of whom will not deviate from their manuals. This point is indirectly corroborated in a survey published last year by the General Accounting Office (GAO), the investigatory arm of Congress. The GAO reviewed ten forestry research findings that Forest Service officials said could be used by field managers. The ten findings had been cited as achievements, some of them in support of the Service's budgetary requests to Congress. In visits to various field locations, the GAO auditors found that some managers were using some of the findings, but two findings were not being used anywhere, and none was being used universally. Some of the findings were not being used because of differences of opinion, which the Forest Service had failed to resolve, about their usefulness. In short the Forest Service was not making the best possible use of its research results. According to Arnold, steps have now been taken to resolve this issue.

The Waggoner and Metcalf studies do not afford a complete picture of federal and state forestry research, and do not take into account the recent changes Arnold has been trying to make. But the indications, as far as the Forest Service is concerned, are of an agency that has allowed its research activities to become enfeebled by in-growth and too subservient to the action arm to veto demands for control programs that are scientifically unwise. "Most of it is me-too research," says Metcalf. "It goes on because the people reviewing it are the same people who carried it out in the past." The solution, he thinks, would be some kind of outside review. To judge by the Forest Service's interest in the Pound report, that is not likely to happen soon.—NICHOLAS WADE

British Science Policy: After the "Great Debate"

London. The British, like the Americans, have been overhauling their machinery for making policy on research and development. In both countries the action has been prompted partly by disappointment with the results of heavy R & D expenditures. The practical effect of both reorganizations has been to give science policy a decidedly more utilitarian cast.

Increased pressure on basic research in both Britain and the United States has caused anxiety among scientists, particularly in the universities. In the United States, however, the relegation of the White House science advisory apparatus to the National Science Foundation was accomplished with an abruptness that induced a state of shock in the scientific community. In Britain, on the other hand, recent changes were preceded by a lively public discussion which lasted for the better part of a year.

Whether, in fact, this "great debate" significantly changed the outcome is unclear, but the British scientists came out of it still feeling that they had a foothold in the establishment and the power to influence events.

The spadework for an R & D reorganization in Britain had been done through a series of reports and well-circulated rumors. What had particularly aroused university scientists were predictions that the government would clip the wings of the semi-independent research councils* through which public funds had been channeled to support civil research. Involved was perhaps $275 million of the total of about $1.6 billion the British government spends annually on research and development. Research council funds go mostly for basic and applied research in university and government laboratories in the same categories primarily supported by the National Science Foundation and National Institutes of Health in the United States.

The key document in the debate was a Green Paper titled *Framework for Government Research and Development* issued late in 1971. (Green Papers are "for discussion only." White Papers state government policy.) The paper was unusual in that it combined two reports espousing significantly different approaches to the reorganization. The one that attracted the most attention at the time and generated most concern in the universities bore the name of Lord Rothschild, a former Cambridge don and Shell research executive who headed the Central Policy Review Staff in the cabinet office for the new Conservative government. Lord Rothschild was known to be less than enthusiastic about the research council system, and the report bore the unmistakable mark of his views and prose style. In the report he enunciated a "customer/contractor" principle for applied research, under which government departments ("customers") would decide what sort of research was needed and negotiate directly with researchers in universities and government labs ("contractors") to get it more or less on the same basis as had been done in the past with contractors in industry.

The other report, which was viewed as putting the case for the research council system, was produced by a working group from the Council for Scientific Policy (CSP), whose function was primarily to advise the government on research policy affecting the research councils. This group was headed by Sir Frederick Dainton, then chairman of the CSP at the time and one of the most influential scientific knights.

The debate began in earnest even before the Green Paper was published, in part because of government delay in making public the Dainton report, which was known to have been completed for some time. When the Green Paper did appear, it was, as one civil servant put it, "a Green Paper with a whitish tinge," since the government in a preface set the rules for the debate which was to ensue by stating that the government was committed to (i) accepting the customer/contractor principle for applied research, (ii) preserving the research councils, and (iii) seeking formation of an "authoritative body to advise on allocation of the science budget," the implication being that it would have to be a body representative of the customer departments and industry as well as of government and university researchers.

