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Biological Warfare: Is the Smithsonian Really a "Cover"?

Early this month a program televised nationally by NBC News charged that the Smithsonian Institution is serving as a "cover" for chemical and biological warfare (CBW) activities. Specifically, the program alleged that a Smithsonian bird-banding project has served as a "screen" for efforts to locate a site in the Pacific Ocean to conduct CBW tests; and as a "cover" for an "ultra-secret test" of an "animal delivery system for CBW." The charges—made in the course of a long program on CBW activities—attracted immediate attention in many of the nation's leading newspapers. Before the hubbub had subsided, another Smithsonian project—an ecological study in Brazil—had been implicated as well.

The barrage of adverse publicity provoked alarm and indignation inside the Smithsonian. Sidney R. Galler, the institution's assistant secretary for science, was called away from a scientific meeting to investigate the charges. On the basis of his findings, he told *Science* "unequivocally" that the Smithsonian "has never engaged in any kind of biological warfare research." He also said there is "no evidence" that the Smithsonian has served as "an unwitting dupe or cloak for some kind of biological warfare research." He said charges that the Smithsonian is helping the Army find a CBW test site, or was involved in a secret test, are "absolutely without foundation."

Possible Repercussions

Galler said Smithsonian scientists are "all shook up and really heartbroken about this kind of dastardly accusation." He expressed particular concern that the adverse publicity would undermine the Smithsonian's delicate international activities and its relationships with the scientific community in this country and abroad.

The Smithsonian's bird study has excited such controversy that it is worth examining the project in some detail to determine just what the Smithsonian has done. There is absolutely no doubt that the Smithsonian is conducting a biological survey of the Central Pacific under an Army contract—that is a matter of public record. From the available evidence, it also appears quite probable—even almost certain—that the Army is looking for a biological warfare test site in the Pacific and is using data turned up by the Smithsonian survey to assist in the search. The Smithsonian data is relevant because any test site would have to be located where there is no danger of germs being carried outside the test area by migratory birds or other wildlife.

But there is no good evidence that the Smithsonian has either participated in, or served as a "cover" for, any CBW activities. NBC never bothered to define precisely what it meant by "cover," but in modern spy terminology the word would seemingly imply either that (i) Smithsonian scientists carried out military activities while pretending to be engaged in research, or (ii) military personnel posed as Smithsonian scientists, or (iii) the Army, in order to hide its intentions, used the Smithsonian to perform research that should normally have been performed by the Army itself. None of these seems to have been the case.

Nor is it clear whether the Smithsonian should be condemned, or praised, for undertaking the project. Indeed, the whole episode provides a striking illustration of how an institution can get caught in a changing moral climate. What seemed "good" or "acceptable" 5 or 6 years ago is often deemed "suspect" today.

The Smithsonian project—known officially as the Pacific Ocean Biological Survey—has been conducted for about 6 years in a central Pacific area covering more than 4 million square miles of open ocean, dotted with islands and atolls. The area includes the Hawaiian, Line, Phoenix, and Tokelau island chains, as well as various individual specks of land. The goal of the project, from the Smithsonian's point of view, is to learn what plants and animals occur in the area, and, in particular, what factors determine the distribution, abundance, and migration of birds. Some 2 million birds have been banded, mostly in the central Pacific, but also on islands as far away as the Pribilofs in the Bering Sea.

Initiated by Army

According to S. Dillon Ripley, secretary of the Smithsonian and an ornithologist himself, the survey has produced "terribly exciting" scientific data on such "mystery birds" as Newell's shearwater, whose breeding and migrating habits were previously unknown. "It's a wonderful project from the scientific point of view—the fulfillment of a dream," Ripley says.

The project was apparently instigated by the Army, but the Smithsonian jumped at the chance to carry it out. Philip S. Humphrey, director of the project and also director of the Museum of Natural History at the University of Kansas, told *Science* that in the summer of 1962 military officials came to the Smithsonian for help in finding a university that might be interested in conducting an ecological study in the Pacific. Instead of suggesting another institution, however, Humphrey, who was then curator of birds at the Smithsonian, put together a proposal himself, and the Army accepted it. The project started in 1963. By the time it is completed next June, it will have received an estimated $2.8 million in Army funds, a sum which Humphrey feels was simply not available from any

Sidney R. Galler

other source. Army scientists say they had to hire an outside organization to carry out the study because the Army's ornithological capabilities are "limited, to say the least."

