# Sea-Level Canal: How the Academy's Voice Was Muted

Last fall a special presidential commission recommended that a sea-level canal be built across the Isthmus of Panama not far from the site of the present Panama Canal. The Canal Study Commission—officially known as the Atlantic-Pacific Interoceanic Canal Study Commission—argued that the potential military, economic, and foreign policy benefits justified spending some $2.88 billion to build a sea-level passage that would supplement and supersede the existing lock passage. The commission gave scant credence to assertions that a sea-level canal might pose serious ecological hazards. Indeed, it devoted only 4 pages of its 109-page cover report* to environmental considerations, and the thrust of its conclusions was that whatever ecological risk might exist is "acceptable."

But this was not quite the view, it turns out, of a National Academy of Sciences committee which studied the ecological implications of the proposed canal at the request of the commission. Ernst Mayr, professor of zoology at Harvard University and chairman of the Academy's Committee on Ecological Research for the Interoceanic Canal†, told *Science* the canal commission has "minimized" the potential dangers cited by his group and has "talked about other things" rather than confront the issues raised by the Academy group. "We said that great danger would result from building a sea-level canal, though we can't prove it," Mayr said. "But they turned it around and said that, since we can't prove it, the danger is minimal."

The canal study—the latest in a series that have been conducted since World War II—was authorized by Congress on 22 September 1964. The members of the commission were subsequently appointed by then President Lyndon B. Johnson and they were reappointed by President Richard Nixon when he took office. The commission was headed by Robert B. Anderson, former Secretary of the Treasury during the Eisenhower Administration. Its other members included Robert G. Storey, former dean of the law school at Southern Methodist University, who served as vice-chairman; Milton S. Eisenhower, former president of Johns Hopkins University; Kenneth E. Fields, retired Army brigadier general and former general manager of the Atomic Energy Commission; and Raymond A. Hill, a San Francisco consulting engineer. The staff director was John P. Sheffey, a retired Army colonel with considerable experience in Panama. With the submission of its report on 30 November 1970, the commission went out of business.

### Military and Economic Rationale

The commission's chief conclusions were that there are no insuperable technical obstacles to the construction and operation of a sea-level canal, and that such a canal would be highly desirable for a number of reasons. From a military standpoint, the commission concluded that a sea-level canal would be superior to the present lock canal because it would be less vulnerable to destruction and because it would be able to transit large aircraft carriers which can't fit through the existing locks. From an economic standpoint, the commission concluded that the present canal will reach its traffic capacity toward the end of this century, thus cramping U.S. and world trade, and that it will be unable to handle the increasing numbers of huge tankers and bulk carriers which are already beginning to appear on the world's oceans. The commission consequently urged that a sea-level canal be built along what is known as Route 10 in Panama, about 10 miles west of the existing canal, provided that suitable treaty arrangements can be worked out. The commission recommended that conventional excavation techniques be used because "neither the technical feasibility nor the international acceptability" of nuclear excavation have been established.

In assessing the ecological implications of a sea-level canal, the commission relied heavily on a report prepared by the Battelle Memorial Institute with some help from the Institute of Marine Sciences at the University of Miami. The commission said that certain forms of marine life have been passing through the existing canal for 50 years on the hulls of ships and in ballast water yet "no harmful results have been identified." The commission also noted that marine biologists have offered divergent predictions that a sea-level canal might cause anything "from disaster to possible beneficial results." In order to clear up the confusion, the commission said, it asked Battelle to conduct a study—admittedly limited in time and money—which involved a literature survey, mathematical modeling, and a study of marine species collected from the general canal area.

The Battelle report, which was prepared by William E. Martin, James A. Duke, Sanford G. Bloom, and John T. McGinnis of Battelle's Columbus, Ohio, laboratories, acknowledged that "present knowledge of the marine ecology of the Isthmian region is not sufficient to permit anyone to predict, with certainty, either the short-term or the long-term ecological consequences of sea-level canal construction." But the Battelle team went on to say that it had found "no firm evidence to support the prediction of massive migrations from one ocean to another followed by widespread competition and extinction of thousands of species" (a prediction that had been made by others but not by the Academy group). The Battelle group said that barriers could be arranged to block the migration of species from one ocean to another, and it argued that differences in environmental conditions on the two sides of the isthmus coupled with the prior occupancy of similar ecological niches by analogous species would constitute "significant deterrents" to the establishment of any species which

* A limited number of copies of the report and supporting annexes, entitled "Interoceanic Canal Studies 1970," are available without charge from the Office of the Deputy Undersecretary of the Army, International Affairs, Department of the Army, Washington, D.C. 20310.

† Other members of the committee included Maximo J. Cerame-Vivas, University of Puerto Rico; David Challinor, Smithsonian Institution; Daniel M. Cohen, Bureau of Commercial Fisheries; Joseph H. Connell, University of California, Santa Barbara; Ivan M. Goodbody, University of the West Indies, Kingston; William A. Newman, Scripps Institution of Oceanography; C. Ladd Prosser, University of Illinois; Howard L. Sanders, Woods Hole Oceanographic Institute; Edward O. Wilson, Harvard; and Donald E. Wohlschlag, University of Texas, Port Aransas. The staff officer was Gerald J. Bakus, University of Southern California.

