need to understand science as a social and institutional expression of a tradition of which they themselves are not a part. The social relations of science are no longer merely internal, within a closed guild. They are a fundamental part of the policy of a nation and of the international community. The audience of people within the umbra of science consider science not so much a system of ideas about nature as a social activity among men. Many in this audience are in command of sophisticated bodies of scientific information. Many of them, however, have only outworn slogans with which to analyze the changing role of science in society. Can any public servant do his job today without some appreciation of the changed relation of the government and science? Can any business executive make adequate decisions without some appreciation of the role of the industrial research laboratory? Can any university official operate today on the assumption that he has no scientific connections with the government and industry? Is any military or diplomatic problem understandable apart from the scientific problem that is involved? These questions involve political, social, and economic issues in society as a whole. And on their resolution could depend survival itself.

The ability of the rich and varied empires of science to mount a program of public education may be open to question, but a glance at any American university's resources for studying science as social activity reveals only appalling weakness. Despite the hundreds of scientists on its faculty, a university can usually count the scholars working on the social relations of science on the fingers of one, or at most two, hands. And even these scholars are scattered through several departments of the humanities and social sciences and are out of touch with one another, distracted by other interests and demanding duties. Would not a public education program in science as a social activity only reveal to the world the scandalous neglect of this subject by the universities? Possibly so. But there is a surprising amount of literature, written in at least passably plain English, stacking up in this area, which might provide a sufficient basis for discussion. One cannot conceive of didactic teaching on the basis of present knowledge. But a body of information does exist, at least enough for interested people to ponder. It is the importance of the questions, not the availability of answers, that bids people attend. If this were not so, how could international affairs and the cold war have any place in public education?

In summary, the trends in 20th-century science sketched here call for the universities to mount not one but at least two programs in public education in science. The first must be designed for an audience that does not know what a scientist does or how he thinks or solves a problem. The second must be for an audience already in touch with science and challenged by that very fact to understand it as a social activity. In neither case does the university possess the manpower to man the programs directly. Rather, it must decide whether these programs can be carried out indirectly, through techniques of public education developed in other fields. Above all, however, the universities must not, in their preoccupation with the difficulties of doing anything in public education, forget the price they will pay if they do nothing. Misunderstanding science and its role in civilization levies a toll on all mankind.

Science and the News

As Interpreter of Soviet Moves, Khrushchev Remains the Best Kremlinologist

For those whose job it is to explain the Khrushchev Effect, the last 2 weeks have been busy ones, indeed.

Without so much as stumbling, Khrushchev has ordered Soviet test resumption; demanded a settlement of the "German problem"; scoffed at the neutrals; caused the United States to resume nuclear testing; and rejected an appeal for an atmospheric test ban.

At the same time, the French agreed to U.S. nuclear arms training for their troops; Congress acted favorably on a permanent U.S. disarmament agency; a badly mauled foreign-aid bill was authorized; and the Geneva test-ban talks were indefinitely postponed after 340 sessions.

Meanwhile, intrepid Soviet and U.S. scientists met in the sylvan tranquillity of Vermont to discuss mutual interests; Eastern and Western scientific confreres met in Vienna to exchange data on fusion research; U.S. disarmament negotiator John J. McCloy met with Valerian A. Zorin to plan a general disarmament conference; and the nettlesome Jack Parr upstaged two colonels, a lieutenant colonel, a major, a captain, two lieutenants, and a platoon of enlisted men in Berlin.

At best, attempts from beyond Red Square to explain all the actions and reactions that result from the Khrushchev Effect are conjectural. Clearly, the best Kremlinologist is Nikita S. Khrushchev. In recent weeks he has repeatedly spelled out his plot. He is authoring an anatomy of terror. And, for the moment, at least, he seems to be succeeding.

Khrushchev wants two Germanys and an independent Berlin. Although he is willing to subject his demands to a second Kennedy-Khrushchev confrontation—and there could very well be an East-West summit meeting soon—most observers agree that Khrushchev would remain intractable in his demands. In this, Khrushchev mimics the World War II aphorism that there is a right way, a wrong way, and the Army way of doing things. To settle the Berlin crisis, there is only the Khrushchev way, in Khrushchev's view.

The Soviet resumption of nuclear testing is inextricably linked to the

Berlin crisis, though it has its military needs, too. Undoubtedly, there are other concomitant underlying and overriding Soviet reasons for resumption. It is in the nature of this conspiratorial beast that cause and effect is a well-spun web responsive, always, to the spider in the middle no matter where upon the web the fly is enticed to light.

Bullying

Politically, Khrushchev is using nuclear testing to bully the Western alliance and the neutralists. And he has made no bones about dealing in "atomic blackmail." He is threatening thermonuclear war hoping to cow the West into accommodating him on Berlin and Germany, and to cow the neutralists into pressuring the West for this accommodation.