Humphrey insists that "the project is not Army-directed research—it's Smithsonian research supported by the Army." He says that "the military at first wanted to restrict me to a narrow geographic area, but I said, 'No. If the Smithsonian is going to do it, we'll do it my way.' And they gave in." The Army has exerted some influence on the survey by requesting additional data on certain islands, Humphrey said, but in each case the Smithsonian scientists were delighted that the Army was willing to finance additional work.

The project has clearly had some relationship to the Army's CBW program. Humphrey says it was originally administered from Fort Detrick, Md., the Army's biological warfare center, but the latest contract, effective 1 August 1968, has been administered through the Army Research Office, perhaps because the Army sensed trouble was brewing. Moreover, Smithsonian scientists have regularly sent blood samples, ticks, live birds, and other specimens collected in the field to Detrick and to the Deseret Test Center in Utah, another CBW installation. Smithsonian officials say it is "relatively common" to perform such collecting services for a granting agency.

What the Army Wants To Know

Why is the Army, and, in particular, the CBW establishment, interested in the Smithsonian's bird survey? The official explanation put forth in statements over the past year is that the Army is studying (i) the natural distribution of diseases in the area as they may affect the health of servicemen and civilians; (ii) the impact of U.S. installations on local bird populations; and (iii) the problem of collisions between birds and aircraft at airports on small Pacific islands. An Army statement submitted to the Senate Foreign Relations Committee last year said the survey had shown that U.S. activities in the Pacific had not reduced bird populations; that bird populations are much larger than previously suspected; that migratory habits of several species of birds are different than previously believed; and that several species of birds are susceptible to certain diseases, and, in fact, carry diseases. The statement said "at least one new disease

Philip S. Humphrey

of humans was found." (The Smithsonian stresses that it is not doing disease work itself; it is merely supplying blood samples and field specimens to the Army.)

Almost no one believes that the Army's explanation of why it is interested in the project is the complete truth. In fact, Humphrey, the project's director, says he learned "fairly early" in the survey "why the military is interested in this in a general sense." He says he is "sure" the Army wants to test CBW in the Pacific and is looking at the findings of the ecological survey to be certain that any potential site is "safe." But he says the Smithsonian itself is not trying to pick such a site; it is simply trying to learn more about the animal and bird populations of the area.

Some ecologists suggest that the Smithsonian project may actually prevent the Army from conducting tests in the Pacific (assuming such tests have not yet been held), for it may demonstrate that no site is sufficiently "safe." Indeed, there are unconfirmed rumors that the Army was not at all eager to finance the costly, time-consuming project, but only did so to satisfy safety objections. If this is so, it raises an interesting question for the CBW critics: Should the Smithsonian be condemned for aiding CBW activities, or praised for throwing a roadblock in the way of a potentially reckless CBW venture?

A few of the Smithsonian's critics have suggested there is another purpose behind the project. They claim information on bird migration patterns and bird diseases will enable the Army to develop a bird delivery system for germ warfare. Humphrey calls such suggestions "ridiculous" because "while birds in a statistical sense may have predictable migrations, in an individual sense you don't know what the hell they're going to do." A Defense Department fact sheet states unequivocally: "We have not been studying birds as potential carriers of biological warfare agents."

The Smithsonian project was classified for most of its existence, according to Humphrey, but it was declassified at the Smithsonian's request last August. In retrospect, Humphrey believes "classification may have been a tragic mistake, for it roused suspicions and made the project seem mysterious."

At times, the secrecy fetish seemed extreme. Robert Standen, a junior college teacher and graduate student in Los Angeles, who worked as a field investigator for the project in 1964-65, says he was instructed not to mention that he was on a Defense Department contract. Similarly, Victor B. Scheffer, a biologist with the U.S. Fish and Wildlife Service, says he was on the Pribilof islands in 1965 when two Smithsonian field men came through banding birds. When asked what they were doing, Scheffer says, the men replied: "You can see we're banding birds, but we can't tell you why."

