

according to the report, are identifying characteristics that predispose a child to aggressive behavior; ascertaining what reactions occur at different ages; discovering how the context of violence on television affects reactions; and identifying what fare other than violence induces aggression. The committee also sees a great need for investigating the reactions of very young children to television. Infants are the most difficult to study because lengthy, tedious observations must be relied upon in lieu of interrogation.

(According to a group of Boston mothers called Action for Children's Television, commercialism is a greater source of dismay than violence. They say that during toddler-aimed shows—particularly the Saturday morning fare, which is known among nonfans as

"kidvid ghetto"—up to three times as many commercials are showered on innocent viewers as during adult shows. They have petitioned the Federal Communications Commission to outlaw commercials at prime time.)

The surgeon general's study may be a way to gain a foothold on the larger impact of television on society—the tastes and values it imparts, and the subtle force it has in molding children's concepts of the roles of various races, sexes, and minority groups.

These larger questions may get an airing during the week of hearings on the report to be held by Pastore's subcommittee, starting 21 March. A staff member says the object of the hearings will be to elicit the kinds of policy recommendations that the committee was barred from making. Testi-

mony has been solicited from various government agencies, as well as from the seven individuals who were vetoed from the committee—including two prominent researchers in the field, Leonard Berkowitz of the University of Wisconsin and Albert Bandura of Stanford University.

Changing the ways of the television industry is slow going, particularly since the protections afforded by the First Amendment mean that real efforts to improve the quality of video fare will have to be voluntary. But researchers feel that the Surgeon General's report has accumulated new evidence that, if pursued, will add up to significant social pressure on broadcasters to make better use of their rich and powerful medium.

—CONSTANCE HOLDEN

National Science Foundation: Managing Applied Research

The university scientist has traditionally responded to the idea that he do applied research in much the same way a proper Victorian maiden reacted to an improper suggestion. Now the National Science Foundation, the bastion of basic research, has begun to spend a portion of its funds on problem-oriented research, and some members of the scientific community see NSF as fatally compromised.

There has, in fact, been increasing pressure on NSF from Congress, the Administration, and the public to modify its exclusive devotion to pure science (*Science*, 4 February). NSF's chief answer so far has been the RANN (Research Applied to National Needs) program, directed at helping to solve critical social and economic problems. And last month, the Administration proposed a new experimental R & D incentives program to encourage private industry to invest more tellingly in research. NSF's stake in the new program would be \$22 million the first year. RANN was financed at the level of about \$56 million last year—over 10 percent of the NSF budget—and an

increase to \$80 million for RANN is requested in the President's new budget.

Although RANN remains controversial, die-hard opposition to NSF sponsorship of any applied research seems to have dwindled markedly, both in the universities and within the foundation itself, as the change came to be conceded as inevitable. This legitimizing of problem-oriented research in NSF will doubtless be regarded as the most significant legacy of the relatively brief term as director of William D. McElroy, who left 1 February after 2½ years at NSF to become chancellor of the University of California, San Diego. What is still being argued heatedly, however, is how fast and how far the applied research effort should go, as well as what the effect of grafting a new management style on NSF will be. One thing on which both partisans and detractors of RANN do agree is that, as NSF grows bigger and more adventurous, the agency becomes more visible and vulnerable.

The idea for RANN actually germinated during the tenure of Leland Haworth, McElroy's predecessor. A

small pilot program, which Haworth himself dubbed Interdisciplinary Research Relevant to the Problems of Society (IRRPOS), was launched apparently to achieve two objectives: (i) to comply with the wishes of Congress, which had just passed an NSF reorganization act giving the foundation the option of sponsoring applied research and which clearly wished the foundation to exercise the option; and (ii) to make a bid for increased funds in a science budget that was then becalmed.

A crucial time for the RANN idea was when McElroy joined the foundation in the summer of 1969. A cautious decision had been made to spend about \$2 million of \$6 million earmarked for the program in the first year. McElroy liked the IRRPOS idea and apparently saw applied research as a way to burnish the image of NSF. He gave the go-ahead to spending the full \$6 million, talked a lot about it in his appearances before Congress and elsewhere, and eventually approved a punchier new name, RANN, for the program.