# NEWS IN BRIEF

● **EPA ACTS ON DDT**: The Environmental Protection Agency (EPA), in response to an order from the U.S. Court of Appeals in Washington, D.C., has canceled federal registration for all remaining uses of DDT. Companies have 30 days in which to present appeals to EPA and may continue interstate marketing of DDT until the appeal has been decided. However, EPA will also hold an intensive 60-day review to decide whether interstate sales of DDT and the weed-killer 2,4,5-T should be immediately suspended as an "imminent hazard" to health. The use of DDT is currently allowed only on cotton, citrus fruit, and certain vegetable crops.

● **UNITED STATES TO AID MUSEUMS**: The National Endowment for the Arts has announced that it has set aside $1 million of its fiscal 1971 budget for a comprehensive program to aid the nation's museums. Grants will be awarded in three categories: improvement of collections, upgrading of staffs, and development of pilot programs to expand the availability of museum resources. The museum allocation will probably be raised next year. President Nixon has indicated that he will urge Congress to appropriate $60 million for the National Foundation on the Arts and the Humanities for fiscal 1972—nearly double this year's budget (*Science*, 4 December).

● **FAVORABLE DISTRIBUTION**: A survey conducted by the National Science Foundation has disclosed that in 1970 the highest median income among U.S. scientific and technical personnel went to statisticians, who averaged $16,900 a year. They were followed by computer scientists ($16,500) and economists ($16,300). The biennial survey covered 313,000 scientists whose median income was $15,000—a 14 percent increase over the figure reported for 1968.

● **NEW PUBLICATIONS**: *Federal Support to Universities, Colleges, and Selected Nonprofit Institutions, Fiscal Year 1969, A Report to the President and Congress* (NSF 70-27), prepared by the National Science Foundation, is available for $1.50 from the Government Printing Office, Washington, D.C. 20402.

might manage to get through the canal. In particular, the Battelle group found it "highly improbable that blue-water species like the sea snake and the crown-of-thorns starfish could get through the canal except under the most unusual circumstances." The Battelle group also said it had found "no evidence for predicting ecological changes that would be economically deleterious to commercial, sport or subsistence fisheries."

However, the Academy group seems to have been much less sanguine about the likely ecological impact of a new canal. The Academy report stresses that "available information is altogether insufficient to allow reliable predictions of particular events resulting from the excavation of a sea-level canal in Panama." But its report goes on to note that previous canal projects have sometimes led to "economic disaster" for certain fishing industries and have made it necessary to launch costly programs to repair the damage. Though it acknowledges that no predictions can be made with certainty, the Academy group warns that a sea-level Panamanian canal might produce major adverse consequences.

One previous instance in which a new canal caused great damage, according to the Academy group, involved the invasion of the Great Lakes by the sea lamprey, a predatory fishlike creature found in the North Atlantic. For thousands of years the sea lamprey was barred from the inner great lakes by Niagara Falls, but a system of man-made canals then allowed the lamprey to penetrate the inner lakes where it fed ravenously on valuable lake trout and other fish. In only 10 years the annual catch of lake trout in Lake Huron and Lake Michigan fell from 8.6 million pounds to 26,000 pounds. "This was an economic disaster for the fishing industry, one that has since been repaired only by years of research that finally led to an effective control of the invader through a costly management program," the Academy group said.

Another previous instance of major impact cited by the Academy group was the Suez Canal, where studies have shown that transmigration and colonization of marine plants and animals occur; that mobile, active organisms and fouling organisms are generally first to make the transit; that large-scale population changes occur; and that "significant economic impact sometimes results." Mayr, the head of the Academy group, told *Science* that a certain valuable species of sardine found in the eastern Mediterranean seems to have been "considerably affected" by competition from a less desirable species that invaded through the Suez Canal from the Red Sea. Mayr visited Israel last year to review work done on Suez Canal effects by a group of scientists at the University of Jerusalem. He said the Israelis reported that the "most remarkable thing" they had found was that it was nearly impossible to predict just what marine life would manage to get through the canal.

### Points of Disagreement

In assessing the possible impact of a sea-level canal through Panama, the Academy group disagrees completely with some of the conclusions of the Canal Study Commission and of Battelle. Whereas Battelle found it "highly improbable" that the sea snake would get through the canal, the Academy group said the poisonous snake—a potential menace to predatory fish and to the tourist trade—"should have no real difficulty moving through a sea-level canal." The Academy report also concludes that the canal itself would provide "a nearly optimal habitat" for certain large Pacific sharks and that these sharks "could become rapidly established on the Atlantic coast of Central America, unless an effective barrier is employed." And whereas Battelle said it found no evidence that commercial or sport fisheries would be affected, the Academy report warned that some species, including certain shrimp, could be replaced by economically less valuable species. Mayr told *Science* it is "an indefensible statement" to say there will be no adverse effects on fisheries since no one really knows what will happen. The Academy group also warned that a sea-level canal might allow passage of parasites and pathogens from one ocean to another where they might cause serious destruction of organisms that lacked natural resistance to them.

