federal and civilian agencies on both defense and civil matters.

In a 20-year career with Bell Labs he has demonstrated considerable versatility, originally working on microwaves and underwater acoustics and later becoming a computer expert. He has been active on the NAE's committee on education, has been co-director of its Engineering Concepts Curriculum Program, and is given a major share of credit for shaping a high school course based on teaching principles underlying modern technology.

David is well known in his own field, but his name is hardly a household word in the scientific community. He has not served on the President's Science Advisory Committee (PSAC), which is regarded as the place where scientists are likeliest to influence major policy. This lack of experience will have to be made up on the job. David has a solid reputation as one of the younger regulars among federal consultants, however, and at Bell Labs he is regarded as being very able and, as one colleague put it, "hardworking and hard-headed" without being abrasive.

An instant appraisal of the stewardship of the man David replaces is difficult. DuBridge's term in office was comparatively brief, and on many of the issues which his office tackled the reports are literally not in. DuBridge was determined that the OST would be an advisory, not an operating, agency, and this makes it harder to judge the depth of the imprint he and his staff made on policy decision.

DuBridge's first year in office coincided with the advent of the environmental issue as a major matter of national concern, and he and his staff were involved in attempts to cope with specific problems such as the Santa Barbara Channel oil leak, and even more directly with efforts to strengthen Executive apparatus to deal with environmental issues. The Administration formula of a cabinet-level interagency council was trumped by congressional passage of a plan for creation of a special Council on Environmental Quality, to be lodged in the Executive Office of the President, and OST is still involved in working out its relations with the council.

DuBridge is credited with having had a main hand in the task force report which influenced the Administration to set a middle course for the space program in the next decade, and he and his staff seem to have played a less influential role in the still unresolved debate over the supersonic transport. DuBridge's awareness of energy problems enabled him and his staff to anticipate the crisis in electric power generating capacity and to initiate some steps to meet it.

According to insiders, DuBridge and his staff contributed much more heavily than is generally recognized to the President's renunciation of biological warfare last year and to the recent move for ratification of the Geneva protocol on chemical and biological warfare.

The state of basic research has been a preoccupation of DuBridge's since he took office, and he is credited with having assisted the modest recovery in the fortunes of the National Science Foundation. He has, however, been a target of criticism from university scientists because of the continued decline in federal support of science. Apparently stung by the reproaches of his old colleagues, he has frequently and often tartly defended the record. In his letter of resignation to President Nixon he repeated the gist of his argument saying, "These past 19 months have, of course, been difficult times in many ways. One result of the fiscal problems has been the slowdown (which began in 1967) of the nation's scientific and technological enterprise has not been reversed. Much of this lag in the past year has been the result of the failure of the Congress to appropriate the full amount of the funds you requested in FY 1970 for scientific research. There is evidence that in fiscal 1971 your request for increased scientific funding will be more fully met. I hope so, and I trust that our mutual desires for the continued welfare of science will be fulfilled."

Perhaps because budget stringencies dramatized the need to make optimum use of resources for science, DuBridge has been more active than any of his predecessors were in pushing initiatives toward building workable machinery for making science policy (*Science*, 24 July).

DuBridge brought to the office of science adviser experience and personal qualities which were probably unique. His familiarity with the corridors of power was that of someone who had helped lay out the floor plan. Because of his prestige and personality he was neither insecure nor office-proud. DuBridge was director of the near-legendary Radiation Lab at Cambridge during World War II; at Caltech he presided over unprecedented expansion which confirmed that institution as one of the country's two preeminent technical universities. He was a member of the scientists' unofficial privy council which, especially during the 1950's, heavily influenced American strategic policy. One view is that the post of science adviser capped a distinguished career for DuBridge, but to others it appeared that he accepted the job more as a duty than an honor.

Nobody who saw DuBridge perform the public functions of his post doubted his energy or his grasp of the issues, and as a future member of PSAC and in other ways he is likely to continue to make a vigorous contribution. But he belongs to that generation of scientists who were 40 or older at the time of World War II and maintained positions of remarkable influence for more than two decades. DuBridge is the last of his contemporaries to hold a major policy post, and his departure signals the end of an era in science affairs in this country.—JOHN WALSH

ABM: Senate Approves Expansion, but Hope Seen for Arms Curb

Before the Senate vote on the antiballistic missile system last year there was much talk in Washington about senators having adopted a tough, skeptical, "gimlet-eyed" attitude toward the military's request for new weaponry. The Pentagon had had it too easy for too long, it was said. The senators opposing deployment of the ABM ultimately failed by one vote. However, the decision was close enough to suggest that the Senate was in fact taking a hard new look at weapons procurement questions. Last week, the Senate ended a new round of debate on the ABM. What it decided was to extend the ABM system to two new installations, despite disturbing questions raised about the system's effectiveness and despite the fact that the two installa-

tions authorized last year have not yet been completed and tested. In view of this, one may ask whether the Senate has gone back to assuming that the Joint Chiefs of Staff always knows best. But the answer is perhaps less discouraging than some advocates of arms control might think.

