipation of a possible domestic row over the wisdom of a test ban.

Briefly, this is where the negotiations now stand: The Soviet Union, returning to a position that it briefly held and later abandoned in 1958, accepts the principle of on-site inspection and is now willing to permit two to three inspections annually. It would also permit the installation of three unmanned seismic stations, so-called black boxes, on Soviet soil, and it would admit foreign personnel to service the instruments.

The United States, on the basis of what are said to be markedly improved seismic detection techniques, has abandoned its insistence on foreign-manned seismic stations on Soviet soil. And the U.S. insistence on on-site inspection has receded from a demand for 20, in 1960, to 12 to 20, in 1961, and, now, to 8 to 10. The U.S. also wants at least 7 "black boxes" on Soviet soil, but it has made it appear that it has not arrived at a bedrock position on any numbers.

Measured in terms of the history of the test-ban negotiations, the Soviet re-

turn to the principle of on-site inspection is of major significance, and now Khrushchev is telling Kennedy, "It's your turn to give something"; meanwhile, Republicans—all along the political spectrum, from Goldwater through Rockefeller—are beginning to chant, "Don't you dare."

Just what Kennedy is going to give, if anything, remains to be seen, but meanwhile longstanding speculations about the country's appetite for disarmament are about to be subjected to a very illuminating test. For the Republicans, out of genuine concern to some extent, but also out of an instinct for political profit, have fixed upon the test-ban talks as a subject for close scrutiny. And in organized fashion, they have begun to hammer at the administration for seeking what they describe as a test-ban agreement that will jeopardize the nation's military strength.

The principal channel for this contention is now the Committee on Nuclear Testing, formed last month by the House Republican Conference, which is the policy-making body for GOP representatives. The committee's function, according to its chairman, Rep. Craig Hosmer, a conservative Californian, includes making certain that the United States is not "trapped, tricked or embezzled out of the means to defend itself against Khrushchev's announced intention to bury us."

"We Republicans," he said, "know we are living in a risky world. We are deeply concerned over the fallout problem. We are actively seeking sane measures for a safer world. But in the process, we do not want the nation to indulge in illusory solutions which make risks greater rather than less." And with that introductory statement, the committee has proceeded to solicit and distribute statements from a variety of experts, but principally those with a record of longstanding opposition to any test-ban proposals that the Soviets could be expected to accept.

Among these are Edward Teller, the distinguished physicist, who is perhaps the most energetic test-ban opponent within the scientific community. In a brief paper for the committee, titled "The consequences of a test-ban," Teller argues that "without great and comprehensive openness" the Soviets could conduct undetected tests that would, among other things, permit them to perfect a missile defense that would "put us at the mercy of Soviet

blackmail and aggression." Putting a curious amount of trust in Soviet pronouncements, Teller noted that "the Russians have announced that they have solved the problem of missile defense. Our missile defense," he continued, "is unsatisfactory," and he went on to warn that "the Russians want us to sign a Munich-type agreement and in this they are supported by widespread public clamor. I hope," he concluded, "that patriotic congressmen of both parties will resist the pressure of a public frightened by crises and misled by the mirage of peace."

Teller was followed by Lewis L. Strauss, former chairman of the Atomic Energy Commission, who, in a published colloquy with Hosmer, said that even ten inspections "would be completely inadequate." He added that "it is less than four months since the President told us that the Soviet emissaries who called to see him at the White House had attempted flatly to deceive him about Cuba. What possible safety is there in risking our safety on anything they say?"

Similar views were expressed by John A. Wheeler, professor of physics at Princeton University. "As a physicist and specialist on nuclear fission," he said, "I see a decisive loss to national security from a test ban . . . It is unconscionable to renounce for the free world a revolutionary device which others will then make without our knowledge."

It is difficult to evaluate the effect that these attacks may have on domestic political passions, and even more difficult to assess what effect these passions may have on the administration's dealings with the Russians. Only a few things are clear in these respects, though there is no dearth of observers on both sides of the question who assert that everything is crystal clear.

First of all, it is apparent that the administration is acutely concerned about the Republican fervor for promoting and exploiting the feeling that the Democratic Party does not fully appreciate the menace of the Soviet Union. One reflection of this concern is to be seen in the fact that Kennedy has installed Republicans in every top national security post, thus taking the edge off any attempt to hold the Democrats responsible for the intractability of the world. The list starts with Defense Secretary McNamara and includes McGeorge Bundy, the President's special assistant for national

security affairs; John A. McCone, director of the Central Intelligence Agency; William C. Foster, director of the Arms Control and Disarmament Agency, and, until his recent resignation, Arthur Dean, our chief disarmament negotiator.

Another reflection of the administration's concern for its anti-Soviet image was its extraordinary response to charges that the Soviets are being permitted to get away with something dangerous in Cuba. By staging a 2-hour televised intelligence briefing, the administration was able to deflate the charge, but in doing so it was acknowledging that the attack was having a far from trivial effect on the politically sensitive issue of its ability to protect the national security. With that experience fresh in mind, it can look ahead to the virtually certain prospect that the Republican attack on any test ban agreement acceptable to the Soviets would make the Cuban furor look relatively placid.

Against this background, however, there is ample evidence that the administration fervently desires to conclude a test ban agreement. This is a fact that, ironically, has been clearly recognized by long-standing opponents of a test ban. But it continues to go uncomprehended by sizable segments of the "peace movement," who, it seems, would rather joust with out-of-date stereotypes than recognize the realities of who is for and who is against arms control and disarmament.

