Africa. Yet the needs and dangers of social and personal survival provided suitable conditions for the development of rituals as pragmatic instruments (from the standpoint of the actors) for coping with biological change, disease, and natural hazards of all kinds. Social action in response to material pressures was the systematic and systematizing factor. Order, cosmos, came from purpose, not from an elaborate and articulated cosmology. It is an order that accords well with human experience at preindustrial technological levels; even its discrepancies accurately reflect the "facts of life"—in contrast to consistent and harmonious cosmologies whose symbols and myths mask and cloak the basic contradictions between wishes and facts.

The Continuing Efficacy of African Ritual Symbols

Nevertheless, from the comparative viewpoint, there are remarkable similarities among symbols used in ritual throughout sub-Saharan Africa, in spite of differences in cosmological sophistication. The same ideas, analogies, and modes of association underlie symbol formation and manipulation from the Senegal River to the Cape of Good Hope. The same assumptions about powers prevail in kingdoms and nomadic bands. Whether these assemblages of similar symbols represent units of complex orders or the debris of formerly prevalent ones, the symbols remain extraordinarily viable and the themes they represent and embody tenaciously rooted. This may be because they arose in ecological and social experiences of a kind that still prevails in large areas of the continent. Since they are thus sustained and since there is a continuous flux and reflux of people between country and city, it is not surprising that much of the imagery found in the writings of modern African novelists and in the rhetoric of politicians is drawn from ritual symbolism—from which it derives its power to move and channel emotion.

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NEWS AND COMMENT

Technology Incentives: NSF Gropes for Relevance

A year ago, on 16 March 1972, President Nixon announced in his first technology message a new plum for the National Science Foundation (NSF), an ambitious sounding scheme known as the Experimental R & D Incentives Program or ERDIP. The message directed the NSF, together with the National Bureau of Standards (NBS), to investigate ways in which the government could "improve the climate for technological innovation" through experimenting with alternative policies to achieve this goal.

The incentives programs were heralded as a possible step toward improving industrial productivity and, ultimately, the trade balance through a more sophisticated tuning of the private R & D establishment. In its own minor way, then, NSF was given a chance to contribute something to White House policy-making on vital national interests—a promise that at present is not being fulfilled.

A year later, however, the NSF has only received and obligated about $2 million of the $18.5 million which Congress warmly appropriated for the fiscal 1973 program. The rest has been withheld by the Office of Management and Budget (OMB). A spokesman there said, "They've made presentations to us and submitted plans which we've been going over with a fine tooth comb. . . . We were disappointed with some previous plans." NBS's share of the program—known as the Experimental Technology Incentives Program—is in the same boat, with most of its funds impounded except for a small allotment for planning purposes.

Impoundment of ERDIP's funds by the OMB is surprising in view of the fact that the program is one of the few tasks that has ever been directly assigned to the NSF by presidential initiative. Although it is hard to assess a program that has produced so little, the first anniversary of its announcement would seem a justifiable time to inquire exactly what had been accomplished so far.

Conversations with the program's staff, with industrial and academic consultants to ERDIP, and with knowledgeable officials in other agencies suggest that ERDIP so far has no clear idea as to how technological innova-

tion comes about. For this reason, maybe, ERDIP staff have great difficulty in explaining in general terms what their future "experiments" will "test." Instead, they have compiled a matrix of 676 possible policy options.

Many outsiders familiar with the program are critical of the slow progress made to date. Some go so far as to criticize the ERDIP staff for not having sufficient prior background in the innovation process, or with the parade of past government attempts to improve U.S. technological innovation. In terms of the obvious political importance which the Nixon Administration attaches to industrial productivity and the growing international trade deficit, some outside advisers are concerned that the ERDIP staff is not sufficiently dynamic, or politically attuned, to do the job. As one industry official said, "If we had Jim Webb [James E. Webb, a former director of the National Aeronautics and Space Administration] running this program, by now we'd all be believing it was going to save the country!"

CEA Origins

According to NSF deputy director Raymond L. Bisplinghoff, the notion of an experimental incentives program grew out of a subcommittee headed by Ezra Solomon of the Council of Economic Advisers. The subcommittee met in the winter of 1971 while William M. Magruder, special consultant to the President, was conducting his technology review for the President. The CEA group's report thus was the basis of the technology message's statements on incentives.

