by aid givers. Based in London with a staff of about 40, including 3 research officers, the ITDG is a nonprofit company that provides consultancy services to less developed countries. It publishes a journal, *Appropriate Technology*, and through a system of expert panels develops its own examples of intermediate or appropriate technologies. In cooperation with other centers, the ITDG has assembled more than 200 such items of equipment. One ITDG product is a hand operated, multipurpose, metal bending machine which can be built for about $16. The cheapest machine available commercially requires mechanical power and costs $1750.

Another product of the group's research and development is a machine for making egg trays, designed at the request of the Zambian government. The smallest existing machine cost $390,000 and had a far greater capacity than Zambia required. The ITDG version costs $19,500 and can make other sorts of packaging besides egg trays.

"Development begins with people, not the production of things," says George McRobie, a director of ITDG and former colleague of Schumacher's at the National Coal Board. McRobie, a Scotsman who regards himself as a citizen of a less developed country, speaks of the inhumanity of large scale technology and its disutility for the poor and powerless. The choice of technology, he says in a recent article, "is the most critical collective decision facing any poor country (and perhaps rich countries too). The choice of technology determines who gets work . . . it determines the kind of [industrial] infrastructure required, patterns of education and training, the extent of national self-reliance or dependence on others. . . . It was, and still is, the virtual denial of such choices to the developing world that brought the Group into existence."

ITDG is still small—the annual budget is about $130,000—and dependent on grants to balance its books. Nevertheless, it has survived, its approach is gradually percolating into development theory, and it remains a tangible proof that its founder's ideas about the beauty of smallness have some marketplace appeal in the practical world.

Such proof is by no means unnecessary: perhaps the chief lacuna of *Small Is Beautiful* is that it describes a number of maybe utopian ideals without offering many signposts as to how they may be attained. Schumacher is not particularly helpful in elucidating the questions left hanging in his book. How can one reverse the trend that he deplores toward technological bigness, complexity, and violence? "People are sleepwalkers," Schumacher replies, "you must hope that if you shout hard enough they will wake up." He is not interested in issuing precise instructions for reform; what is important is that people sort out their own convictions. "We are suffering from a metaphysical, not a technical deficiency—technical brilliance will only drive us deeper into the mire. When we say Concorde [the Anglo-French SST] is a marvelous thing, that is a metaphysical statement. Unless we sort out our deepest convictions we will never get the answer."

Schumacher complains that people "have allowed themselves to be persuaded by Darwin that there is no purpose to anything." Is he then advocating a return to religion or religious values? "I don't advocate anything. What we most urgently need is to find the truth."

Schumacher declines to say whether he is optimistic or pessimistic about the current state of things. But in a recent speech to a London borough council, he explained that the two developments which make big cities (and suburbs) possible are fast transport, which is based on oil, and high agricultural productivity, which is also based on oil. As the era of cheap oil comes to an end, "then it would follow that the task will be to decentralize . . . into small, organic, meaningful structures. Also, it will mean that many more people will have to be engaged in agriculture." The oil crisis, in other words, may be forcing us in the direction Schumacher advocates. His vision of the death of cities may not console those who prefer urban civilization to what Marx called the idiocy of rural life. But it is a vision worth bearing in mind as a corrective to those who say that the cure for all the ills caused by technology is more of the same technology.—NICHOLAS WADE

NSF Science Development Program: "Centers of Excellence" Revisited

In the middle 1960's the National Science Foundation (NSF) launched a major program of grants designed to upgrade science in selected "second tier" universities. An evaluation study* of the program has been released and, because the Nixon Administration in 1971 decided to end the program, the study has something of the quality of a postmortem, not only of the program but of an era in which attitudes and assumptions about federal science were very different from those which prevail today.

The study's findings are not startling. As the report notes, "it is difficult to give $230 million to universities and do them much harm." And the grants carried into the early 1970's—when the financial crunch hit most universities—so that longer-term effects of the program are hard to identify. By the indices devised for it, however, the study does provide evidence that the grants did, in most cases, help—there was, for example, an increase in faculty publications attributed to the program. But the major value of the study may well be that a serious attempt was made to evaluate a major program by an outside group.