McElroy was himself acutely aware of the antagonism in the university community toward NSF's espousing applied research. In an interview with *Science* after he had announced that he was leaving the foundation, McElroy acknowledged that the "academics are suspicious. I know it stirred up the community a bit," said McElroy, "but people who have been critical have not looked carefully at what we're trying to do. Perhaps we made a mistake in calling it applied research. Good science on

major societal problems is not applied research."

McElroy pointed out that 40 percent of RANN funds were going into "fundamental work," and said that "the whole RANN program is only 13 percent of the total NSF budget, far less than the National Academy of Engineering recommended."

The program, since fairly early in its evolution, has been split into four main elements whose divisional names fairly accurately suggest their objectives. These are Advanced Technology Applications (ATA), Environmental Systems and Resources, Social Systems and Human Resources, and Exploratory Research and Problem Assessment.

Particularly at the start, RANN had influential critics, including some on the National Science Board (NSB), NSF's governing body, which is made up largely of well-known nongovernment scientists. Philip Handler, president of the National Academy of Sciences, was known to be skeptical about RANN

and its rapid growth. As one of his colleagues on the board put it, "Phil hopes it will go away."

Another member said that "some members were against [RANN] in principle. Some felt it was growing too fast. And some were concerned with NSF's image." He said he now perceives a change in the board toward "a more positive view" of the program, because the quality of the program is going up.

NSB chairman, H. E. Carter, coordinator of interdisciplinary programs at the University of Arizona, sees RANN in the context of rapid, larger changes in American science. It is clear, says Carter, that "the sweep of events in the last few years has demanded from universities a new kind of activity." RANN is designed, he said, "to furnish a basis for multidisciplinary and interdisciplinary action to deal with problems involving systems, large organizations. If you consider the problems of the university, NSF has a lot in common with them."

"Universities have essentially provided a base for the individual scientist; there has been little management from the top down. That style of management is not adequate for developing effective interdisciplinary teaching, research, and public service activities. Neither is the department alone an adequate base for these activities."

"The same thing is true in the foundation. NSF responded to individual proposals. Basic research grew and also education." Some NSF programs were problem-focused, says Carter, such as administration of observatories by NSF. But these facilities were really managed by university consortiums, he says. "The foundation built its staff and organization to fit the pattern, and its major role is still the support of individual research activity," says Carter. But now the choice is "either to stagnate" or move in the direction of research that contributes more directly to the solution of rational problems. "And the same is true of the university."

In broader perspective, Carter observes that "The World War II to 1970 period produced a generation with unparalleled competence in basic research" and that we now appear to be moving into an era in which that competence will be put to more direct use.

Carter describes himself as "enthusiastic about RANN, but desperately aware of its problems." One of the obvious problems was to find the management for projects that yield practical payoffs. Grafting on this kind of management expertise was sure to create organizational and personality difficulties at NSF.

Critics have complained that NSF, in managing applied research, relied too heavily on NASA methods and NASA people, and they make at least a prima facie case for this view. At the top of NSF, engineering and systems management experience are now more heavily represented than they were in the past. Raymond Bisplinghoff, NSF's deputy director since October 1970, ran advanced research and technology operations at NASA during the Apollo buildup and came to NSF from his post as dean of the school of engineering at M.I.T. NSF's new director, H. Guyford Stever, who was president of Carnegie-Mellon University, earned his Ph.D. in physics but made his career principally in aeronautics research and administration at M.I.T.

The head of the RANN program,

Briefing

Magruder Moves On

At the end of last week, William M. Magruder, the President's special consultant charged with assembling a technology opportunities program since last September, was denying that he would soon become a technological superchief in the Nixon Administration.

