Council indicated that it was tired of being "outslickered" by the white man and said, "we will fight you in every court in the land as long as there is a court available. We will fight you in every other way possible, and there are many. In the words of Sir Winston Churchill, 'We will never surrender'."

In October the Idaho Water Resource Board said in a position statement, "there is an unidentified quantity of Snake River water available at American Falls which will not be developed by any other proposed upstream project." The Board recommended that the Bureau of Reclamation investigate the feasibility of enlarging the dam "without inundating Fort Hall bottomlands." The Board said that diking and pumping to protect the Bottoms appeared to be feasible—an idea which the Indians dispute and which the Bureau of Reclamation has previously rejected because of the expense involved. The Board also asked the Bureau to explore the possibility of building a replacement at Eagle Rock, a short distance downstream from the present site, thus expanding the reservoir, but not at the cost of inundating the Fort Hall Bottoms. The Bureau of Reclamation is scheduled to make its next report on the American Falls dam next month. Whatever course of action is decided upon, the Bureau hopes to obtain authorization for a replacement for the dam in the near future.

The Indians Hold the Key

Unless the Shoshone-Bannock leaders should change their minds, it would be surprising if the relevant public agencies pushed ahead with a proposal to enlarge the American Falls dam. The Indians own the land, and they seem to have the whip hand in this controversy. Last May, Bureau of Reclamation regional director Harold T. Nelson wrote that "the dam would not be enlarged without full consent of the Tribes." Crookham has said that there will be no use of the Fort Hall Bottoms without adequate payment and agreement of the Indians. But some of those connected with the Idaho Water Resource Board think that the Indians are making a big mistake. As Board director Robert Lee commented in an interview in his Boise office: "The day that Indian rights would be trodden on is over. This project has such a favorable cost-benefit ratio that we could afford to pay a good deal for the use of the Bottoms. Here's a chance for the Indians to really take Uncle Sam if they only wanted to do it.

As of now, the Indians would rather keep the bottomlands than deal with Uncle Sam. The Indians, the Idaho State University scientists, and the other important groups which have expressed a desire to preserve the Fort Hall Bottoms may well prove successful in their battle. If they are, they will have won a rare victory in the water-conscious West—a victory for those who put a higher priority on preserving a piece of land than upon water storage.—BRYCE NELSON

American Science Policy: OECD Publishes a Massive Critique

A report that is believed to be the most comprehensive look at American science policy ever taken by outside observers has just been issued by the Organization for Economic Co-operation and Development (OECD), an international group with 21 member nations.* Though balanced in appraisal and basically laudatory in tone, the 622-page volume—the seventh in a series of OECD reviews of national science policies—is filled with impressions of weakness in the American system.

The heart of the report, covering the first 125 pages, consists of separate assessments of the organization of American science and technology by four European experts: H. G. B. Casimir, director of Philips Research Laboratories, the Netherlands; Théo Lefèvre, former prime minister of Belgium; Pierre Massé, board chairman of Electricité de France; and C. H. Waddington, former member of the United Kingdom Advisory Council on Science Policy. The remainder of the volume is devoted to a "background report," prepared by the OECD secretariat, which summarizes and analyzes the goals, implementation, and impact of the U.S. research and development effort.

Much of the background material will be familiar to American readers, but the remarks of the four experts should serve to place American achievements in a fresh perspective. The four examiners made no effort to produce a unified analysis. Instead, each has described his personal impressions—based on a hectic 2-week visit to the United States, a study of the relevant literature, and previous contact with American science. The result is rambling, repetitive, sometimes contradictory—and illumined with flashes of insight. The examiners don't hesitate to stick pins in America's scientific and technological smugness. And they grapple with the big "where are you going?" questions that are too often ignored by specialists working within the American scientific system.

Some of the most trenchant observations are made by Waddington, a professor at the Institute of Animal Genetics, Edinburgh, Scotland. Waddington believes America's vaunted scientific superiority is at least partly an illusion caused by high-powered public relations and the nearsightedness of American scientists. He suggests that America's multitudinous scientific journals constitute "a powerful publicity machine" that overemphasizes American achievements. "It is perhaps inevitable," he says, "that after a time the readers of such journals come to feel that such technological developments as jet propulsion, radio, radar and T.V. are essentially American, and the contribution of such Europeans as Whittle and the German rocket scientists, Marconi, Watson-Watt, and Baird are forgotten, and it is an occasion for surprise when the Nobel prize for optical

*Available in the United States after 15 March from the OECD Publications Center, 1750 Pennsylvania Ave. NW, Washington, D.C.; $12. The final version will contain an account of the "confrontation meeting" at which U.S. science officials discuss the report with OECD. Earlier OECD studies have reviewed science policy in Belgium (1966), France (1966), Greece (1965), Japan (1967), Sweden (1964), and United Kingdom-Germany (1967).

pumping is awarded to a Frenchman." The "exuberant sales élan" of the American journals is reinforced, says Waddington, by the competition for project grants in this country, which makes scientist X in Kentucky more concerned about what scientist Y in Pasadena is doing than about the work of scientist Z in Paris or Milan. As a result of these two factors, he concludes, "American science comes, largely inadvertently, to present itself as even more dominant in the world than it really is."