Reasons for Classification

The Army, and some Smithsonian officials, claim the project was classified merely because many of the sites visited, and the military ships used for transportation, contained classified military equipment. But Humphrey believes there were additional reasons. He believes the Army wanted to hide Fort Detrick's connection with the project and suppress information that would indicate locations in which the Defense Department wanted to undertake activities.

Humphrey insists that the survey's scientific findings have "never, never, never been classified." He acknowledges that the Defense Department has prevented publication of a few of the project's reports, but he says this is for reasons unrelated to the scientific data. The project has already published some 45 scientific papers, and Humphrey says that all of the research results will ultimately be published.

The repercussions caused by the bird project secrecy have reinforced a feeling that the Smithsonian, which conducts numerous projects in sensitive foreign areas, had best avoid classified

research in the future. Ripley, who joined the Smithsonian in 1964, said that when the project was undertaken in 1962–63 the Smithsonian could see "no particular harm" in agreeing to restrictive conditions that seemed "routine boiler plate." But as antipathies have developed toward secret military research in recent years, Ripley said, it has become clear that the Smithsonian must avoid any hint that it is "doing undercover things for the Army."

Ripley says he knows of no other classified research being performed by the Smithsonian. Two years ago, he says, he turned down a project related to Vietnam because "I didn't want to see the Smithsonian mixed up in something that could be assumed to be related to the war." Ripley added that the Smithsonian would hesitate to undertake any research for the Defense Department—even if it were unclassified—in areas of the world that are "pathologically sensitive."

All in all—if one can accept the testimony of the scientists involved—the Smithsonian has behaved much like hundreds of other institutions and researchers who accept Defense Department support. It is conducting a basic research project that it believes has great intrinsic merit; it is accepting Army money to finance the project; and the Army presumably is using the results for military purposes.

But NBC, and some of the newspaper reports, have implied something more: they have suggested that the Smithsonian is serving as a "cover" for military activities. The charges are worth examining in some detail, for, on close inspection, they turn out to be marred by the use of loaded words and guilt-by-association reasoning.

NBC's allegations were aired on 4 February on a program called "First Tuesday." The program, which uses a "magazine format," presented several topics that night, ranging from an examination of ornate bathrooms to a tour of the Sinai peninsula, but its major segment was a long exploration of CBW. The program hit hard at the secrecy surrounding CBW activities, and, in a somewhat doomsday atmosphere, showed animals convulsing and dying from the effects of CBW agents.

The first hint of the revelations to come concerning the Smithsonian was supplied by NBC reporter Tom Pettit, who described the extent of the CBW test programs and then added: "There has even been an ultra-secret test proj-

NEWS IN BRIEF

• **SOVIET POLLUTION CONTROL:** The Soviet government is moving to halt pollution of Lake Baikal north of the Mongolian Republic in Eastern Asia in response to conservation pleas by Soviet scientists. Discharges of industrial waste, lumber by-products, and sewage have threatened water quality in Lake Baikal, which is about 400 miles long and 6000 feet deep in some places. A conservation program, including the construction of waste treatment installations and the restriction of certain lumbering and industrial operations in the Baikal Basin area, is planned. No central agency in the Soviet Union controls environmental pollution. Authority is divided among various agencies. In this case, the Ministry of Reclamation and Water Management will monitor pollutant discharges into the Basin. The Government Hydrometerological Service will regularly test the chemical composition of the lake. The Peoples' Control Committee, a citizens' regulatory group, will urge a cooperative control effort, and the Ministry of Fisheries plans to protect and replenish both the fish and the wildlife.

• **VENEMAN NAMED TO HEW POST:** John G. Veneman has been named Undersecretary of the Health, Education, and Welfare (HEW) Department. He will be second in command at HEW and will serve as principal adviser and deputy to the Secretary in all departmental matters. Veneman, who has served the last 7 years as a California state assemblyman, recently led an investigation of the alleged high costs and abuses in California's medical assistance program.

