Stream Channelization: Conflict between Ditchers, Conservationists

Stream channel alteration under the banner of "improvement" is undoubtedly one of the most destructive water management practices . . . the aquatic version of the dust-bowl disaster.—NATHANIEL P. REED, *Assistant Secretary of Interior for Fish, Wildlife, and Parks*

American agriculture couldn't survive without it.—EUGENE C. BUIE, *Assistant Deputy Administrator, Soil Conservation Service*

American agriculture and the nation's environmental movement, already locked in battle over the use of persistent pesticides, are moving toward a new collision on an issue no less emotionally charged. The conflict centers on several venerable programs of federal assistance to farmers for "improving" or rechanneling streams and small rivers. Despite the best efforts of the President's Council on Environmental Quality (CEQ) to mediate an escalating dispute over the propriety of stream channelization, the issue has already divided and polarized government agencies against each other, and it seems sure to bring an increasing number of lawsuits from conservation groups that doubtless will prove as infuriating to the agricultural community as the current barrage of legal actions aimed at DDT and other "hard" insecticides.

The federal government has been rechanneling rivers since the 1870's, when the Army Corps of Engineers began working along the Mississippi River Valley. But it was not until the mid-1950's, shortly after Congress passed the Watershed Protection and Flood Prevention Act of 1954 (Public Law 556), that alteration of the nation's small waterways for agricultural purposes got under way in earnest.

Through this program, the Department of Agriculture's Soil Conservation Service (SCS) has helped farmers widen and deepen and "straighten" more than 8000 miles of streams and rivers in every state. During the same time, the Corps has improved on nature along another 1500 miles of waterway.

The underlying rationale for reaming and rebuilding these thousands of miles of streambed, and for thereby altering the drainage patterns of more than 10 million acres of land, was, and still is, fundamentally economic: To protect the land from floods, improve navigation, and to help private landowners drain tracts of marsh and swamp and the rich, wet hardwood forest that thrived along the floodplains of the southeastern United States so that new land might be opened to cultivation.

Without question, stream rechanneling has benefited agriculture and the country as a whole. The Corps and the SCS have earned the sincere gratitude of the farmers and the communities they have served. Now, however, a number of state conservation agencies, federal agencies like the Department of the Interior, and a host of local and national conservation groups have begun to argue that, in the vast majority of cases, the biological damage which channel work inflicts on a shrinking supply of wetlands, and on the streams themselves, overwhelmingly negates any economic benefits that might be claimed.

An Outmoded Practice

Criticism of this practice is not based on environmental issues alone. For one thing, stream channelization would seem to provide an almost classic example of the ways in which government contrives to work at cross-purposes with itself. While the Department of Agriculture drains wetlands, the Interior Department tries to preserve them. While the Soil Conservation Service helps farmers drain their land to intensify their production of tobacco and soybeans, another part of the Department of Agriculture tries to prevent surpluses of the same crops. And broader questions of national priorities are involved as well: In an era of corporate farming and concentration of economic power, does agriculture still need all the public help it is getting to keep water off the land? To a growing number of environmentalists, both within government and outside it, the question is rhetorical; stream channelization, under all but a few special circumstances, has outlived its old rationale.

One of stream channelization's severest critics in government is Nathaniel P. Reed, Assistant Secretary of Interior. Last June, in an impassioned presentation to the House Committee on Government Operations, Reed said that his agency had compiled reports from Montana, Missouri, Florida, North Carolina, Mississippi, and elsewhere indicating that reconstruction of stream channels reduced local populations of fish, plant life, and ducks by 80 to 99 percent, and that contrary to SCS assertions, the loss was often permanent. Reed went on to charge that, if all 1119 watershed projects then on the SCS's drawing board for Southeastern states alone were actually completed, then 25,000 to 60,000 acres of stream habitat would be adversely affected and somewhere between 120,000 and 300,000 acres of forested wildlife habitat would be "damaged or destroyed by these alterations." The environmental effects of stream rechanneling have never been studied closely, Reed said, but he added that "I think we are kidding ourselves if we do not admit that the vast majority of stream channelization [projects] have had a devastating effect on our nation's waterways."