The neutralist leaders, at Belgrade, were more interested in condemning the only colonialism they know than in openly castigating the devisers of a new colonialism. Two neutralist delegations were scheduled to present an appeal for peace to President Kennedy. Prime Minister Nehru of India was assigned a similar task toward the Soviets. But Nehru, who faces grave internal challenges at home and wants more Soviet aid, was singularly ineffective in his suasion.

The sum effect seems to be that the neutralists are the first victims of this newest phase of the Cold War. Khrushchev showed his contempt for their influence as a third force. Even President Kennedy seemed irritated with the neutralists. He said, upon signing the foreign-aid bill, that it "should give great attention and consideration to those nations who have our view of the world crisis."

The neutralists' failure to speak out illustrates another point—the curious role of propaganda. After the first well-deserved pats on the back that the United States had shown great restraint and statesmanship in not being the first to resume nuclear testing—despite considerable pressures upon President Kennedy to do so—sober second thoughts suggest there is a half-life value to propaganda, which in this particular case equals that of the omega meson, the fleeting elementary particle whose discovery at the Lawrence Radiation Laboratory was reported on 1 September.

If Khrushchev holds a trump of terror it is the 100-megaton warhead he has talked about repeatedly. There is every reason to believe the Soviets will build such a weapon, if they have not already done so. Khrushchev told C. L. Sulzberger of the New York *Times*, "Let those who dream of new aggression know that we shall have a bomb equal in capacity to 100,000,000 tons of TNT, that we already have such a bomb and shall test the explosive device for it."

It is even conceivable that the Soviets will, in fact, detonate such a weapon at high altitude for the world to witness. Such a horrifying prospect is not without precedence or rationale. After all, this type of display was what many American scientists implored President Truman to do with the first atomic bomb to bring about Japanese capitulation.

Although U.S. officials have expressed no interest in a 100-megaton device as a military weapon, the Soviets could be mindful that big rocket boosters were once considered wasteful military devices but, happily, turned out to have overwhelming psychological meaning for space exploration and spectacularism.

In recent days, there have been suggestions that the United States go on to build a 1000-megaton device as a counter force. This type of thinking bears witness to Freeman Dyson's belief that the importance of new nuclear weapons is they are technically a symptom of further advance in nuclear technology and politically a symbol of military power.

U.S. Underground Tests

The knowledge that the fallout from a 100-megaton detonation would be severe does not seem to disturb Khrushchev. He rejected the Kennedy-Macmillan bid for an atmospheric test ban. This appeal had an error of omission—France was not included. And Khrushchev used this as part of his reasoning for rejecting the bid. He also condemned President Kennedy for ordering a resumption of underground U.S. testing before the 9 September deadline set for Khrushchev's reply to the atmospheric test ban.

It is doubtful, however, that Khrushchev would have agreed to the proposal in any event. There seem to be compelling reasons for the Soviet military to test nuclear weapons. The best guesses are the Soviets want an antimissile missile; more efficient and lighter warheads; and a trigger for the big bomb. Khrushchev argues that the Soviet Union has set off many fewer blasts than the United States, Britain, and France. "We have every reason, both from the viewpoint of morality and of ensuring our national interests," he argues therefore, "to claim an equal number of test explosions with the Western powers."

These and other Khrushchev statements had already dimmed the prospects that the Labor Day weekend proposal by Kennedy and Macmillan would be accepted, and this was very clear to the Western powers before the 9 September acceptance deadline. What is not totally clear to observers, however, is why President Kennedy ordered a resumption of U.S. testing when he did.

There had been considerable prior speculation that the President would defer such a decision at least until after 9 September and perhaps until 19 September when it is anticipated he will address the United Nations. (There is also the possibility that the impulsive Mr. K. might come to New York to table thump in his own defense.)

One report has it that upon hearing of the third Soviet test on 5 September the President decided he had had enough. "In view of the acts of the Soviet Government," the President said, "we must now take those steps which prudent men find essential. We have no other choice in fulfillment of the responsibilities of the United States Government to its own citizens and to the security of other free nations."

The President's decision fit the Administration's policy of convincing the Soviets that the United States will use its nuclear arms if the need arises and fit the nation's ancillary policy that its carefully made decisions are not to be interpreted as signs of weakness by enemy, ally, or unaligned.

The decision has been made and underground testing will resume shortly in Nevada. There is danger, however, that the Soviets will complete their many tests by 19 September—just as U.S. testing gets under way and the United Nations meets. At this point the Soviets could again announce a unilateral moratorium and the U.S., with its sensitivity to world opinion, could find itself in a political dilemma.

Although the first U.S. tests will be conducted underground, it seems only a matter of time before this nation, too, will resume atmospheric testing, even if limited. There are bound to be great pressures created, particularly by the

military and paramilitary scientists, to this end. After all, wars are not fought underground and there will be arguments that the antimissile missile must be tested in the atmosphere, if the nation is to be effectively protected.

Thus, fallout dangers will increase markedly, properly heightening worldwide fears and again raising the specter and voice of genetic doom.