Magruder in an interview said he has completed the study of technology opportunities and has moved on to another assignment, a study of United States export posture. He said he is also winding up some aspects of the technology study. Magruder claims that his study led to \$700 million obligations for fiscal 1973 in a spectrum of fields, but this amount is well below the billions originally rumored. The technology proposals are expected to be the subject of a presidential message now scheduled to be delivered after Nixon returns from China, Magruder said.

Magruder said that the original deadline given him was 30 January. He says he completed the assignment early, on 10 January. On 26 January, a party was given, in celebration of

the conclusion of this phase of the project for Magruder and the staff who had worked with him.

Magruder's remarks last week served to dampen the speculation, which arose when he was appointed last fall, that when the study phase was complete the former Administration SST chief would go on to assume even broader responsibilities for technology policy. At present, however, he plans to remain as special consultant and do whatever chores are assigned him, principally to participate in the exports study. The individual technology projects will be carried out by various agencies, not by a single office.

At the party on 26 January, Magruder was given a toy red plastic airplane with a revolving propeller powered by a tiny battery. The toy pilot was made to look like the flying "red baron." Magruder's colleagues in the White House, the Office of Science and Technology, and the Office of Management and Budget had signed the trophy, and someone had painted one-half of the red baron's helmet black, with the letters "SST" on it. The other half of the helmet was painted white, and had the initials "TOP" for Technology Opportunities Program, on it.—D.S.

Alfred Eggers, assistant director for research applications, came to NSF from NASA. He was assistant administrator for policy at the time of his departure and had worked in upper-level posts in the advanced research and technology program at the space agency; at one time, he served as Bisplinghoff's deputy.

During McElroy's tenure as director, a number of key officials were recruited by Bernard Sisco, McElroy's assistant director for administration and a veteran of NASA and the Department of Health, Education, and Welfare. Not surprisingly, several of these appointments went to NASA alumni and were in pivotal administrative sections such as the financial management office and the office of budget, programming, and planning analysis. And Sisco's successor, present Acting Assistant Director for Administration Thomas E. Jenkins, has a NASA background.

Allegations of a NASA "takeover," however, appear to be overstated. In RANN itself, for example, the deputy director for science and technology is Joel A. Snow, who has been active in the NSF applied research effort virtually from its inception and was NSF program director for theoretical physics before that.

The directors of the three main RANN divisions are also not NASA men. Philip A. Johnson, director of the Environmental Systems and Resources division, has a Ph.D. in plant ecology and made his career mainly in university jobs until he joined NSF as program director for ecosystems analysis in 1968. Paul F. Donovan, director of the ATA division, is a nuclear chemist who joined NSF in 1967 and held a series of jobs in program administration, leading to a post as head of the physics section in 1970. Director of the Social Systems and Human Resources division is Harvey A. Averch, who recently joined NSF from the RAND Corporation, where he was a senior staff economist.

Questions about the NASA influx were, as a matter of fact, raised on Capitol Hill. During authorization hearings in the House a year ago, the Science and Astronautics Committee staff did ask NSF for the names and positions of NASA people who had joined the foundation. A committee staff member recalls that the number of NASA recruits proved "not to be really that large, although there were 12 to 15 in key positions." The ques-

tion was never formally raised in hearings, and the science committee staffer says, "We were simply trying to keep on top of it."

Some unsympathetic vibrations on the National Science Board also seemed to have been triggered by Eggers's appointment of Sidney Sternberg to a new post of deputy director for research applications for RANN. Sternberg, most recently an RCA vice president in charge of commercial and government systems in RCA's Electromagnetic and Aviation Systems Division, had, except for an interlude with Xerox, spent most of the years since the middle 1950's managing aerospace contract work.

Sternberg's appointment apparently resulted in a reduction in the scope of duties of RANN Deputy Assistant Director for Program Management Leon M. Schwartz, who had been brought in from HEW by Sisco and who recently left to take a top administrative post at the National Institutes of Health. The incident seems to have been one of the things contributing to a feeling among some university-based members of the NSB that there is, as one put it, "a little too much NASA style for my taste."