The study of the Science Development (SD) program was carried out for NSF by the National Board of Graduate Education.† The project director was David E. Drew, a sociologist who worked in the research office of the American Council on Education before heading the SD study and is now at the Rand Corporation. The cost of the study was $270,000, but NSF hopes the investment will be figuratively amortized over a fairly long period be-

*The study is published in two parts. Copies of a summary report, *Science Development, University Development and the Federal Government* may be obtained free from the National Board of Graduate Education, 2101 Constitution Avenue, NW, Washington, D.C. 20418; a technical report, *Science Development: An Evaluation Study*, is available for $5.75 from the Publication Sales Office of the National Academy of Sciences at the same address.

†NSF asked the National Academy of Sciences to undertake the study, and the academy, through its operating arm, the National Research Council (NRC), delegated the job to the National Board of Graduate Education (NBGE), with which the NRC has a slightly complicated relationship. The NRC, the Social Science Research Council, the American Council on Education, and the American Council of Learned Societies form the Associated Research Councils which established the NBGE to carry out studies in graduate education. The NBGE is administratively housed within the NRC, and the board's staff are NRC employees. The board was set up on a temporary basis and is due to expire when three reports which the staff is still working on are complete. While certainly not hostile to federal grants to universities, the NBGE had no particular axe to grind for the SD program.

cause a data base was created which researchers in the future are expected to use and refine. Data were collected not only from institutions which were SD recipients, but from a control group composed of the leading doctorate-awarding institutions in the United States. In the physics group, for example, 34 institutions were SD recipients and 52 were in the control group. Data were collected for a 15-year period (1958 through 1972).

The SD program was an experiment in institutional funding—the only major one to date. Until the time of the program, NSF hewed close to the line of supporting excellence in science, with the result that foundation funds tended to flow through the medium of research grants to those identified by the peer review system as the best people in the best institutions. In 1963, the federal government spent about $1.3 billion for academic science, some $500 million, or 40 percent, of which went to 17 institutions. Each of these 17 received more than $20 million.

The early 1960's was a boom period for science. The boom was stimulated at least in part by Sputnik, and the implied threat of Soviet superiority, but there was also an assumption that R & D was a catalyst for regional economic growth, as the high technology enclaves around Boston and in California seemed to prove.

Logic thus led to the conclusion that the way to serve both national security and the economy was to increase the number of science departments of the first rank and thus the number of graduate students in science, mathematics, and engineering.

The President's Science Advisory Committee had fostered the idea of creating what, in the cliché of those days, were called "new centers of excellence." And the machinery of institutional grants meshed well with growing congressional insistence on more equal geographical distribution of R & D funds. This demand had been spurred by studies which showed that military procurement orders tended to be concentrated where military R & D contracts were performed.

The SD program was authorized in 1964 and the first grants awarded in fiscal year 1965. The grants were awarded on a competitive basis to universities which not only had to come up with detailed plans for developing their science programs, but could also provide assurances of sustaining the new momentum in science after the grants ended.

The NSF program was, in fact, three programs. Of the total $230 million spent, some $177 million, or more than four-fifths, went into the University Science Development (USD) program, under which 31 universities judged to have the potential for developing excellence in science were given funds to upgrade clusters of departments. Grants were made usually for from 5 to 7 years, and many of the institutions received supplementary grants. The totals of most grants ranged between $3 million and $7 million. At the top end, Indiana University got about $9.2 million; the University of Southern California, $7.5 million; and the University of Arizona and Washington University in St. Louis, over $7 million each. Two smaller subprograms were also funded. A Departmental Science Development (DSD) program was designed for single departments regarded as having the potential for work of high quality, but which were in "weaker" institutions. Some 73 grants were made in this program, averaging about $500,000 each. Special Science Development (SSD) grants were given to 11 institutions identi-

President Ford at NIH: Courting Biomedical Science

President Gerald R. Ford recently paid biomedical researchers a kind of tribute they are not used to receiving. He treated them like any other group of constituents whose votes he will need in 1976 by making a personal appearance at the National Institutes of Health (NIH). It has been some time since a President has bothered much about courting the research vote.