A central element in the Rothschild

* The five research councils are the Agricultural Research Council (ARC), Medical Research Council (MRC), Natural Environment Research Council (NERC), Science Research Council (SRC), and Social Science Research Council (SSRC).

report was the recommendation that a substantial portion of research council funds be transferred from the Department of Education and Science which, has administered them to the customer departments. From the beginning it was clear that the brunt of the reallocations would fall on three of the councils, Agricultural Research, Medical Research, and Natural Environment Research. The Science Research Council, which has the biggest budget of the five ($130 million), handles basic research making it analogous to NSF in the United States. The Social Science Research Council had a degree of immunity because it is the newest of the councils and has the smallest budget.

Rothschild had called for a transfer in the first year of nearly half of the total annual budgets of ARC, MRC, and NERC, which totals about $130 million. In the White Paper itself, the transfer schedule was stretched to 3 years, with a step formula starting at $25 million in the first year.

The reorganization itself, although retaining much of the spirit of Rothschild, followed the Dainton recommendations more closely, both in handling of fund transfers and in important structural details.

The Dainton report, for example, was the source of the design for the new advisory board demanded by the White Paper. This is the Advisory Board for the Research Councils (ABRC, or "ABRa Cadabra" to research council wits). The membership of the board is much more cross-sectional than that of the parochial CSP which it replaces—representatives from the chief customer departments, from the office of the Chief Scientific Advisor to the Government and from industry sit on it too—and would seem to have a chance of setting priorities for civil science with some authority.

If the customer/contractor principle is to succeed in practice, a lot depends on another main element in Rothschild's prescription—enhancement of the role and in some places creation of the post of "chief scientist" in the customer departments. The chief scientist and his staff are to have major responsibility for matching the R & D needs of the departments with the research capabilities of the universities and other potential contractors.

Rothschild seems to have had in mind as a model the "shop" run by the chief scientific adviser to the Ministry of Defence, Sir Herman Bondi. Like departments handling civil aviation and nuclear energy matters, the Defence Ministry has a lot of experience with the customer/contractor principle. Whether the new chief scientists will be given the staff and the status in the civil departments to enable them to achieve the customer/contractor "partnership" envisioned by Rothschild may well be the make-or-break question for the reorganization.

Certainly there are misgivings over whether this blueprint is appropriate for civil research. These are perhaps

FASEB Blocks Petitioners

In December 1970, the Federation of American Scientists (FAS), a scientists' public interest lobby, issued a statement criticizing radical scientists for disrupting the AAAS annual meeting and criticizing the AAAS for permitting the disruptions.

Now the FAS is criticizing the Federation of American Societies for Experimental Biology (FASEB) for going too far in the other direction by prohibiting FAS from distributing a petition at FASEB's annual meeting, which was held on 15–20 April in Atlantic City.

The petition, protesting proposed budget cuts for biomedical research and training, has already been sent to about 40,000 scientists, says FAS director Jeremy J. Stone. The FAS was planning to follow up by sending some of its members to quietly distribute the petition in hotel corridors. Officials of FASEB nixed this idea on the grounds that it is against their policy to have people swarming the halls with pamphlets and sandwich boards.

Subsequent negotiations broke down after FASEB agreed to allow FAS to set up tables for the petitions, but refused to let anyone from FAS man them. Stone said this was silly, because no one would pay attention to the petitions if there were no one there to explain what it was all about. The FAS executive committee thereupon decided that the issue of free speech was more important than circulating the petition, and FAS issued a press release stressing "the obligation of scientific organizations to avoid needless and unjustifiable restraints on the political activity of scientists."

The release contends that, as long as the activity stays in the hotel corridors, it is up to the hotel, rather than the meeting organizers, to decide whether it is disruptive.

Eugene L. Hess, executive director of FASEB, says FAS could not be accommodated because it made its request too late for it to be included in the meeting program. He added that allowing FAS people to post themselves outside meeting rooms would make for too much congestion. Any scholarly group could book a room and set up displays if they made their plans known well enough in advance, he said. But Stone "wanted to have his own set of rules." (Another group concerned with Soviet treatment of Jewish scientists was also turned down for the same reasons.)