• **GAO SCORES RESEARCH CENTERS:** Think tanks and other research centers which do business with the federal government come under fire in a General Accounting Office (GAO) report to Congress titled "Need for Improved Guidelines in Contracting for Research with Government-Sponsored Nonprofit Contractors." The report calls for government-wide guidelines on the amounts and use of "fees" or management allowances given by the Defense Department, NASA, and the AEC to federal contract research centers. The GAO found that [illegible] nonprofit organizations varied significantly, were not being much used for the conduct of research, and had been spent by some centers, including IDA, MITRE, and RAND, to acquire extensive capital facilities. The report also noted that RAND uses its fees to let its employees fly first-class on trips of more than 1½ hours, contrary to regulations restricting the use of first-class accommodations for government employees and contractors. The report also stated that Aerospace Corporation had used its fees for paying executive salaries which are excessive. (The president of Aerospace receives an annual salary of $90,000.) The GAO is the budgetary "watchdog" of Congress, and its reports are influential among budget-minded congressmen. The use of government funds by federal contract research centers has been criticized in Congress in the past and is expected to receive congressional attention again this year.

• **HOLIFIELD NEW AEC COMMITTEE CHAIRMAN:** Representative Chet Holifield (D–Calif.) will serve as chairman of the Joint Committee on Atomic Energy during the 91st Congress. Under the 1954 Atomic Energy Act, the chairmanship of the Joint Committee alternates, each Congress, between the House and the Senate. Holifield, senior Democrat on the committee, has changed positions with Senator John Pastore (D–R.I.), who is the new vice chairman.

• **PITTSBURGH COLLEGES PROTEST TAX:** Six Pittsburgh area colleges and universities are testing the validity of a new Pittsburgh city revenue measure, which college representatives believe violates the traditional tax-exempt status of educational institutions. The new city ordinance, which levies a 0.6 percent tax on the gross receipts for services of colleges and universities, was passed by the Pittsburgh city council in December; it is expected to apply to tuition, room and board charges, rent, and could result in higher student charges and bookkeeping expenditures. Educators fear that the Pittsburgh tax could have widespread ramifications. Communities with a similar taxing authority may attempt to adopt comparable laws.

ect in the Pacific Ocean, conducted under a cover of bird-banding study." A few minutes later, after two brief preliminary interviews, Pettit supported this charge by introducing Robert Standen, the Los Angeles teacher who had once worked for the Smithsonian project. Standen described a typical day's work, and then Pettit dropped his bombshell. He revealed that "Standen later took part in an ultra-secret military CBW project in the Pacific."

In a rather confusing question-and-answer sequence, Standen said that he had never told the Smithsonian about the military test, and that the test involved a "biological carrier." He refused to say where the test had taken place.

Reporter Pettit then filled in the blanks by announcing that NBC had learned from other sources that the 6-week test was conducted in the spring of 1965 on Baker Island, a 1-square-mile U.S. possession some 1700 miles southwest of Honolulu. Pettit said Army, Navy, and Air Force personnel were "testing animal vectors, or carriers, to see how they would behave in a tropical climate. No germs were involved. In effect it was a checkout of an animal delivery system for CBW."

What was the Smithsonian's involvement in this military test? "The Smithsonian never knew what it was about," Standen told *Science*. Standen said the Army asked the Smithsonian project to send an observer along so that, if the test caused biological changes on the island, the Smithsonian scientists would understand what had happened. As it turns out, Standen said, there were no changes, so Standen left the island after 12 days, well before the end of the test.

Standen said the Army refused to tell one of the Smithsonian project's ranking scientists what the test was about. He also said that he himself was barred from a meeting aboard ship at which the objectives of the test were apparently discussed, and that he was instructed not to tell his Smithsonian colleagues about anything he had seen.

Shortly after the NBC program, the Defense Department acknowledged that "some years ago" it had conducted "classified biological warfare-related testing for purely defensive requirements at Baker Island and other Pacific islands." The Defense Department said "These tests involved no Smithsonian Institution personnel and no actual BW agents were ever used."

Thus the Smithsonian's only involvement with this test seems to be that the bird project allowed one of its field men to accompany the military team, almost as an "outcast." NBC's use of the word "cover" to describe this situation seems highly misleading. As far as Standen, NBC's star witness, is concerned, the Smithsonian bird project "is not a cover for anything."