Officials of the SCS are inclined to regard such accusations as "nonsense," as one of them put it in a recent interview. In truth, the Agriculture Department has no clearer idea of the collective impact of 20 years of reaming streams than the Interior Department has. Intuitively at least, the SCS thinks that streams recover quickly, an opinion seemingly drawn largely from the fact that brush tends to grow back quickly along banks skinned bare of vegetation.

Eugene C. Buie, who is in charge of watershed planning for the SCS, insists that his agency is bending with the times. More and more, Buie says, channel work plans are incorporating damage-mitigating features such as water inlets for the cutoff meanders of newly straightened streams. In theory, the inlets help sustain vegetation, fish, and wildlife along the oxbows. And Buie says the SCS has recently "designed out" several hundred miles of

Crow Creek: Case History of an "Ecological Disaster"

Crow Creek is—or was—a clear and lovely stream that flowed through gentle Appalachian mountain valleys in Tennessee and south across the Alabama line. Sweet gum and dogwood and dense stands of hickory and oak shaded its banks; rainbow trout and secretive wood ducks thrived in its coolness. In the words of a 1965 work plan prepared for the Soil Conservation Service, the Crow Creek watershed was a "truly scenic wonderland" of forests, meadows, and swift brooks.

Crow Creek's misfortune lay in the fact that it emptied eventually into the Tennessee Valley Authority's huge Guntersville Reservoir. In times of heavy rain, the reservoir would back up along the creek and inundate 125 small, hardscrabble farms that lay along 24 miles of the stream's floodplain. As a remedy, local watershed districts prevailed upon the SCS to straighten, widen, and deepen 44.2 miles of Crow Creek.

The SCS approved the project in 1966 and estimated its cost at $979,000, of which the federal government would pay just under 90 percent. Construction was delayed until last summer, in part because the SCS and local sponsors spent months haggling with Tennessee and Alabama fish and game authorities over the inclusion in the project of features to "mitigate" environmental damage. A study team from Arthur D. Little, Inc. found that in these talks state and SCS biologists were an "important influence" in planning—perhaps more so than in most stream channel projects. Indeed, the biologists won $65,000 worth of concessions, including construction of inlet pipes to allow water to continue circulating through six meanders that were to be cut off in the straightening of Crow Creek. The SCS also agreed to leave a canopy of trees along parts of one bank and to reduce slightly the amount of channel to be excavated.

Thus, by conventional standards, the "improvement" of Crow Creek followed all the rules. Yet when biologists from the Philadelphia Academy of Natural Sciences visited the scene last January, they found Crow Creek nearly lifeless—an "ecological disaster," they said.

Soft clay banks, stripped bare of vegetation, crumbled into the muddied stream even as they watched. A long search could find no rooted plants in the streambed and no established populations of fish or other animals. A few aquatic creatures and some rotting insect pupae were found stuck to the wet clay banks, now deeper and wider than ever before. Black flies had become the "dominant organism," but even they had evidently drifted from untouched reaches far upstream.

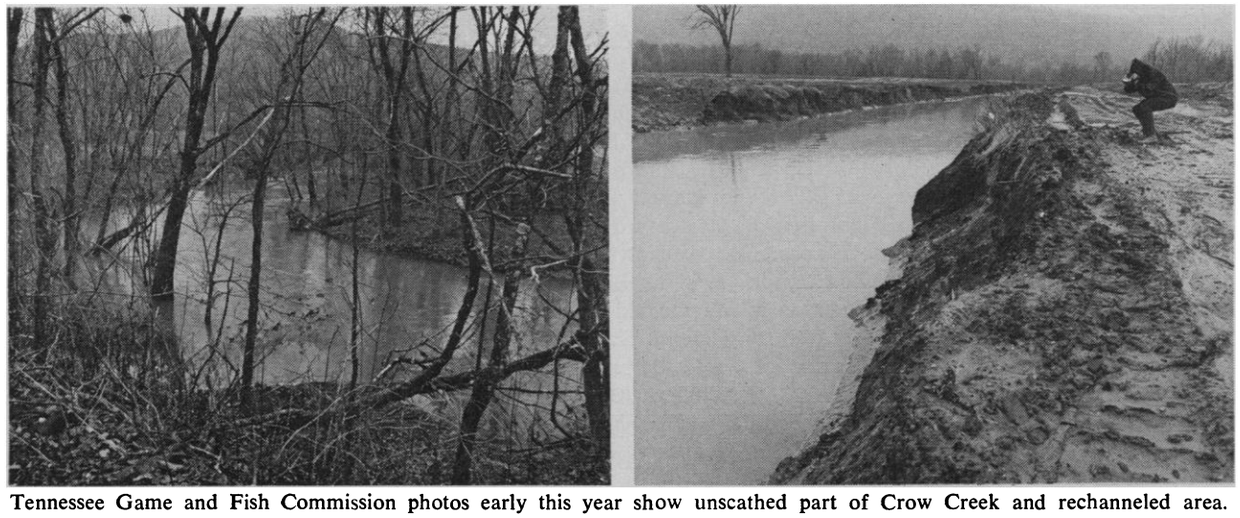
Ironically, all of the mitigation features seem to have failed. Inlets to the six cutoff meanders were silted over, and the water in them was stagnant. Trees left on the steepened, soggy banks were toppling into the stream. "Invariably," the academy noted drily, "heavy, large trees left perched on 6- to 8-foot vertical wet clay banks will slump into the channel." The outlook for biotic recovery of Crow Creek was pronounced "very dim," and even the Little team was moved to remark that the "scenic beauty of this valley has been seriously marred and scarred" and might not recover for a generation.