In this year's ABM debate the Nixon Administration contended that approving plans for an expansion of the system would give U.S. negotiators a vital bargaining chip in the "SALT" (strategic arms limitation) talks with the Russians. Although in the Senate this argument appears to have been decisive, the historical evidence does not necessarily support the idea that threatening to extend the arms race is the best way to reach arms-control agreements. In fact, President Kennedy's promise in 1963 that the United States would not be the first to resume atmospheric testing is believed to have helped make possible the successful test-ban treaty negotiations. Nevertheless, most senators were not willing to challenge the President's judgment that the way to persuade the Soviet Union to abandon its ABM defenses and limit its offensive missile deployment was for the United States to move toward an expansion of its ABM system.

The Senate rejected, 52 to 47, a proposal by Senator John Sherman Cooper (R–Ky.) and Senator Philip A. Hart (D–Mich.) to allow work on the first two ABM sites to continue but to deny the Administration a $322 million authorization to begin work at two additional sites. Later, the Senate voted, 53 to 45, to reject a proposal by Senator Edward W. Brooke (R–Mass.) which, while confining work to the two initial ABM sites, would have allowed the extra $322 million to be spent for additional radars and missiles at those sites. Both proposals were meant to check the ABM program's momentum by blocking its geographic expansion.

But the Senate has taken a step to restrict the ABM system to one principally for the defense of U.S. offensive missile sites. It is this that encourages some observers to believe that the Senate is having a restraining influence on U.S. weapons policy. The Senate Armed Services Committee struck from the Administration's proposal, which had been approved by the House, a $10 million authorization for advanced preparation of four "area defense" sites. An area defense is not one to protect offensive missile sites within a relatively restricted region, but rather one to protect widely separated population centers. The Administration has talked of deploying a "thin" area defense against the possibility of a light Chinese attack. A defense oriented against a Chinese threat might be "thickened" later—with more missiles and radars—in the hope of giving U.S. cities some protection against a heavy Soviet attack. The Armed Services Committee said that present circumstances did not justify preparations for a costly defense against a future Chinese nuclear attack capability.

Jeremy J. Stone, executive director of the Federation of American Scientists (FAS) and a lobbyist against the ABM, believes that the strong opposition to the ABM expressed over the past year and a half in the Senate has influenced the direction of the SALT talks. Stone recalls that early in 1969 President Nixon had said he thought that the United States and the Soviet Union would want to have thin ABM systems accepted under a SALT agreement. But, now, he observes, the Administration is talking of the ABM as a chip to bargain away at the negotiating table. The risk, of course, is that, if these talks fail, the United States will be well along in deploying a system which many scientists, including three science advisers to former presidents, regard as useless.

More Rigorous Review

A review of the Senate's consideration this year of the ABM issue suggests that the Senate will not go back to its former habit of rubber stamping Pentagon requests for new strategic weapons. Prior to last year's intense ABM debate, the Armed Services Committee's annual printed hearings on the military procurement bill were contained in one volume; this year's hearings run to four volumes. Moreover, the committee has continued the innovative practice, begun with the 1969 hearings, of having some people such as Wolfgang Panofsky, director of the Stanford Linear Accelerator and a severe critic of the ABM program, testify along with the usual Pentagon witnesses. The committee was first needled into doing this by Senator William Fulbright (D–Ark.), chairman of the Foreign Relations Committee. This latter committee's panel on arms control, under Senator Albert Gore (D–Tenn.), held hearings again this year on the ABM, MIRV (multiple warhead missiles), and SALT.

Moreover, during recent months the legislative aides of numerous senators met weekly, even daily when the critical voting approached, to discuss the ABM issue. These meetings, sometimes attended by as many as 50 aides, were an offshoot of some dinner meetings sponsored in the past by the Council for a Livable World, the arms-control group founded by the physicist Leo Szilard. Thomas A. Halsted, the council's national director and a former Foreign Service officer, has lobbied actively against the ABM, working together with Stone in this effort. Before the ABM issue was taken up on the Senate floor, the council had luncheons—really pep rallies—for more than a score of senators known to oppose the ABM's expansion.

The Federation of American Scientists has redoubled its lobbying efforts in the House and Senate. Stone, a mathematician by training but an arms-control specialist by inclination, has been employed full time by the FAS since 1 July, working out of an office just off Capitol Hill. He and Herbert F. York, chairman of the FAS and a director of Defense Research and Engineering in the Eisenhower and Kennedy administrations, hope to see the FAS double its membership, now less than 2000, and thus bring in more dues to support increased lobbying activities.

Currently, Stone has a volunteer, Michael Casper, who teaches physics at Carleton College, working to give the FAS ties with at least a few scientists in each of the 435 congressional districts. These scientists, to be found mainly on college and university campuses, will be kept informed of FAS positions through newsletters and the reports of the committees the federation is establishing to study a wide range of arms-control and other issues. They would be expected to urge their representatives and senators to support FAS objectives. "People are getting angry about losing (on arms-control issues)," Stone told *Science*. "We feel the climate is favorable to an expanded lobbying effort."

Stone finds no reason for dismay in the outcome of the voting on the ABM. He is perhaps more optimistic, more hopeful of congressional support for arms control, than there is cause to be. Nevertheless, when the Senate emerged last year from the ABM struggle, it appears to have crossed some kind of threshold and to have adopted a more independent view of arms-procurement questions.—LUTHER J. CARTER