Hess said that FASEB was sticking to its policy throughout the meeting and has no particular plans to change.

Apparently the sprawling structure of FASEB, which is made up of six constituent societies, is partially responsible for this display of inflexibility. There seems to have been no way of getting all six directors to agree on loosening up the policy in time for the meeting.

Stone finds it ironic that FASEB should try to block the FAS effort, since the petition was in the interests of anyone concerned about biomedical research and FAS is one of the few non-tax-exempt organizations in a position to influence legislators. He also emphasized that it was time scientific organizations developed some sensible guidelines that would permit political expression at meetings without allowing it to get out of hand. While Hess insisted that any responsible group could have a voice at the meeting if it planned far enough ahead, it would appear that this policy rules out possibly constructive spontaneous political activity.—C.H.

sharpest in the Medical Research Council, which plays roughly the same role in biomedical research in Britain that NIH does in the United States.

The concern of researchers and administrators associated with MRC, as they contemplate the closer embrace of the Department of Health and Social Security, might be expressed as follows. The philosophical weakness of the White Paper is the view that there is some research relevant to the needs of the Department of Health and some that is not. The department is responsible for the operations of the National Health Service and much of the welfare system, and there is a fear that operational people will take a short-term view and that basic biomedical research will be submerged.

A specific example illustrates both the reason for concern and how compromises can be made. The department has a need for research on the delivery of health care. The MRC has traditionally supported research relevant to what a doctor does for a sick patient, rather than to the organization of health services. Research in the latter area requires a mix of skills that goes beyond the usual MRC range. An agreement is being worked out under which MRC will participate in such research, but the work will be paid for out of departmental funds other than those now allocated to MRC.

Some other conciliatory and reassuring gestures have been made to MRC, such as the appointment as first chief

Academy Panel Could Send Saccharin the Way of Cyclamates

If the recent history of food additive testing is any kind of a guide, by year's end saccharin will have joined cyclamates, diethylstilbestrol, and Violet No. 2 on the Food and Drug Administration's list of proscribed additives—another (possibly innocent) victim of the Delaney amendment that prohibits use of any food additive found to cause cancer in animals or men. FDA has made no overt motion toward a ban on saccharin, but a recent string of events is beginning to make such an outcome seem virtually inevitable. The latest additions to that string include the quiet decision of Monsanto Industrial Chemicals Company, the largest U.S. saccharin manufacturer, to discontinue its production and the disclosure by Wisconsin's Warf Institute Inc. of results indicating that saccharin in the diet of rats produces malignant tumors of both the bladder and the uterus.

Saccharin has survived many claims of hazard since substantial use began near the turn of the century, but most of the early experiments that purported to show tumors or other ill effects resulting from its ingestion have been dismissed because of uncertainties in interpretation of the results, vagaries of the experimental methods, and conflicting results from other experiments. Nonetheless, in January 1972 FDA removed saccharin from the "generally recognized as safe" list of food additives and recommended that human intake be restricted to less than 1 gram per day for an adult. FDA had by then also initiated its own long-term feeding studies to determine the safety of saccharin.

Last fall, Paul Nees of the Warf group revealed (*Science*, 18 September 1972) that in a group of 20 rats fed diets containing 5 percent saccharin several developed bladder tumors that he considered malignant. The Warf group, whose research is supported by the International Sugar Research Foundation, had earlier been instrumental in providing research that led to the ban on cyclamates.

Shortly thereafter, and without fanfare, Monsanto—which began producing saccharin in 1902, its first year of operation—abandoned ship. The company has cited rising saccharin imports (from 172,000 pounds in 1962 to 1.4 million in 1971) and falling prices (from $1.68 per pound in November 1971 to $1.25 when production ended) as the major factors in its decision; but there is a nagging suspicion in many minds that Monsanto had seen the handwriting on the wall. At the time it stopped production, Monsanto had the capacity to manufacture 2 million pounds of saccharin per year and U.S. consumption was about 4 million pounds, so the firm was obviously surrendering a market in which it had a dominating share.

