

the Assistant Secretary of Defense for International Security Affairs, John T. McNaughton; the Director of the National Science Foundation, Leland J. Haworth; and the Assistant Secretary of State for International Organization Affairs, Harlan Cleveland. Since OST itself was, in part, established to reduce pressure for a Department of Science, the establishment of the policy group follows a tested course, and at this point there appears to be little likelihood that the proposed commission will receive congressional approval. The bills, introduced by Representatives Craig Hosmer (R-Calif.), John P. Saylor (R-Pa.) and Rogers C. B. Morton (R-Md.), were the subject of recent hearings before a subcommittee of the Committee on Interior and Insular Affairs, and the subcommittee is yet to report to the parent group.

The motivations for congressional interest in tidying up the administration of research are complex, and they vary from case to case. But in general, each case seems to have an underpinning of a congressional desire to know precisely who is in charge of spending the government's research funds, particularly in programs that are sprawled over several government agencies. In addition, since the power and prestige of a congressional committee is closely related to the importance of the activities under its jurisdiction, committees often maneuver to acquire authority over administratively amorphous and burgeoning programs.

On the scientists' side of the issue, the aversion to neat administrative organization probably is a vestige of the scientific community's traditional fear of governmental control. The dangers of such control, it has generally been felt by the leadership of the scientific community, are considerably lessened when government support of science flows through a highly balkanized administrative structure. Whenever the Department of Science proposal, in one form or another, has been raised, the response of scientific leaders has been that the benefits that might be realized from centralized administration of the nation's far-flung research and development programs wouldn't be worth the risks. As things now stand, the organizational chart of federal research agencies resembles the doodles of a very disturbed person, but the virtue of the system is that if the National Science Foundation says no, the Office of Naval Research, or one of half a dozen other agencies, might say yes.

Other manifestations of the scientists' aversion to tightening up the system are the frequent colloquies that take place between congressmen and scientists on the question, What is our national science policy? Congress would understandably like to have a policy spelled out so that it can ascertain whether the policy is being followed. On the other hand, the leadership of the scientific community is generally pleased with the way things have worked out, and sees no merit in saddling the relationship with a master plan. When pressed, at committee hearings, the emissaries of science will usually go no further than to express the view that all talented scientists and promising projects should be supported. The Daddario Committee (*Science*, 30 April) tried to get more specific answers by asking just how much the federal government should spend on science; the response from the scientific community was 15 separate essays, most of which ignored the question.

As for the Antarctic Treaty, it provides a remarkably successful story of international cooperation, especially between American and Soviet researchers. Harlan Cleveland, Assistant Secretary of State for International Affairs, in recent testimony before the House committee considering the Byrd Commission proposal, stated that the treaty "was an innovation without precedent on the world's land surface. . . . Its doctrine is simple: that all nations would have access to Antarctica, as long as that access was for peaceful scientific purposes."

Cleveland pointed out that the treaty, which went into effect in 1961, "was, among other things, history's first nuclear test ban agreement. It authorizes any signatory nation to inspect the activities of all other nations in Antarctica. . . . The nations operating in Antarctica have agreed, for example, to exchange detailed reports about their expeditions. The inspections called for by the treaty have actually been carried through; we have sent inspectors to the installations of a number of our Antarctic partners, including the Soviet Union. And we have opened our own peaceful stations to their scrutiny whenever they care to come."

Referring to the proposed Byrd Commission, Cleveland concluded with the observation, "When Congress finds a Government activity that works as well as the Antarctic program does, it is cause not for reorganization but for rejoicing."—D. S. GREENBERG

Research Facilities: Los Alamos Designated by JCAE as the Site for New \$55-Million Accelerator

During the past few years, various regional interests have come forward to stake their claims whenever it became known that the federal government was contemplating the construction of a major research facility. Such was the case with the NASA Electronics Research Center, the Environmental Health Center, and the 200-GeV accelerator now under design at the Lawrence Radiation Laboratory.

The Electronics Center went to Boston after a lengthy row, the Environmental Health Center was cut into three parts to assuage the contenders, and, in an effort to dampen the strife, the National Academy of Sciences has been asked to provide recommendations on a site for the accelerator.

Now and then, however, the regional lookouts fail to detect who has the ball, and the decision on locating a major facility goes through without a squabble. A case in point occurred a few weeks ago when the Joint Committee on Atomic Energy (JCAE) authorized the first steps toward the construction of a \$55-million, 800-Mev linear accelerator, also referred to as a meson factory, at the Los Alamos Scientific Laboratory, in New Mexico. The JCAE took the action despite an administration decision not to go ahead with the project at this time, and it is not certain whether Congress will appropriate the requested \$3.2 million in design funds or whether the executive will spend the money. But the JCAE generally has its way in atomic energy matters, and the odds are that the machine will be constructed, and constructed at Los Alamos.

Both scientifically and politically, the JCAE decision seems to have ample support. Early last year, after the administration vetoed the high-intensity accelerator proposed by the Midwestern Universities Research Association (*Science*, 31 January 1964) a panel chaired by Hans Bethe, of Cornell, recommended construction of a meson factory and all but came out explicitly for placing it at Los Alamos. The matter was understandably of some interest to Senator Clinton P. Anderson (D-N.M.), who is a member of the Joint Committee on Atomic Energy and

* AEC Authorizing Legislation, Fiscal Year 1966, part 1. Available for \$2.25 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

chairman of the Aeronautical and Space Sciences Committee.