Unfortunately too, actual costs were higher and measurable benefits were lower than anyone had predicted. Flood protection will probably enhance the economy of Crow Creek agriculture at the rate of $11 per acre per year. But costs rose to $1.13 million, which breaks down to a cost of $8.50 per acre per year over the project's 50-year lifetime.

One party, however, stands to gain significantly from flood protection, although it receives no mention in cost-benefit calculations by local sponsors or the SCS. The silent beneficiary is the Nashville, Chattanooga, and St. Louis Railroad, whose main line parallels the entire north-south length of the rechanneled Crow Creek. The Little report said the railroad suffered property damage whenever the creek spilled over its banks, "yet the record is strangely silent on any benefits associated with the railroad" from more than a million dollars of public money.

"Yes," said Eugene C. Buie of the Soil Conservation Service, when the subject of Crow Creek was raised, "that's a bad one." A staff member of the President's Council on Environmental Quality who visited the valley earlier this year said the Little report's commentary "could have been tougher. There was just nothing left."

—R.G.



Tennessee Game and Fish Commission photos early this year show unscathed part of Crow Creek and rechanneled area.

work from approved channel projects in the interest of conservation, although often at the cost of reduced flood-control benefits.

Well intended as they are, however, the concessions to wildlife sometimes work better on paper than in the field (see p. 891). In any case, the anguish of conservation groups and the Interior Department has not done much to stay the bulldozers and draglines. The SCS says it has committed itself to 1060 new watershed improvement projects encompassing another 13,000 miles of creeks and small rivers. The momentum of all this work—most of which local communities initiated with their applications to the SCS 5 to 8 years ago—is too great to permit the SCS to think about stopping now, even for the year-long moratorium on construction that conservation groups and some congressmen have been urging.

Moreover, the secure sense of mutuality that exists between the SCS and its congressional patrons—several of whom are Southerners with comfortable seniority—is sufficiently great to make such thoughts unnecessary. Seventy percent of the stream channel projects now under construction or approved for work are located in the Southeastern states. Obviously, this is where much of the nation's rain falls, but SCS largesse falls less evenly than the rain. Four states—Georgia, Louisiana, Mississippi, and North Carolina—each have more than 1400 miles of approved SCS projects, and Mississippi leads them all with 2400 miles. In recent years, each of the four has had in common one or more senior senators or congressmen firmly seated on the committees that control appropriations for the Agriculture Department. Special mention in this regard is due Representative Jamie L. Whitten (D–Miss.), a prime mover in the passage 18 years ago of Public Law 566. As chairman of the House agricultural appropriations subcommittee, Whitten holds sway over money for both the SCS and the CEQ.

Given the enormous scope of stream reconstruction in the United States, and the emotions that attach to it, the CEQ was probably the only force in government with a reasonable chance of resolving the current dispute. The CEQ, after all, carries the imprimatur of the White House, which means a lot inside the Administration if not outside it, and the council was a new organization unemcumbered with old perspectives and prejudices.