Complaints from Academia

Congress has also been a sounding board for some complaints from university scientists. One committee staff member noted the "concern expressed that the requirements and interpretations of the RANN staff could result in widespread reorganization of the universities—the creation of new institutes and interdisciplinary groupings." Complaints that "if they don't come in with new gimmicks they won't get the money [from RANN] are being relayed by people in academia."

No backlash in Congress seems to have been created so far, however, by these reports, according to committee sources. "As far as the major innovation of RANN goes, there is no disagreement that the work has to be done." But some congressmen who are not much disturbed by rumors of "NASAfication" believe the "danger for NSF is that RANN will grow so rapidly that . . . thinking at the top of NASA will be applied."

Last year, Congress limited the RANN budget to \$56 million, rather than give the \$81 million requested by the Administration. This, after all, was an increase of about \$21 million over the previous year, and Congress is

likely to remain skeptical toward any very rapid buildup of RANN funds.

From NSF's standpoint, the infusion of NASA people was hardly illogical. As McElroy said, "We were adding people who understand the concept of management." And NASA has had experience with big projects. On balance, middle management at NSF is hardly dominated by NASA retreads, and it would appear, as Eggers claims, that a real effort has been made to follow RANN's interdisciplinary principle in recruiting staff.

The rationale for RANN is hardly that of a little Apollo program. As Bisplinghoff explains it, RANN has two main objectives. These, he says, have to be understood in terms of the kind of agency NSF is. "Research is managed by NSF mainly on a random basis," he says, "with the idea of extending basic knowledge. Grants are awarded on the quality of the researcher and the university."

"On the other hand, when we want to solve some of the country's fundamental problems, we find we don't have the basic knowledge. It makes sense to put a small part of the budget into this kind of research—to ask what fundamental research is missing. RANN, therefore, spends some of its money on getting that fundamental knowledge."

The second point, says Bisplinghoff, is that RANN "provides some options in solutions of important national problems. NSF programs span the responsibilities of several agencies and provide integration."

Eggers puts it another way. "RANN forms a bridge between the mainline NSF [basic] research program . . . and the development and operational programs of the mission-oriented agencies. The question is what do we carry across the bridge—how do we know then what is ready for a payoff? If you decide to give this kind of focused effort," says Eggers, "you have to decide how long it will take to get there, how much it will cost. This is where RANN management takes on a different hue from the management of other NSF programs."

"Let's not confuse this with major project management as in DOD [Department of Defense]. It doesn't come close." Time-line research project management would only happen, says Eggers, if projects were taken over by a mission-oriented agency. But RANN does require much more detailed planning from its grant applicants and

more contact between its staff and clients.

To coordinate the RANN program with similar projects elsewhere in the government, an interagency committee of the Federal Council on Science and Technology was set up last year. Presidential Science Adviser Edward E. David, Jr., created the committee to review fiscal year 1972 programs, and the committee continues in its coordinating role.

Eggers says that the RANN program has been modified as a result of activities already under way in other agencies. In the urban systems area, for example, a good deal of work was in progress in the Department of Housing and Urban Development, says Eggers, and RANN's initiatives in this area were redesigned to support the HUD work. RANN, for example, is now putting more emphasis on research on integrative systems, as well as excavation and tunneling technology.

Many RANN programs will inevitably have deferred results, as in the case of the Chesapeake Bay study (*Science*, 21 May 1971), but others deliver more immediate payoffs. An example of this is a project on the handling of solid waste in New York City. A group at the State University of New York at Stony Brook is carrying out the project for New York City's environmental pollution agency.

A special problem in New York is that solid waste collection peaks on Monday after the weekend, declines in volume for the next 2 days, and then levels off. The task for Stony Brook researchers was to find a way to meet peak loads without hiring a lot of extra people or requiring a lot of overtime.