After finishing with Standen, re-

Science Adviser DuBridge Makes His Press Debut,

President Nixon is making unusual efforts to ingratiate himself with the scientific and academic communities. Earlier this month he restored $10 million in funds for the National Science Foundation. On 13 February the President spent an hour and 15 minutes discussing problems of research and the universities with 25 members of the National Science Board.

Few Presidents would make a meeting with the National Science Board a priority item for their first month in office. Basically, the Board, whose members are chosen from universities and industries, is the inconspicuous policy-making body for the National Science Foundation (NSF), which itself controls only a portion of Federal research spending.

At least part of the President's solicitude for the scientific community must be credited to the uncommon respect and access he seems to accord his science adviser, former Caltech president Lee A. DuBridge. (DuBridge held his first press conference as science adviser on 13 February after meeting with Nixon and the National Science Board, then left immediately afterward for yet another appointment with President Nixon.)

DuBridge described the "friendly" meeting with Nixon, the Board, and Vice President Agnew, as a "round-table discussion" on the problems of science, the universities, and graduate education. DuBridge said that Nixon expressed "his very deep interest in the progress of science in our universities especially" and believes that it is important for basic science to have stable and dependable research support. Nixon believes that the National Science Foundation should play "an ever increasing part in the support of academic science."

DuBridge's 13 February press conference was his first major appearance in Washington since becoming science adviser. Reporters packed the Treaty Room in the Executive Office Building (where President Eisenhower held his press conferences). DuBridge handled the press conference with authority. Although he dodged some questions, especially on weapons systems, he did convey a lot of information and ideas during the session. In response to reporters' questions he made these points:

► DuBridge said that his office, NASA, the Department of Defense, and the National Space Council were charting "new directions, new goals, and new programs for the entire United States space program" for the post-Apollo decade. Recommendations will be delivered to the President by 1 September. DuBridge said that a "balanced" space program with several goals is more appropriate than a program with a single goal, that "the Apollo program will certainly go on," and that "the Apollo Missions Program is still under study."

► He reported that the President had asked his office to give an opinion on "the value and budgetary justification" of the 200-Gev accelerator at Weston, Illinois. He said he was "enthusiastic" about the accelerator and hoped that Congress would approve this year's $100-million budget request for the beginning stages.

► DuBridge revealed that a panel of the President's Science Advisory Committee headed by Princeton University physicist Marvin L. Goldberger would submit a "highly secret report" on ABM within a few days. The study, DuBridge said, represented "3 or 4 years of work" by the Goldberger panel and examined the pros and cons of various technical alternatives. The report will be sent to the Defense Department, he said, before being given to the President. (The study will be received in an atmosphere

porter Pettit then moved in with his clinching evidence. He revealed that former Senator Joseph S. Clark (D–Pa.), "when he was in the U.S. Senate, learned of a direct connection between the Pacific bird project and CBW testing." Clark then stated: "Well, as I understand it, under the screen of the Smithsonian Institute in a bird-banding project, they were looking for a relatively safe place to conduct chemical and biological warfare testings. This resulted in their picking one of the islands in the Hawaiian Chain, probably a pretty small one. It is my understanding that they are now on their way to do some testing there."

And where did Clark, the clincher in NBC's case, get his evidence? "I took that largely from NBC and from Tom Pettit," Clark told *Science*. "Pettit said there was no doubt about it. It was all documented in the NBC documentary." When pressed as to whether the NBC program really did prove that the Smithsonian had been used as a "screen," Clark acknowledged: "We could be wrong. I'm not so much concerned with whether the Smithsonian is covering up for the Army as with the fact that the Army is engaging in utmost secrecy, and the American people have no opportunity to know what is going on."

The allegations about the Smithsonian were virtually the only part of the NBC program to receive extensive coverage in the press. Unfortunately, some of the nation's leading newspapers seem to have been as casual as Senator Clark in their treatment of the charges. The New York *Times* put the weight of the prestigious Senate Foreign Relations Committee behind the allegations by asserting, in the opening paragraph of a story published on 5 February, that the committee's staff "has obtained information suggesting that the Army, under the guise of a bird study by the Smithsonian Institution, is looking for a remote Pacific site to conduct experiments in chemical-biological warfare." The *Times* said that Senator Clark, a former committee member, had based his statements to NBC on information obtained from the staff.