However, another story around town has it that the program was included only by accident in the message—a speechwriter's fluke. Needless to say, there is no official confirmation of this version, but a close reading of the message shows that all sorts of different goals and aims are assigned to the incentives program at different points in the text.* As one official familiar with the programs both at NSF and NBS said, "If they're still trying to devise a program around the President's words, they're crazy."

A third account is that the incentives program was the creation of the OMB, which, disillusioned with Magruder's space program–like proposals, decided more needed to be learned about encouraging American technology. But it may have been included, too, according to some officials, as a substitute "experimental" program for full-scale government action.

What has been achieved in the intervening year? According to ERDIP director C. Branson Smith, during the summer NSF commissioned background studies on innovation in industry, innovation generally, and some frequently suggested federal incentives, such as changed capital gains laws and tax rebates. In addition, Smith says, "all throughout the spring, there was planning for the program." To date, the monies have gone for planning.

Smith came to NSF in September 1972, having been a technical engineering consultant with United Aircraft. He met Bisplinghoff while at the Pentagon's Directorate of Defense Research and Engineering.

What view of the innovation process will NSF test in its experiments? Smith replied that the models of the process developed by the studies "stretched all the way across the room" on charts. "You could think of five or six exceptions just sitting there." So the staff abandoned the quest for a single, generalized theory and instead drew up a "matrix" involving 676 incentive options. As to the long history of Uncle Sam's attempts to encourage industries to become more technologically innovative, such as J. Herbert Holloman's attempted Civilian Industrial Technology Program in the early 1960's and the Operation Breakthrough experiment with the building industry, Smith mentioned none of them. He indicated, however, that he was mistrustful of certain conventional wisdom about recent innovations. "The people who made the innovations are in controlling positions . . ." and "rewriting history through PR machines. . . . I happen to be in favor of the historical model," he said of innovations 50 to 100 years ago where historians have had time to clear things up.

ERDIP has worked out some policy decisions, however, perhaps with the urging of the ever-present OMB. One is not to intervene in "internal" company organization, but to work in the "environment" in which companies operate. Another is not to test the big economic reform ideas, such as tax incentives and capital gains laws changes. Smith indicated that discussions with the Treasury (which traditionally opposes such maneuvers) discouraged the staff of ERDIP from attempting to experiment with capital gains, for example.

In November, despite these diffuse activities, NSF issued a general description of ERDIP which echoed the language of the technology message and told prospective "experimenters" how to submit their proposals. By February, an estimated 600 proposals had come in but since NSF hasn't decided which to fund, they cannot be discussed individually. According to advisers to the program, however, many are from money-hungry firms seeking, in the words of one, "to invent a better kind of peanut butter." With a thin wash of buzz words, some of the proposals state that NSF support of "peanut butter" research will reveal, ultimately, some lesson concerning innovation. Apparently the issue of whether to fund these is a bone of contention among ERDIP planners, the OMB staff, the ad hoc advisory committee to ERDIP drawn from the National Academy of Engineering, and the National Science Board (NSB). ERDIP has made presentations both about the unsolicited proposals and also about some plans for institutional "experiments" to the White House Office of Science and Technology, the NSB, other NSF staff, and the OMB.

OMB in Background

Finally, lurking behind the ERDIP studies, policy moves, proposal considerations, and a plethora of presentations, has been the dark hand of the OMB. OMB has apparently justified its continued hyperinterest in the program on the grounds that it is a presidential initiative. One ERDIP staffer said that OMB talks with those in the program sometimes as infrequently as once every 2 weeks, but at other times two to three times a week. But Smith claims that OMB has not held up his program. As a prime example of how the budget agency has this year moved into policy-making roles through its disputed control of funds appropriated by Congress, OMB apparently is making no bones about its wish to have acceptable program plans from both NBS and NSF before it permits either agency to spend their incentives money.

All this, the tug of war with OMB, the continued vagueness of NSF plans,

* The technology message in fact gives ERDIP three different jobs in three different passages: to "seek effective means of improving and accelerating the transfer of research and development results from Federal programs to a wider range of potential users. . ."; to "determine effective ways of stimulating non-Federal investment in research and development"; and to "explore the possibilities for creating better ties between State and local governments on the one hand and local industries and universities on the other. . . ."

and the delays involved, has advisers to the program agitated. Emotions include worry, scorn, and fear that the government will abandon all experimental policy programs if ERDIP doesn't work out.