According to Khrushchev, there is an out. In rejecting the proposal to ban atmospheric tests, he said, "It is possible to end nuclear tests . . . only on the basis of general and complete disarmament." This is a complete turnaround. It was the Soviets who originally insisted that nuclear testing be separated from general disarmament talks and the U.S. accommodated them in this. Whether the U.S. will again accommodate the Soviets remains to be seen. Hopefully, the channels for disarmament negotiation have not been closed. But there is little more than this to comfort an anxious world.—HOWARD SIMONS

While Howard Margolis is on vacation, his section will be written by guest reporters. Howard Simons, this week's guest, is on the staff of the Washington Post.

Wilderness Protection

The Senate last week approved a bill to strengthen existing regulations against the intrusion of civilization upon millions of acres of federally owned wilderness. The bill, which is yet to be considered by the House, is of vast and far-reaching significance for the preservation of some of the nation's most splendid and untouched woodlands and mountains.

In passing the bill, the Senate recognized the pleas of conservationists who have long argued that now is the time for increased protection, before increased demand for space, timber, and minerals inevitably brings pressure against the boundaries of these huge, unpopulated, and unexploited areas. Under the bill, some 6.7 million acres would be placed at once in a National Wilderness Preservation System. In addition, another 60 million would be reviewed, and of these, it is expected, some 35 million, probably all in the West, would qualify for eventual inclusion.

The demand for additional protection was heightened by a number of factors, all of which portend hazards for the preservation of these lands in their natural state.

One of the factors is the shrinkage of state, county, and municipal parklands, especially at the hands of road builders, who, following the line of least resistance in seeking rights-of-way, have found that citizens are more inclined to fight for their homes than for their parks. Another is the long-range, but growing interest in the commercial exploitation of wilderness resources. And still another is the boom in camping, which has resulted in what have been called camping slums in some of the more popular national parks.

Restrictions

The Senate bill contains severe restrictions on the use of lands in the Wilderness Preservation System and reflects the conservationists' disillusionment with compromises that have resulted in encroachments upon many supposedly protected areas. Development in the wilderness is not a reversible process, at least over the short run, and each loss to the bulldozer is regarded as irretrievable.

The bill would, in effect, "lock up" wilderness areas by barring road construction and prohibiting motor travel, including aircraft and motorboats. The only access would be on foot or horseback, thus eliminating the likelihood of great encampments of tents and trailers, and attendant refuse, which have disillusioned some conservationists about the wisdom of opening the outdoors to the American public. Without exceptions granted by the President, no construction or exploitation of resources would be permitted. As was pointed out by the bill's opponents during the Senate debate, it would not be easy to obtain such exceptions.

The lands proposed for inclusion in the Wilderness Preservation System are all federally owned and are under the jurisdiction of agencies of the Interior and Agriculture departments. Their preservation in a wilderness state has, with a few exceptions, been the policy of both departments, but the matter is at the discretion of the Secretaries, and trends disturbing to conservationists have become apparent over recent years. Among these has been a steady increase of commercial interest in the potential of these lands, increased prospecting, which is lawful, and, perhaps most alarming, the disclosure that a sizable number of oil leases were granted on Fish and Wildlife Service lands during the Eisenhower Administration while a moratorium supposedly was in effect.

A significant feature of the bill is that it would give the President, rather than the Interior and Agriculture secretaries, the authority to make exceptions to wilderness preservation. The change may appear to be a small one, but it is of great importance for the tactical problems that confront both the advocates and opponents of preservation. The departmental agencies that manage the lands, such as Interior's Park Service and Agriculture's Forest Service, are neither well publicized nor unsusceptible to congressional pressures. The White House, on the other hand, is strongly sympathetic to wilderness preservation, for the time being at least, and provides a well-illuminated arena for a great public row if the conservationists feel they are ill-treated.

The bill approved by the Senate also provides the President with authority to add federally held lands to the Wilderness Preservation System, unless there is an opposing resolution adopted by either house of Congress. Since it is generally easier to block than to achieve positive action on Capitol Hill, conservationists look upon the Senate bill as a route to great expansion of the wilderness system. In support of this optimism is the fact that "wilderness," like national defense and medical research, does not lend itself to easy opposition. Even the mining and timber interests which doggedly opposed Senate passage —Senator Humphrey declared that "the abuse from the vested interests has been unbelievable"—stressed that they are for wilderness preservation. They explained, however, that they opposed the bill because it created restrictions which they considered unnecessary in view of existing Interior and Agriculture department regulations.

The final vote was 78 to 8, with much of the expected conservative opposition failing to materialize. In part this was due to the fact that the wilderness concept not only is attractive to persons of all political persuasions, but also that it involves no expenditures, merely redesignation of existing federal holdings. In addition, while the long-range economic interests of mining and timber industries are clearly affected, the areas concerned are empty, and the opposition could call upon no constituency that would be aroused by the pros-