It is demonstrable, however, that in 15 years of negotiations toward these goals, no administration ever exceeded the Kennedy administration in (i) recognizing the perils of a continued arms race and (ii) seeking to reduce these perils without impairing the nation's ability to protect itself. The administration has not publicly said it in so many words, but it is profoundly frightened by the hazards of the hair-trigger standoff that now exists between the United States and the Soviet Union, and it looks upon the test ban not as a panacea for the world's ills, but as a necessary, though small, step toward more significant arms control measures. And it is beginning to assert publicly that when all the possibilities are added up, a carefully devised test ban comes out to be in the interest of the nation's security.

Such was the burden of another paper solicited by the Republican Committee on Nuclear Testing, this one

from Director Foster of the Arms Control and Disarmament Agency. "While there will always be some risk of cheating and of a surprise abrogation," he said, "the gains to the United States far outweigh these risks." At present, he said, the United States is ahead of the Soviets in the development of tactical nuclear weapons, and the "point of diminishing returns in improving weight-yield ratios is fast approaching."

If the Soviets observe a test ban, Foster said, our lead will last longer, since their development work will be limited to the laboratory; if they cheat, there is a strong possibility that they will be caught, since the United States would not go in for an agreement that did not include inspection. While single tests might sometimes escape detection by seismic means, he stated, "a test series would be far more difficult to hide. Yet, little progress can ordinarily be made with individual, isolated tests." In addition, Foster noted, "for the weapons development and knowledge of weapons effects which are of primary concern to us, and which might make a substantial change in the military balance in a way which would be unfavorable to us, clandestine underground testing would be unsatisfactory."

Foster also addressed himself to an argument that is frequently raised against a test ban—that U.S. testing capabilities would erode during a ban, just as they did during the unpoliced moratorium which the Russians broke in the fall of 1961. Revealing publicly for the first time that the administration has been developing plans in this connection, Foster said, "in case of an agreement, the government will make it a matter of national policy to maintain readiness to test and to provide funds necessary for this and for the incentive program necessary to keep competent scientific talent available. Under these circumstances, our scientists should retain the incentives to continue nuclear weapons research and our weapons laboratories should function effectively. This is not insurance against surprise abrogation, but would minimize the possibility of a long Soviet head start in preparations for testing."

Finally, Foster made a plea—a seemingly futile one—for "a continuing bipartisan effort in this crucial area of United States foreign policy."

If an accord were to come out of Geneva, what would happen next?

Procedurally, a test ban agreement would have to be ratified by a two-thirds vote of the Senate or by a joint resolution of the majority of both houses. It is likely, however, that the administration will have done some careful nose-counting before it takes a test ban to Capitol Hill, for Congressional rejection of an agreement would cause an international political disturbance that would have a calamitous effect on this nation's image as a promoter of peace. Administration officials agree that it would be better to avoid a congressional fight than to lose it. No formal ban could take the simple form of an executive agreement, since the act establishing the Arms Control and Disarmament Agency states that "no action shall be taken to disarm or to reduce or to limit the Armed Forces or armaments of the United States, except pursuant to the treaty-making power of the President under the Constitution or unless authorized by further affirmative legislation by the Congress . . ."

While the Geneva talks are now in a state of deadlock, with the So-

viets demanding that the United States come forth with some concession, the administration is beginning to pay more attention to the state of public opinion on the test ban. Last week, without any public announcement, officials of the Arms Control and Disarmament Agency met with representatives of a number of nongovernmental groups that have been involved in promoting arms control and disarmament activities. Various aspects of the test ban issue were discussed, including the problem of public support.

Independently of this meeting, the Federation of American Scientists has invited each Senator to attend or send a staff member to breakfast briefings next week at which FAS representatives will discuss the test ban.

During the last session of Congress, FAS held similar briefings on civil defense and the establishment of the Arms Control and Disarmament Agency. The attendance was high, and members along the entire political spectrum agreed that the briefings laid out the issues in a dispassionate and informative fashion.—D. S. GREENBERG.

### **Science Information: Local Groups To Inform Public On Policy Issues Establish a National Institute**

*New York.* Representatives of a score of independent groups of scientists organized to inform the public on scientific and technical aspects of public policy issues met last weekend in New York to discuss the future of the scientific information movement.

Some 100 scientists from around the country attended the 2-day conference and divided their time about evenly between discussing first principles of the movement and devising ways and means to strengthen and expand it.

The principal formal action of the conference was to create a Scientists' Institute of Public Information to serve the local groups as a clearing-house for information, to improve liaison and, if possible, to raise money.

To give the institute form and substance, the conferees also elected a 21-member board heavily weighted with members whose names are prominent in the scientific-philanthropic complex and who can be expected to benefit the institute not only by the quality of their judgments but also

by the luster of their prestige, which is of the brightness that attracts foundation support.

At the end of the meeting the conferees also unanimously passed a resolution stating that scientists in the information movement, as represented at the conference, "subscribe to certain guiding principles:

"1. Information is presented unencumbered by political or moral judgments, which judgments are the prerogative and responsibility of all citizens.

"2. Information is prepared with scientific objectivity, which includes attention to divergent studies and interpretations.

"3. Information is freely available to all."

Absent from the resolution was any explicit reference to whether, or under what conditions, a scientist engaged in educating the public on scientific matters related to a public issue should add his personal opinion on that issue. It was evident from the discussion on drawing the line between information and persuasion—the topic which kindled the most heated exchanges of the weekend—that the question has