Waddington finds several fundamental weaknesses in the American system. He believes "the general scientific climate in the United States is not very well disposed towards theoretical considerations," primarily because the competitive grant system makes it "difficult" for Americans to find opportunities for "contemplative, imaginative thought." This is true even at the highest levels of American science, says Waddington, as is evidenced by the fact that "quite a number of the American Nobel prize-winners have received their awards for discoveries depending on large machines . . . or the organization of large teams of research associates" rather than for fundamental theoretical breakthroughs.

Waddington also faults the "strategic thinking" in American science for relying entirely on "projective programming," by which he means that planners assess the present situation and ask, "Where do we go from here?" An equally valid and often better approach, he suggests, is "anticipatory programming," in which planners decide where they want to go and then ask, "How do we get there?" Waddington clearly believes projective planning has led to some faulty decisions. "It seems difficult to avoid the conclusion that appalling suffering will occur unless we can double the world's output of foodstuffs before 2000 A.D.," he says. "In this perspective, the advantage of reducing the time for a trans-Atlantic journey by even 50 per cent, through the development of supersonic aircraft, appears extremely marginal. But it is currently accepted, on a 'projective basis,' that this development is 'inevitable'—supersonic booms, biological time-clocks and all the rest of it notwithstanding. And the cost of this development will be several times what is spent on research and development in food production."

Waddington feels "the most important criticism" to be made of America's strategic science planning is that it has failed to formulate a comprehensive, well-supported research program aimed at "ensuring that life is biologically enjoyable." He faults scientific thought for failing to adopt a broad ecological outlook and for failing to take interest in the achievement of optimum biological performance. "There are several National Institutes of Health, each dealing with a different type of ill health," he notes, "but it is difficult to argue that there is one whose main effort is devoted to the study of how to optimize human health. . . . It would probably take a considerable research effort—though miniscule in comparison with the man on the moon effort—to discover how to measure the neurological situation resulting from commuter stress, noisy or polluted environments, excessive sensory stimuli, or the other factors of modern living which lead to 'nervous exhaustion.' But it looks today at least as feasible as putting a man on the moon did 20 years ago."

No Unified Policy

A second member of the examining team, Lefèvre, came here in search of an overall national science policy, but went home convinced that there is no single U.S. science policy, only a plurality of policies split among various agencies established to pursue particular national goals. While there are advantages to pluralism—such as the fact that researchers can approach a variety of agencies for support, thus minimizing the risk that a valuable project will die for lack of resources—Lefèvre warns that "the system has its drawbacks." He finds needless duplication, high costs, and a series of "feudal fiefs which escape the demands of policy," whose aim should be to "weight the efforts, coordinate them and make them converge." "If the Federalist conception and the structure of the agencies has thus far yielded good results," he says, "it is not, in our view, because of their intrinsic qualities, but in spite of defects which are no doubt tolerable and even profitable in a society of plenty, but which would be inacceptable in a European society with limited resources."

Lefèvre finds it "regrettable that the National Science Foundation does not seem to have succeeded fully in all its tasks; a late-comer, with less power than other agencies, and no doubt because its directors have not sought to make it assert more power, its support has more often been complementary than propulsive." Lefèvre hopes that Europeans will display "greater boldness" if they pool their efforts to establish a mechanism for financing fundamental research.

The European observers repeatedly stress that America's R & D effort grew primarily in response to external challenges—in defense, nuclear energy, and space. An unfortunate result, says Lefèvre, is that "research sectors are neglected which are, or seem to be, irrelevant to the challenges which are felt." A second unfortunate result, he adds, is that, by responding to perceived challenges with the whole of its vast resources, the United States may have "started a certain hardening of the enormous organism. The resources committed to current projects are so vast that a change of front would mean serious economic and social upheavals."

The examiners cover so much ground and throw out so many ideas that their reports cannot be discussed comprehensively in the short space of this article. But the following remarks give a further hint of the flavor of the enterprise.

► Casimir, the head of a major industrial laboratory in Europe, found that in this country "the contribution of industrial research laboratories to fundamental science has been surprisingly small," with the exception of General Electric and Bell Laboratories. Casimir also found that "Washington does little to encourage fundamental work in industry." He acknowledges that his judgment is based on "insufficient data," since the team's contacts with American industry were restricted to discussions with a handful of research managers and were not supplemented by a "thorough knowledge" of research labs.

► Waddington finds that American foundations have "altered rather considerably" over the past decade or two. "Most foundations have adopted definite policies decided by their own body of senior staff and advisers, and are not very ready to come in on the offbeat, to assist something which is not already within their programme," he says. "They are, in fact, as mission-oriented as the governmental agencies."