As a mediator, Reed said in a recent interview, the CEQ has conducted itself in the past few months "with grace, style, and objectivity." Nevertheless, the CEQ has now run into some serious and unforeseen difficulties that have jeopardized its further usefulness in settling the controversy before environmental groups unleash an expected flurry of lawsuits against stream-channeling agencies.

The problems have arisen from a $157,000 study of the economic and environmental costs and benefits of stream channelization the CEQ commissioned last year from the highly reputable management consulting firm of Arthur D. Little, Inc. The CEQ had hoped the study would serve as a definitive basis for talks between the two opposing sides and perhaps as a basis for new federal policy on stream channeling. The study is now in draft (and nearly final) form, but it is not the

MacDonald Resigning from CEQ

Gordon J. F. MacDonald, one of President Nixon's top environmental advisers, plans to resign from the Council on Environmental Quality (CEQ) in the near future to take a teaching job at Dartmouth College. MacDonald, the lone scientist on the CEQ, is the first of the council's original three members whose intentions to leave have become known. There is some evidence that CEQ's close ties to the White House have subjected it to stronger political restraints than might have been hoped, but MacDonald's departure seems related to personal career goals and not to any disappointments or grievances he may have experienced.

The White House has not announced his departure, and therefore he is understandably hesitant to talk about his plans, except to say that he's thinking about moving to Dartmouth "sometime in the future." Some of MacDonald's intended colleagues there, however, are looking forward to seeing him in Hanover, New Hampshire, early in the new academic year, hopefully by September.

When he does arrive, MacDonald is expected to take the reins of Dartmouth's 2-year-old Environmental Studies Program, an assemblage of five undergraduate courses. A college spokesman said that the program is not meant to turn out professionals in environmental fields, but rather is supposed to elevate the consciousness of budding doctors, lawyers, journalists, and so on. Eleven faculty and 410 students are participating in this program.

During the past year, Dartmouth has garnered endowments for two 5-year environmental professorships—one from the Esso Educational Foundation for $268,000 and one from the Henry Luce Foundation for $225,000. MacDonald is understood to have accepted the Henry R. Luce Professorship in Environmental Studies and Policy, which is named for the late founder of *Time* magazine.

For a man of 42, MacDonald has had an unusually varied and peripatetic career. By any measure, he is one of the fastest rising and most ubiquitous figures in science policy circles.

A product of Harvard, MacDonald spent time at the Massachusetts Institute of Technology and at Carnegie Institution's Geophysical Laboratory in the 1950's before moving to the University of California at Los Angeles as a professor of geophysics. He soon became a departmental chairman, and at the tender age of 32, found himself elected to the National Academy of Sciences. Since then he has served in numerous advisory and study groups within and outside the academy, including the President's Science Advisory Committee from 1965 to 1969. Although his government biography doesn't mention it, MacDonald also put in 2 years as a vice president of the Institute for Defense Analyses before moving to the University of California at Santa Barbara as a vice chancellor in 1968. He and the two other CEQ members, Russell E. Train and Robert A. Cahn, were appointed in February 1970, shortly after the council was established by the National Environmental Policy Act of 1969.—R.G.

milestone the council had hoped it would be. The Little report seems to lean heavily in favor of continued stream construction, and it is drawing harsh criticism from virtually everyone interested in the subject, save the four agencies whose projects were studied.* CEQ staff members concede that the study is badly flawed in some fundamental ways, but in trying to convince A. D. Little to repair it, the council has placed its own impartiality in the balance.

From the start, the CEQ recognized the special political liabilities of dabbling in policies of watershed improvement. One highly placed source with the council said last July that, in light of Whitten's interest, "We're proceeding very slowly and cautiously. We want to make sure what we say is well documented."

Little was hired to ensure the credibility of the report, but it soon became apparent that the firm's economists, agronomists, and experts in public administration were ill equipped to assess the ecological effects of stream channelization. Rather hurriedly, Little was allowed to subcontract the "environmental" part of its assignment to the Philadelphia Academy of Natural Sciences, a choice based largely on the fact that the academy's respected chief limnologist, Ruth Patrick, was among the five scientists the CEQ had consulted for advice on the general outline of the study and was therefore already familiar with its aims. The academy asked for and received only $22,000 for its work, a figure that seems in retrospect "almost gratis," as one CEQ staffer put it.