The Atomic Energy Commission included design funds for the machine in its submission to the Bureau of the Budget last year, but following consultations involving the Bureau, the Atomic Energy Commission, the Office of Science and Technology, and President Johnson, it was decided to remove the item from the budget.

In defense of the Los Alamos site, the JCAE included in its annual hearings* an analysis which stated that the meson factory would contribute to the scientific strength and morale of the Los Alamos nuclear weapons laboratories.

"The weapon research and development program at Los Alamos," it stated, "is in an extremely effective and vigorous state at the present time. It is essential for national security to keep it so. Even if nuclear weapon testing is continued at its present basis indefinitely, it will be necessary to provide the Laboratory with means to attract new generations of scientists to provide new ideas and new stimulus. The meson factory will not be an isolated part of the laboratory; it will be an integral part of our scientific work as are all our research activities. If, on the other hand, the nuclear weapon testing is stopped—and even when there are rumors that it might be stopped—it is equally essential that we maintain Laboratory morale and viability. The Laboratory and the country would have to plan for the possible resumption of testing on the basis that the USSR or some other nation might resume testing. We would have to put devices on the shelf for possible further testing. . . . This would have to go on for 2, 5, perhaps 10 years. It can go on if the Laboratory staff believes that Los Alamos has a future with or without weapon testing. Construction of the proposed meson factory will provide tangible evidence that Los Alamos is here to stay."

This argument, along with the accelerator's scientific and political support, is potent stuff, and it therefore appears that this is one case where a multi-million-dollar research facility may go through without stirring a nasty pork-barrel fight.—D.S.G.

Daniel S. Greenberg is contributing to Science on an every-other-week basis while working on a book about science and politics, to be published by McGraw-Hill.

Tornadoes: Weather Bureau Office in Kansas City Is Nerve Center for Severe Storm Warning Network

A modern Montesquieu might well surmise that the strain of violence in the American character is related to the random violence of nature in the United States. The climates of the 50 states range from subtropical heat, to arctic cold, to the temperature extremes of the desert. Indigenous also are a rich variety of natural disasters—hurricanes, floods on the great rivers, droughts, earthquakes, and tornadoes.

As the spring floods on the upper Mississippi attest, Americans have not yet succeeded in preventing these disasters, though we have made considerable progress—with hurricanes, floods, and tornadoes, at least—in predicting them.

In the case of tornadoes, which can be terribly destructive in a relatively limited area and which have a frightening capriciousness, a workable warning system with wide coverage is little more than a decade old.

The Weather Bureau's national tornado warning system is centralized in the Severe Local Storm (SELS) forecasting center in Kansas City, which is located about in the middle of the echelon of states, running roughly northwest from the Gulf of Mexico, which the weathermen, on good statistical grounds, call "Tornado Alley."

The forecasting center is interested not only in tornadoes but in severe thunderstorms, particularly those which are accompanied by high surface winds, which produce hail, and which cause serious turbulence aloft. "Extreme turbulence," in the weathermen's parlance, is the sort that will cause severe damage or failures in aircraft. But tornadoes are a chief concern of the center staff, as they are of the public in a number of states when the thunder clouds of spring and summer begin to roll.

Tornadoes have been reported in every state of the Union and in every month of the year, but there are striking patterns in the distribution of tornadoes, and also in tornado "seasons," which vary from area to area. In the cold months, tornado activity is concentrated in the Gulf states and states of the Southeast. From the end of February through the end of August, the arena of greater activity shifts to the central and northern plain states. Lowest tornado activity occurs west of

the Rockies, a fact which long ago led observers to the pragmatic conclusion that the mountain barrier played a significant role in this freedom from tornado weather.

Empirical observations indicated that the frequency of severe storms is greatest during the time of year when thermal contrasts in the atmosphere are most pronounced. In the plains states this period is May and June. It was also observed that, particularly in the plains states, afternoon and early evening, especially, is tornado time.

Severe-storm forecasting was lent sharp impetus during World War II when intensified weather research yielded increased knowledge of the characteristics of thunderstorms and the turbulent eddies associated with them.

By the early 1950's the rise in commercial air traffic had created strong pressure for better severe-storm forecasting. The Weather Bureau historically reacts to such economic demands, and in 1953 a severe-storm warning center was set up in Washington; a year later it was moved to Kansas City on orders of Weather Bureau chief Francis W. Reichelderfer, who thought the unit should be closer to the center of action.

Starting from Scratch

A cadre of younger meteorologists was assigned to the project, and many of them are still working at the center. There was no need to reeducate old-line forecasters, since everyone was young and, so to speak, starting from scratch. Donald C. House, who was one of the early members of the group and now is meteorologist in charge of the forecast center, says this long experience on the part of the center's forecasters has been an important factor in achieving a more than respectable record of accuracy in a new and difficult genre of forecasting.

The state of the art is still far from perfection. While there appears to be a definite correlation between the intensity of thunderstorms and the occurrence of tornadoes, says House, the exact nature of the linkage between the two remains unknown.

Forecasting depends on a network of radar stations, upper-air soundings, and conventional weather observation. In the early days of the center, hand-processing of data fitted in with the rule-of-thumb methods which had to be used. But as knowledge and the flow of data from around the country in-