The occasion of Ford's visit to NIH was the swearing-in of Theodore Cooper as assistant secretary for health in the Department of Health, Education, and Welfare (HEW) and Donald S. Fredrickson as director of NIH. The swearing-in had originally been planned to be an in-house affair on the afternoon of 7 July, but it was hastily moved up a week to the morning of 1 July to accommodate the President's desire to attend.

The Marine Band was there, playing show tunes for the 400 or so senior scientists who had been invited to witness the festivities in the Clinical Center auditorium. On stage, Cooper and Fredrickson sat with their families and a poker-faced Secret Service agent. The President, delayed in traffic, was a little late. Someone gave Mrs. Cooper and Mrs. Fredrickson white orchid corsages. Former NIH Director James Shannon and his wife were introduced to the crowd that thinks of him as something of a patron saint. He received several rounds of applause. The band played on. There was an air about the place that reminded one of a high school graduation.

Outside, a crowd estimated at 1000 persons waited to greet the President who, reportedly, took several minutes on entering and leaving to shake hands. He entered the auditorium to the familiar strains of "Hail to the Chief."

The ceremony thereby became a "historic event," as HEW Secretary Caspar W. Weinberger noted in his introduction of the President. Weinberger called the President's presence at NIH a "clear and unambiguous" statement of his commitment to health and research.

A Presidential Pat on the Back

Ford then made a few brief remarks—no policy speech, just a pat on the back for a community that has felt sorely neglected by the White House. The President said he wished to pay a "long deserved tribute" to NIH, which he called "a symbol of hope, not only for patients here, but for all peoples everywhere." He praised Cooper and Fredrickson and spoke with special affection of Weinberger who has recently resigned as HEW secretary, effective next month. Ford declared that, under Weinberger, HEW worked at "peak efficiency."

The President commended NIH as a premier research establishment, telling Fredrickson that "the people" look to him not only to develop new knowledge but also to make it widely available. Ford affirmed his belief in quality medical care for all Americans at a reasonable cost and said we can look to Cooper for progress in that area. All in all, it was a pleasant, predictable speech. It was followed by the formal oath-taking, after which Cooper and Fredrickson received their letters of appointment, tied like diplomas with white ribbons. The crowd loved it. The President had come to NIH—a gesture that will not be soon forgotten.—BARBARA J. CULLITON fied as occupying a position in between those qualifying for USD and DSD grants. The average SSD grant was about $1 million.

In its early days, the SD program inspired misgivings of several kinds. Some skeptics suggested that universities would simply substitute SD funds for money already being spent on science, and there would be no net improvement. There were predictions that recipient institutions would use federal funds to lure faculty and graduate students from other universities and, in the process, bid up salaries. Some nonscientists saw the SD program as still another federal program which would subsidize science to the disadvantage of the humanities. It was also suggested that institutions funded by the program might recruit less able graduate students and turn out Ph.D.'s who would fare poorly in the job market compared with those produced by institutions with more prestige.

Most of these questions were considered when the study was designed. But it must be noted that only physics, chemistry, and mathematics programs in the natural sciences were covered in the study (along with history, for a social science comparison), so that the study was not comprehensive. Perhaps the most satisfactory way to indicate the tack the survey took is to quote the major findings of the study as they are presented in the summary report.

1. *Faculty Size* NSF funds helped departments in all three science fields to enlarge their faculties. In physics and chemistry this increase in faculty size was limited to the public sector.

2. *Faculty Mobility* An analysis of senior faculty mobility in the field of physics showed that the funded institutions did not develop by recruiting extensively from the leading physics departments.

3. *Scholarly Productivity* Science Development funding had a positive effect on scholarly productivity as measured by rates of publication in key journals, i.e., the funded departments registered an increase in the number of articles published by their faculty members in journals that have high scholarly impact. This increase, however, was largely a function of the growth in faculty size; the effects on the publication rate of the individual faculty members were minimal.

4. *Graduate Student Enrollment and Quality* Receipt of a grant was not closely related to increases in graduate student enrollments. Funded departments, however, were able to attract higher quality graduate students (as measured by an improvement in the scores of first-year graduate students on the Graduate Record Examination), though there was no change in the quality of graduate students if one judges by the selectivity of their baccalaureate institutions.