► The OECD's background report finds that the "call for better and fuller use of the potential of science in the service of man comes mainly from the politicians and administrators" rather than from "farsighted scientists."

"Somehow the R & D explosion spearheaded by the military has permitted the scientific community to live with something near to a personality split; to be a principal agent of change in our society during the work hours in the laboratory and yet not feel committed to the consequences of such change as it enters our daily life," the report says. "The state of 'pureness' of intentions and 'non-involvement' in consequences will no longer be possible in a society fully permeated by science."

Despite its comprehensiveness, this massive volume, standing a foot tall and 2 inches thick, remains annoyingly incomplete. The treatment of industrial science is sketchy. The lack of an index, coupled with a rambling organization, means that a reader in search of particular information may have to plow through mountains of half-digested material to find what he wants. And despite all the documentation (the volume contains more than 150 tables, graphs, charts and figures), the report often lacks supporting evidence just where the reader wants it most. The four experts are forever tossing out generalizations without explaining in any detail how they reached their conclusions. Lefèvre, for example, suggests: "Is it not American industry and science which lay down science policies under the cover of the specialized agencies of the President's Executive Office and control and modify them under cover of the Science Policy Division of the Library of Congress?" An interesting speculation, but one which surely requires a bit more documentation than a one-sentence reference to President Eisenhower's famous warning against the "military-industrial complex" and a one-paragraph observation that scientific advisers are "in evidence at every level of the administration."

The heart of this report—the analyses by the four experts—rests, in the final analysis, on a surprisingly shaky foundation. The four examiners visited this country for a total of 15 days and whizzed through a series of interviews in Washington, New York, Cape Kennedy, Los Angeles, San Francisco, Stanford, Santa Monica, Boston, and Cambridge that would daunt even the hardiest information-seeker. In their 6 days in Washington, the four talked (usually as a unit but occasionally in groups of two) with representatives of the State Department, NSF, OST, PSAC, Council of Economic Advisers, Bureau of the Budget, AEC, Commerce Department, HEW, NIH, NAS, Department of Defense, NASA, Brookings Institution, AAAS, National Council on Marine Research, four congressional committees, ACS, the Dupont Company, General Electric, Union Carbide, Merck Sharp and Dohme, Ford Motor, and U.S. Steel. Granted that the examiners seem to have backgrounded themselves thoroughly, one could reasonably ask if 2 weeks of on-site investigation was enough for the job at hand.

This is a question that troubled the examiners themselves. Acknowledging that their reports may be "superficial" and "cannot . . . claim to make any revelations," the examiners nevertheless hope that a fresh look "from the outside" may shed "new light" on U.S. science-policy problems. They also hope that a discussion of fundamental issues confronting U.S. science, though old hat in this country, will prove useful to other OECD nations. On both counts the report, despite its imperfections, may well prove valuable.

—PHILIP M. BOFFEY

Budgeting for Research: British Study the Cost of "Sophistication"

London. One of the conventions of budget-making for science is that an automatic annual increase is needed to pay the costs of the growing complexity of science. Five percent a year for "sophistication" is widely regarded as fair. A study made recently for the British government, "The Sophistication Factor in Science Expenditure,"* indicates that 5 percent is probably a little high for an average figure. But in demonstrating that different laboratories have very different sophistication factors, the study calls into question the whole custom of giving a flat 5 percent.

The study, made by the science secretariat of the Council for Scientific Policy, is based on a survey of 13 government and three university departmental laboratories for which budget data over a 10-year period were available. In the study, the sophistication factor for each laboratory was obtained through an analysis of rising costs per scientist in a budget separated into items for salaries, buildings, and equipment.

Very costly purchases of major equipment, such as computers and a ship, were omitted when inclusion, for several reasons, would have had a distorting effect. Even so, equipment was by a big margin the fastest rising of the three items. Increases in expenditure on equipment hit 10 to 20 percent a year and even more, but since the item accounted for only about 18 percent of total expenditures, the effect on overall budgets was small.

For nine Ministry of Technology stations included in the study, the major elements—salaries and buildings—grew at roughly the same rate of 5 to 6 percent a year, so that the annual growth rate in overall costs per scientist was about 6 percent.

Salaries, which include the pay of supporting staff as well as of researchers, is the item which was perhaps most difficult to analyze in terms of pure sophistication. After wage inflation in the general economy is allowed for, the incremental raises on the civil-service pattern, which go to scientists in both government laboratories and universities, and salary increases attributable to a rising standard of living for scientists have to be taken into account. And it is very difficult to separate these elements from the rises or falls in costs which are actually the result of sophistication.

A chief variable in the salaries item is what the authors of the study call the "youth factor." A new research organization tends to have a large group of young and relatively low-paid workers. In an expanding organization the intake of young staff and the retirement of elders act to keep salaries in balance. When an organization stops growing its pyramidal age

*Her Majesty's Stationery Office, London; 6 shillings.