However, the staff does not seem to have much information. The only evidence mentioned in the *Times* was a letter from E. W. Pfeiffer, professor of zoology at the University of Montana, who wrote that he had "learned from an absolutely reliable source" that the purpose of the project was to locate a test site; plus indications that CBW officials are interested in the project. Peter B. Riddleberger, the staff's CBW specialist, told *Science* the Foreign Relations Committee has no other evidence and has not investigated the Smithsonian project. Indeed, the *Times* article acknowledged, in the last paragraph, that the Army's alleged interest in the Smithsonian project for CBW ex-

Tells about Nixon's Meeting with Scientists

of increasing scientific, congressional, public, and press criticism of quick deployment of an ABM system.)

► "The problem of finding proper personnel for scientific positions in the government has been one of my most frustrating tasks," DuBridge commented. He said "we have not yet located the right man" for either the new administrator of NASA or the Executive Secretary for the Space Council. In response to a later question, he said that acting NASA administrator Thomas O. Paine was one candidate for the NASA job. Although he did not say so specifically, DuBridge left the impression that the Nixon Administration was looking for new leadership for the NSF. The term of NSF director Leland J. Haworth, 64, expires on 30 June.

► DuBridge, at Nixon's request, has assembled a special panel on the Santa Barbara oil leakage. DuBridge said that the group would meet in Santa Barbara on 19 and 20 February to begin to determine the geological source of the leak and the biological and environmental consequences and to recommend how such damage can be avoided in the future. Petroleum geologist John C. Calhoun, vice president of Texas A&M University, will serve as chairman of the 14-member panel.

► The President has also asked DuBridge's office to help examine the Marine Sciences Commission report and the Telecommunications Taskforce report.

In his able handling of the press conference, DuBridge made only two kinds of comments which might cause him trouble in parts of the scientific community. First, DuBridge, a physicist, gave a great deal of attention to the physical sciences. He enthusiastically backed the Weston accelerator, gave short shrift to a question about what his office planned to do about molecular biology, and failed to mention chemical, biological, or medical research in specifying those areas which he hoped would have increased funding when the budget permitted. The disciplines he did single out as deserving greater funding were expensive big-science areas: high-energy physics, oceanography, astronomy, and radio astronomy.

Second, DuBridge once again made clear his desire to heal the "breaches" between the Defense Department and the universities. He said that the breaches had been exaggerated by "extremist elements" in the universities and that "many responsible scientists and engineers are collaborating effectively and earnestly and patriotically with the government in connection with its defense problems."

In discussing the 4 March research halt at M.I.T. (*Science*, 24 January), DuBridge said that the planned session had been "badly misrepresented" as a "research strike" by some people at M.I.T., including faculty members and graduate students, and had been intended by "very responsible members of the faculty" as a "day-long symposium on social problems." (Last month 182 M.I.T. graduate students and faculty members wrote DuBridge a letter of protest about his statements on wanting to heal the breach with the Defense Department. Instead, they argued, he should be trying to build closer ties between the scientific community and HEW, HUD, and Transportation).

Although DuBridge may underestimate the responsibility and seriousness of those scientists who have raised questions about the relationship of science and the military, it is clear that he is off to a fast start as science adviser, is getting his message across to President Nixon, and is being used by the President for advice on a number of issues which have great political as well as scientific significance.

—Bryce Nelson

periments had not been "conclusively established."

Thus the evidence cited to prove that the Smithsonian has been used as a "screen" or "cover" seems flimsy indeed. It consists of a confused description of a military test in which the Smithsonian does not seem to have been directly involved; a casual charge by a former senator who says he got his information from NBC and admits he could be wrong; and an uncorroborated letter to the Foreign Relations Committee which quoted an anonymous source and which, incidentally, never once mentioned the word "cover."