Mayr's general impression of the canal commission's report is that it has made a number of "casual" and "misleading" statements, and that it has set up some straw men and then knocked them down while ignoring the most important fears expressed about a sea-level canal.

In order to lessen the potentially adverse impact of a new canal, the Academy report stressed that it is "essential" to install a barrier of warm fresh water

in the canal to block the transit of as many species from the colder salt oceans as possible. But the canal commission was not persuaded that such a barrier is necessary. It simply said that if "future research" indicates the need for a biotic barrier (in addition to the tidal gates which will be installed to control currents), then "it would be possible to install a temperature or salinity barrier." However, the commission did not include plans for such a barrier in its designs indeed, it noted that the cost of a thermal barrier would be "high" and that the supply of fresh water available for a freshwater barrier is "limited." About the only point on which the commission and the Academy group seem firmly agreed is that an agency should be designated to support and coordinate research that could shed light on the potential environmental effects of a sea-level canal. Mayr professed himself "delighted" that the commission has recommended such a research effort.

Why were the Academy group's views largely ignored by the commission? Mayr and some other members of the Academy committee complain that the commission and its staff were more concerned about the economics of world shipping and about military defense than about possible ecological hazards—a charge which certainly seems to be true based on emphases given in the commission's report. But if the Academy group is right in asserting that the proposed canal could cause major damage, then the Academy itself must bear part of the responsibility for failing to make its voice heard.

Like all too many Academy committees, this one seems to have been given an overly restricted role. The canal commission report states that Battelle was asked to make "a study" of potential ecological effects whereas the Academy was merely asked "to recommend a program of long-term studies to be undertaken if the decision is made to build a sea-level canal." Mayr insists that his committee and the Battelle group did essentially the same thing, yet the fact that Battelle was the organization officially designated to do the "study" enabled the commission to emphasize Battelle's upbeat report while minimizing the Academy group's warnings.

The Academy study was further restricted in that it did not grapple with the question of whether a canal *should* be built, but only with the question of *how* it should be built. As the Academy report states in its preface: "Evaluation of the need for a canal and the wisdom of constructing it were explicitly excluded from the committee's task—deliberations were carried on under the assumption that a canal would be built." Asked why the Academy group had made that assumption, Mayr said the canal commission had, in effect, told the group: "Look here boys. That canal is going to be built no matter what you say." Consequently, Mayr said, "We decided the best thing to do was to make the canal as harmless as possible."

A further factor that limited the Academy group's effectiveness was its failure to speak out clearly. The Academy report does not use very forceful language in describing the potential hazards of a new canal. ("Scientists don't like to make loud statements—they like to understate things," Mayr says.) Moreover, the Academy group was unable to proclaim its apprehensions at the time the canal commission's cover report was made public last November. Neither Mayr nor the Academy itself would release copies of the Academy report until they had been officially published by the canal commission, and that did not happen until weeks later—long after public and press interest had dissipated.

No one can seriously contend that a group of scientists, who are by no means expert on the economic and military issues involved, should make final judgments as to whether a canal should be built. But the scientists are in a particularly good position to make judgments as to the ecological costs involved and to insist that these costs be considered before deciding whether to go ahead with a canal. As it now stands, the canal commission does not seem to have given much weight to the possible ecological costs, and its failure to do so must be blamed not only on the commission, but also on the Academy, which allowed itself to be mousetrapped into a restricted role in which its voice was inevitably muted.

—PHILIP M. BOFFEY

# Boston Hospital Dispute: Harvard Rectifies "Expansionist" Policies

*Boston.* When radical Harvard students occupied University Hall in April 1969, they demanded, among other things, that Harvard stop its "expansionist" policies. Specifically, the students protested the planned construction of the Affiliated Hospitals Center, a project to provide new facilities for three hospitals associated with Harvard Medical School; this project would have involved Harvard's evicting 180 families from their homes in Boston's Roxbury district.

As a sequel to the rhetoric of the April demonstrations, three Harvard students practiced a tactic often discussed, but rarely used, by student radicals: they organized the residents of the Roxbury community into a coherent political group. Since then, both Harvard and the Affiliated Hospitals Center have been forced to discuss their plans for the area with the community's residents. And, although all of their differences are not yet resolved, it appears that the hospital construction and Harvard's plans for relocation housing will satisfy the demands of the community.

Unlike most medical schools, the Harvard Medical School relies solely on independent hospitals for its teaching facilities. In the early 1960's five of the hospitals affiliated with Harvard began to draw up plans for construction of a new teaching facility, envisaged as a complex of the separate hospitals connected to a core of common facilities. Eventually the group, incorporated in 1967 as Affiliated Hospitals Center, Inc., was narrowed to three hospitals: Peter Bent Brigham, Boston Hospital for Women, and Robert B. Brigham—all three of them