The researchers worked not only with city officials, but with sanitation workers and their union. Study of the collection schedules and some tricky nonlinear programming made it possible to redesign "manpower loading" to handle variable manpower requirements, says Eggers. Sanitation workers benefited because they got more 2- and 3-day weekends; the city benefited because there was no increase in costs. And as a result of the experience, the city decided to add its own staff with the sort of analytical competence provided by the Stony Brook researchers.

One of the key management principles applied by RANN in such projects, says Eggers, is to try to insure that the results are put into effect by the "user community." "It's their decision," says Eggers, "and it's crucial that they be

familiar with what we're doing. One of the best ways to get something you're sure somebody will use is to be sure they're in on the project." RANN officials deal with grantees, not with the ultimate users of research results; thus what RANN does is to be very sure that the original project design includes early involvement of potential users.

Eggers and his colleagues do not underestimate the difficulties they face. "We know there's a lot of concern in the universities," says Eggers. "Universities are traditionally not interested in doing problem-oriented research. It's going to take time. We do make planning grants—give them time to get organized. And it's not just universities which have trouble [doing applied research]. It's a new ball game."

Is RANN winning?

"People worry about the quality of the work being done," Eggers concedes. "Frankly, we don't really know how to measure quality." But he says he is "immensely pleased" at the way universities have responded. He rattles off names of distinguished researchers now involved with RANN and notes that two-thirds of the support in the RANN program is going to universities in the Association of American Universities (the AAU includes the twosome most affluent and prestigious research-oriented public and private universities).

Judgment by Congress

Perhaps the most important judgments on RANN's effectiveness will be made on Capitol Hill. NSF's general relations with the authorization and appropriations committees in both the House and Senate seem to be prospering. RANN officials, for example, have met several times with an energy task force set up by the House Science and Astronautics Committee, which has NSF in its jurisdiction. The task force chairman is Representative Mike McCormack (D-Wash.), and the ranking Republican is Representative Charles A. Mosher of Ohio. Work on energy problems is the largest single RANN program item in terms of funding, and RANN and the task force have mutual interests and have established what is described as a comfortable relation.

This does not mean that Congress accepts NSF proposals uncritically. The House science committee's subcommittee on science, research, and development, headed by Representative John W. Davis (D-Ga.), last year restored some cuts in education and institutional aid funds and registered some doubts

about parts of the NSF basic research program. (Future articles will focus on NSF basic research and education programs.)

Last year the subcommittee's actions also led Congress to cut back increases in the RANN budget requested by the Administration. The subcommittee, primarily, was unconvinced that NSF would spend the additional money effectively. Congress cut RANN funds from the \$81 million originally requested in the budget to \$56 million—still a healthy boost over the \$35 million voted the previous year.

The new Nixon budget asks \$80 million for RANN this year, but, as Eggers notes, "If you compare the RANN budget this year with the \$81 million RANN budget last year, you'll find a shift in emphasis." Last year, \$25 million each was asked for ATA and Environmental Systems and Resources. This year, ATA is to get \$35 million and Environmental Systems, \$25 million. The request for the division of Social Systems and Human Resources was cut from \$16 million last year to \$12 million, and the Exploratory Research budget from \$14 million to \$6 million. In effect, \$10 million would be transferred from the latter programs to ATA. The added funds in ATA would go mainly to work on solar power, earthquake engineering, and tunneling.

Some observers see this new emphasis on hard technology as reflecting Eggers's own tastes. It may also be a sign that the Administration wants more short-term demonstration projects that are likely to yield immediate payoffs.

The Administration strategy on research and development will not be fully revealed until the President's promised technology message appears, probably in March (see Briefing, page 612), but there are enough hints in the budget and elsewhere to indicate that the Administration has retreated from any grand, technological pyramid-building and means to stress utilitarian research and development on such things as energy problems, industrial research, and increasing productivity in the services sector.

If this proves to be the case, the Administration scenario is likely to give NSF, if not a starring part, at least a strong supporting role. NSF has been unaccustomed to this sort of prominence. The new visibility will bring with it increased pressure on NSF to produce results. And more than ever, NSF will be on its mettle to make sure that RANN is no also-ran.—JOHN WALSH