5. *Ph.D. Production* Although Science Development funds increased the production of Ph.D.'s in physics, in mathematics that effect was observed only in the public university sector. In chemistry, no impact at all was apparent.

6. *Postdoctorate Employment* Ph.D.'s from funded institutions differed very little from Ph.D.'s from nonfunded institutions with respect to attractiveness of jobs obtained upon graduation, whether in or outside of academe. New Ph.D.'s in mathematics from private Science Development institutions were somewhat more successful than those from (private) control institutions in obtaining positions at high-quality universities.

7. *Geographical Distribution* Under the major subprogram, University Science Development (USD), 31 universities in 21 states were funded. Six USD recipients were located in a state that already had at least one leading university according to a combined science measure based on the fields of mathematics, chemistry, and physics. The other 25 USD recipients were distributed among 17 states that did not have a leading university in 1965. Therefore, the goal of geographical dispersion of funds was largely achieved.

Whatever the hopes of its sponsors, it is clear that the SD program did not double the number of first-rate research universities in the United States. It is possible that, if a different strategy had been used—bigger grants to fewer institutions, for example—the program might have had a greater impact, but it is difficult to see, under the circumstances which prevailed, how NSF could have picked the lucky schools.

In the later stages of the program, some critics argued that the program was oriented mainly toward increasing the production of Ph.D.'s, and that this was unfortunate since the market for new Ph.D.'s was very tight. The Nixon Administration brandished this argument when it cut the program, but, ironically, the data in the study to some degree contradict the contention that the SD program markedly increased Ph.D. production.

The generalizations in the report are subject to the usual qualifications that experience in different institutions and different disciplines varies a good deal. And the worsening financial situation of the institutions in the 1970's did cause some to husband SD funds, with the result that the effects of the program may have been attenuated. A stretch-out of funding was possible under the terms of the program, and some institutions, in fact, are still drawing on the last of their SD funds.

Not surprisingly, the bigger grants usually made bigger impacts. The study indicates that the institutions that were most successful in upgrading their science programs were those with strong central administrations which stuck to their plans, particularly institutions which had the same president before, during, and after the period of the SD grant.

The aim of the study was to detect the impact on university programs made by the grants. The authors admit that some of these effects were positive and some negative and end by saying that "The interpretation of their value is a philosophical decision that we leave to the reader."

To some readers, the methodology of the evaluation study will be more interesting than the results. Two approaches were used: (i) collection of data which would permit a "multivariate analysis" of institutions and (ii) site visits. Project director Drew says, "You really need a mix of hard-nosed, quantitative data with site visits. If you just analyze data through a computer, you get one step away from reality. On site visits, there's the danger of getting snowed."

Drew notes that data in higher education has been notoriously hard to handle because schools keep records differently and it was difficult to get comparable data. Staff members worked hard at reconciling data from different sources and think they did some missionary work which will contribute to improving the situation.

The SD evaluation is an ex post facto exercise, and Drew stresses that, if a program is to be evaluated with maximum effectiveness, detailed plans for evaluation should be included in the program design.

The study does not necessarily vindicate the principle of the institutional grant program, but it does give NSF some concrete data with which to answer questions about how this particular program worked.

Questions about the quality of research and graduate education in particular institutions are becoming increasingly pointed as competition for funds increases, and legislators and the public demand evidence that public funds for science are being used productively. At a time when NSF is being called to account by critics in Congress, the foundation may hope to make some points by offering the evaluation study as its own contribution to the cause of accountability.—John Walsh

Gillette Wins Nieman Fellowship

Robert Gillette, a News and Comment reporter since 1971, has been awarded a Nieman Fellowship in Journalism for the academic year 1975–76. The Nieman fellowships provide a year of study at Harvard University in fields of the recipients' choice; Gillette plans to emphasize science and foreign affairs.

The Nieman Fellowships were established in 1937 through a bequest of Agnes Wahl Nieman, in memory of her husband, who founded the Milwaukee *Journal*.