For one thing, the lack of a clear consensus on what exactly ails the mysterious beast called the process of innovation is viewed by some as at the heart of the ERDIP's difficulties. "The program as announced by the President has very little intellectual content," said a critic in government who asked not to be named. "The project set up is a straw man."

He indicated that "people understand invention and innovation. You can make generalizations about it. There's no great big mystery here . . . but the fact is that nobody has the guts to take any one of these steps," such as tax incentives or capital gains laws changes. "It's questionable if you can make 'experiments.' You end up spinning your wheels."

Economist Edwin Mansfield of the University of Pennsylvania, who has specialized in the economics of R & D and advised the government and NSF, stated that studies of stimuli for aiding the laboratory-to-marketplace process are worthwhile but less urgent than evaluating the social returns from research. Mansfield said he was concerned that the program wasn't "trying to get information on where the shortfalls are greatest," where the "social returns are high and the private returns are low," although he thought the staff was "aware of these considerations." In other words, NSF hadn't identified fields where aiding the commercialization of products would be of the most value to society.

The prospect that NSF will fund the so-called peanut butter proposals seems to worry a good many people. "The proposals are all coming from institutions which would be performing the experiment," said an industry consultant. "This is the same old NSF way of doing things: they get in a lot of ideas, look them over, choose the best, and fund them. . . . I was hoping there would be one group that would be terribly imaginative."

Commerce Department economist Michael Boretsky, who has theories about the importance of high technology to the health of the economy (*Science*, 2 March) indicated that the programs in NSF and NBS, as he understood them, would substitute public funds for private funds. "If a guy comes to you with a brilliant idea, and you give him money, and it then becomes a commercial success, what have you learned? That government funding of good ideas leads to successes."

And the late Donald Marquis of M.I.T. stated, "I think the NSF and . . . NBS should take the lead in designing the kinds of experiments they think would be fruitful and then putting them out for bid rather than relying on unsolicited proposals," but he added that NSF "doesn't have the clout to carry out the experiments."

The earlier remark diagnosing a lack of Webb-like dynamism and political savvy was echoed in other comments by outsiders concerning the ERDIP staff. Many who had made inputs to the program thought Smith and Bisplinghoff were both "sensitive" to the complexity of the problem. But there were plenty of other comments reflecting impatience with the delay. "Those guys have completely alienated industry," said a professor who helped bring industry officials to talk with NSF. He said when the program was announced a year ago that many of the people he knew were very enthusiastic and eager to help NSF, "but they [NSF] just didn't react. These guys are used to action." "There are 12 to 20 people in the country who know something about the innovation process," said another university adviser. "None of them are among that staff."

Once NSF finally clears some plans with OMB and announces some specific actions, the anxiety, impatience, and confusion now surrounding the program may clear away. OMB may finally remove its spiked boots, step back, and let ERDIP officers conduct their business normally for a change. And, in what NSF estimates will take 5 years, some results useful to federal policy-making could start rolling in.

However, as Bisplinghoff himself stated in an interview, if the economy recovers, "There would be a tendency to take a lot of the steam out of it [ERDIP]," since the impetus for the program stemmed from economic troubles. Another government official said, "If the economy begins to move . . . they can turn the program off and say we don't need the stimulus. It'd be easy."

Whether or not ERDIP ever gets off the ground, at the moment, appears to depend on how adroitly NSF can maneuver to close the credibility gaps ERDIP has opened inside and outside government. It may also depend, incidentally, on whether ERDIP can actually do something about an urgent national problem.—DEBORAH SHAPLEY

Endangered Species: Moving Toward a Cease-Fire

It was the third week in February, and hope was turning rapidly to despair among a small band of conservationists and biologists who had spent the past decade trying to arrange a worldwide treaty to protect endangered plants and animals from the depredations of illicit trade. Only 10 days before, in a grand culmination of this long enterprise, the delegates of 88 nations had trooped into the State Department in Washington to thrash out the final details of an international cease-fire of sorts on endangered species. In an opening round of speeches the diplomats had staunchly pledged themselves to saving the earth's vanishing animals and plants. But now, in the private shirt-sleeve sessions that followed, negotiations were bogging down in a mire of conflicting amendments and semantic disputes, and it had begun to look as if the long-awaited agreement might not be signed.

With the conference half over and the prospects for a broad, forceful agreement growing dimmer by the day, the U.S. Interior Department could