From August 1971 until last February, the Little team and several academy biologists toured 42 channel projects involving 2500 miles of stream in 18 states. They held 30 public meetings, perused 900 project documents, and took 300 photographs. From all this they distilled two thick volumes of field studies and a third summarizing their findings and some highly controversial conclusions. The academy's contribution to the summary volume consists of only 6 out of nearly 200 pages. There is no bibliography and only a few scattered footnotes.

Generally, the Little team found, stream channel projects accomplished their missions of flood control and drainage and did so, "contrary to widespread opinion," without significantly worsening erosion or downstream flooding. Little found that 20 years of environmental effects ranged from severely destructive to moderately beneficial. On balance, the weight of evidence was said to be heavily against channeling untouched natural streams "in terms of environmental effects." But at the same time, the Little team concluded:

> On balance, the weight of evidence is marginally in favor of channeling both untouched natural streams and man-altered channels in terms of . . . economic effects.

In addition, if the economic value of social gains of all stream channeling were to be weighed against the economic value of environmental effects, the former would "substantially outweigh" the latter. Little gave no hint of how it arrived at this judgment and said that it was "admittedly unsupportable."

Since the end of March, draft copies of the report have been circulating to the state and federal agencies that took part in the study and to conservation groups. The CEQ has compiled a 3-inch-thick loose-leaf folder of commentary so far, and oddly enough the only evident praise comes from the four agencies whose projects were studied. The SCS thinks it was "excellent . . . objective." The Corps found it to be "commendably objective." In an internal memorandum, Ellis Armstrong, commissioner of the Bureau of Reclamation, said he thought it was "unusually objective." Only the Tennessee Valley Authority hedged its praise, saying that any criticism of its current activities was "ill-founded."

In rather stark contrast, six out of the eight state fish and game agencies that have been heard from so far have berated it for a lack of objectivity, technical errors, contradictory statements, and a general bias favorable to stream excavation. The Interior Department is known to disagree vehemently with parts of the report. Four of the five scientists the CEQ sought out for advice last summer have roundly flayed Little's portion of the study, and none praised it. "It began almost to seem that the A. D. Little team had forgotten that their contract was with the CEQ and not the Soil Conservation Service," wrote F. Raymond Fosberg, an ecologist with the Smithsonian Institution and one of the CEQ's advisers.

One characteristic of the study that has made it more incendiary than conciliatory is the tendency of its conclusions to conflict with information laid out in the 42 field studies—and particularly with data gathered by the Philadelphia academy. Patrick, in a recent letter to the CEQ, complains that, while the academy kept its promise to confine its comments to biological effects, even though this "hurt our full evaluation of what we found," the Little investigators had no compunctions about making environmental judgments well beyond their range of competence. Patrick lists half a dozen statements in the Little report that seem to undercut her far less sanguine impressions.

At one point, for example, the Little report concludes that, once excavation of a stream is finished, "recovery of habitat is very rapid except in arid regions." In her letter, Patrick wrote: "Our field team does not feel habitat recovery has been rapid. . . . Indeed, after draining and clear-cutting the swamps, hardwoods are greatly decreased and drier types of vegetation come in."

Charges of Bias

For their part, state fish and game authorities complain that the SCS and the other channeling agencies had an improper hand in selecting the projects to be studied. In fact, most of the SCS projects studied were on a list of candidate sites suggested by the SCS. To the CEQ's subsequent chagrin, one turned out to have won a national watershed award, several others were part of a demonstration program, and still others were in urban areas, whereas the controversy centers on wild, natural streams outside the cities. Steven Sloan, who supervised the study for the CEQ, says an effort was made to select projects common to two or three agencies' lists, including one submitted by the SCS.

Another complaint of some merit from state conservation authorities is that the SCS, the Corps, and the other construction agencies were allowed to squire the visiting investigators around each site, while conservation officials and local environmental groups sometimes received very short notice of the study group's arrival, or no notice at all. Sloan says the construction agencies were not designated as "hosts," but were merely asked to arrange for hotels, transportation, and so on "because they could be counted on." The Bureau of Sport Fisheries and

* The SCS, the Corps, and two relatively modest programs of the Bureau of Reclamation and the Tennessee Valley Authority.

Wildlife was supposed to notify interested parties of the study group's impending arrival at each site, but a "communications breakdown" snarled that plan, Sloan said.