Some press reports linked a Smithsonian project in the Amazon delta, also directed by Humphrey, with the Pacific Bird Project. The Amazon project involves a collaborative effort, with the Brazilian government, to study the ecology of a tropical rain forest, including birds and virus diseases. No one seems to have charged that this project, too, is a "cover," but some reporters have suggested that the findings might be useful in CBW. The project, which is unclassified, is supported by the Brazilian Ministry of Agriculture, the National Institutes of Health, the Rockefeller Foundation, the Smithsonian, and, at Humphrey's request, the U.S. Army and Air Force.

Smithsonian officials are outraged at what they regard as "irresponsible reporting" by the mass media. Project director Humphrey, who presumably knows more about the bird study than anyone else, says he was never contacted by NBC. Galler, the Smithsonian's assistant secretary for science, says he had one brief phone conversation with Tom Pettit, in which Pettit asked several general questions but never once raised the question of CBW. However, Pettit told *Science* his notes indicate he specifically asked Galler if the Smithsonian knew of a relationship between the Pacific Ocean Biological Survey and chemical and biological warfare testing. Pettit says Galler replied: "To the very best of our knowledge there is absolutely no relationship."

Any ethical judgment as to whether the Smithsonian's bird project is "good" or "bad" depends, of course, on one's own moral code. But from a practical standpoint, one can question whether it was wise for an institution with highly sensitive international dealings to accept a classified defense contract, or to send a man along on a military expedition, however innocent his role may have been. Perhaps the real lesson of the whole episode is that, in these highly charged times, an institution that wishes to maintain an unblemished reputation can't merely follow its traditional mores—it must consider the changing values of the public as well.

—PHILIP M. BOFFEY

All water over the dam now. Ed.

Earth Resources Satellite: Finally off the Ground?

If the taxpayer ever gets the bountiful economic payoff from the space program that the National Aeronautics and Space Administration has promised him, the credit almost certainly will go in part to an as yet unbuilt device known as "ERTS"—the earth resources technology satellite. This project, which now at last seems to be gaining momentum after having long languished in the shadow of NASA's manned flight program, promises to give such earth-bound agencies as the U.S. Department of Agriculture and the Department of the Interior a remarkable new diagnostic device for carrying out their missions. Further, while much advanced technology is of little use to the underdeveloped nations, ERTS seems likely to prove an exception, for it should allow the United States, or perhaps an international agency, to establish a variety of useful data services for these nations at modest cost.

It is expected that earth resources satellites will permit the United States, and other nations, to make revolutionary improvements in cartography, allowing them for the first time to bring their maps up to date and keep them that way. Today, according to the U.S. Geological Survey, all of the world's small-scale maps are either inadequate, out of date, or a combination of both.

These satellites, using sophisticated remote-sensing techniques, should also make possible numerous other valuable services, such as surveying water supplies and the quantity and quality of farm crops, monitoring pollution, and identifying geologic areas that are promising for petroleum and minerals prospecting. Most of the remote-sensing technology necessary for the achievement of these benefits is still in the development and testing stage. Yet, according to a report* issued on 10 February by the National Research Council committee on space applications, it may be possible to have an operational ERTS system, useful in a variety of earth resources fields, within the next 10 years.

The ERTS project, though a slow starter, may get off the ground this year. NASA has, for the first time, submitted to Congress a budget requesting the money necessary to start construction of an experimental ERTS system. Whether Congress will in fact provide these funds is hard to predict. But ERTS does have a strongly committed, and strategically placed, supporter in Representative Joseph E. Karth (D–Minn.), chairman of the House subcommittee on space science and applications. From the point of view of gaining economic returns, Karth regards ERTS as possibly NASA's most promising project; a start on building this satellite is, he feels, long overdue.

Should all go well, the first ERTS satellite will be launched in late 1971 or early 1972, with a second to follow about a year later. The satellite would be placed in a sun-synchronous polar orbit at an altitude of 500 miles. It would provide virtually global coverage, with repetitive observations being made of specific areas about every 17 days.

This first-generation ERTS, designed for a minimum life in orbit of 1 year, would be equipped primarily with three high-resolution television cameras. Two of these cameras would look within the visible spectral range, while the third would look within the near-infrared. Each picture would take in an area of about 100 square nautical miles. Ulti-

* *Useful Applications of Earth-Oriented Satellites*. Available at $2 a copy (34 pages) from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, NW, Washington, D.C. 20418.