Eugene Buie bridles at the suggestion that his agency influenced the study's outcome. "We didn't control this study. We only did what we were asked." He says he suspects much of the criticism directed toward it is nothing more than an attempt by "certain state fish and game people," conservation groups, and the Interior Department to "deliberately try to discredit the study because it doesn't agree with every little bit of nonsense they've been putting out."

Conservationists have their own conspiracy theory, which has it that Whitten somehow rigged the study. The fact that his staff aides made a number of phone calls around federal agencies last year to keep tabs on its progress, and then quit calling in December, suggests to some that he was satisfied with its outcome before anyone else knew what it said. Some close observers of the study's travails say such allegations are unfair to the CEQ, however.

Actually, the study's difficulties appear to have arisen from several sources, none of them fixers. Several early and critical administrative decisions of the CEQ in planning the study seem, in hindsight, to have been ill advised. Relations between the academy and Little, once the two were selected, probably could have been more clearly spelled out. Moreover, a quick reading of the summary volume suggests unseemly haste in writing and editing, and possibly in thinking.

There is also something to be learned from the backgrounds of Little team members. The study was directed by John M. Wilkinson, an economist formerly with the Bureau of Reclamation, one of the four agencies whose projects were studied. Two others were former, long-time employees of the Agriculture Department. None of this suggests that they were incapable of criticizing their old employers, for indeed they did, although not on fundamental points. What is more than possible, however, is that the A. D. Little group shared philosophies and perceptions of good water resource management that made it impossible for them to deliver the "fresh appraisal" of stream channelization they had promised.

"It will take extensive reworking to make this a useful document," one CEQ staff member said. In the meantime, the debate over stream channelization is likely to remain as muddy as ever.—ROBERT GILLETTE

Higher Education Bill: Busing Provision a Cuckoo in the Nest

For more than a year Congress has struggled to reach agreement on a higher education bill that would extend existing federal programs and provide a new form of aid for students and, for the first time, a program of "institutional" aid for universities and colleges. Last week, a House-Senate conference finally produced an $18.5 billion omnibus education authorization bill, but the conference measure generated more acrimony than accord and, as this was written, the prospects of final passage were highly uncertain.

Advocates of the bill argue that its institutional aid features make it the most significant piece of higher education legislation since the Land Grant College Act of the 1860's. But the sense of new beginnings has been blurred in the legislative process, which has been rather like the progress of a leaking ocean liner through dangerous shoals, with officers arguing over the charts, the crew near mutiny, and the passengers about ready to rush the lifeboats.

The major obstacle has been provisions to regulate federal funds for school busing to achieve racial balance in local school districts. If this seems an exotic feature in a higher education bill, it is. Antibusing amendments were added to the bill during House debate last November, along with the contents of a bill providing $1.5 billion over 2 years to assist school districts with desegregation problems. (This bill had earlier been rejected by the House.) The Senate enacted a more lenient antibusing amendment, and disagreement on the touchy issue led to a delay in action on the bill until this year.

Even before the busing issue was inflicted on the higher education bill, however, the new institutional aid and scholarship provisions had caused divisions in Congress (*Science*, 26 March 1971), and the conference compromise —particularly in the case of institutional aid—by no means resolved all differences.

In one sense, the problems of the higher education bill are a legacy of the strategy developed for the consensus politics of the early and middle 1960's. At issue is an omnibus bill, which means the bill contains a variety of measures that should appeal to a variety of constituencies. The theory is that, by providing something for everybody, everybody will want something avidly enough to vote for the whole package. Those who added the desegregation-aid and busing amendments presumably thought that the higher education provisions of the bill had enough appeal to carry the controversial amendments. In the mid-1960's, the omnibus approach in education legislation worked reasonably well with authorizing legislation, less well with appropriations. This time, it seems to be working rather badly.

Part of the uncertainty and confusion which greeted the conference action on the measure arose because the bill is so large and complex that details of the compromise on crucial issues—the "language," as it is referred to on Capitol Hill—were not available, even through the weekend following the conference finale at dawn on Wednesday, 17 May. Besides the controversial sections mentioned earlier, the bill contains a score of titles that include extension and modification of major laws such as the National Defense Education Act, the Higher Education Act of 1965, and the Higher Education Facilities Act of 1963. In addition, there are several brand-new provisions, including a proposal for a potentially important National Institute of Education (NIE). The NIE is modeled on the National Insti-