Near the end of February, FDA disclosed that its own, still incomplete studies suggested the presence of bladder tumors in rats fed diets containing 7.5 percent saccharin, although there was no evidence of malignancy. This preliminary revelation was viewed by many investigators as an attempt by FDA to soften the blow that might result from a sudden ban on saccharin. Some investigators, however, criticized both the Warf and the FDA studies because of the strong possibility that, at the high concentrations of saccharin used in the studies, the sweetener might have precipitated from urine in the bladder and produced tumors simply by mechanical irritation. And still others have pointed out the great difficulties of positive identification of tumors in the bladder.

These objections may be swept aside by a paper prepared for—but not delivered at—last month's 165th national meeting of the American Chemical Society by Phillip H. Derse, an associate of Nees's at Warf. Derse, who was snowbound in Madison the day the paper was to be presented, reported not only the presence of malignant bladder tumors in 7 of 20 male rats fed diets containing 5 percent saccharin, but also the presence of malignant uterine tumors in 5 of 20 female rats fed the same diet. Uterine tumors had not previously been observed in saccharin feeding studies.

Neither the FDA nor the Warf results have been forwarded to the National Academy of Sciences panel that has been convened to review the data, and few of the panelists are familiar with the recent results. It is expected that both sets of data, along with the results of other studies, will be examined by the panel, which should have much of the information by June. It seems clear that the panel will be hard pressed to dismiss Derse's report of uterine tumors, and, if it accepts his results, it may well sound the death knell for the last of the nonnutritive sweeteners.

—BARBARA J. CULLITON and THOMAS H. MAUGH II

scientist of Sir Douglas Black, professor of medicine at Manchester and chairman of MRC's clinical research panel. And the government has guaranteed that transfers of applied research funds will not be made from any of the councils until chief scientists' organizations are adequate to handle them. But there is no doubt that the government intends to keep the pressure on for the departments to assure steadily greater influence over applied research activities and also that practical results are expected.

The MRC and other research councils will retain their "independence" and are free, in fact they are encouraged, to obtain research support through other customers. As one research council official put it, "We expect the government to be tough on DES [basic research] grants and relaxed on the customer side."

As in the United States, funds for university research have plateaued after a decade of steady increases. As Sir Brian Flowers, chairman of the Science Research Council, acknowledges, this pattern, combined with the new policies, will probably mean that more university researchers will be applying to the SRC for support and that a tighter squeeze appears inevitable.

Another effect of the reorganization is to give de facto recognition of the limits on the role of scientists in the making of science policy. Decisions on certain sectors of the science budget, particularly those affecting basic research and manpower training, are still mainly in the hands of scientists and their allies. But that sector of the budget is hardly growing and, in fact, is being eroded by inflation. In other sectors involving major commitments in such fields as weapons, nuclear energy, and civil aviation, political and economic considerations often prevail over purely technical judgments. (A similar generalization would apply in the United States.) In Britain, the recent reorganization amounts to a strengthening of departmental powers and a further decentralization of decision-making in science.

Decentralization is certainly not without its critics in Britain. The House of Commons Select Committee on Science and Technology has borne down hard on the government's lack of a central capability for science advice. (Partisans argue that the need for centralization has increased with Britain's entry into the European Community and the start of talks on a common science policy for the community.) This was a main theme of a debate in the Commons in January. The point was succinctly made by Arthur Palmer, a Labour M.P. who was chairman of the select committee under the Labour government, in remarks from which the following is excerpted:

> My first contention in an attempt to influence the Government a little towards diluting neat Rothschild is that basically the Select Committee is right in asking for a national research and development programme with ultimate centralised responsibility. I am sure that we are right about that. I am sure, too, that the Select Committee is right in saying that research councils, and not Government Departments, are the best agencies for research and development in the various broad fields that we recognise. I am not sure that it is absolutely essential—and here I am a little more moderate than some of my colleagues—to have a Minister for Research and Development—although I believe that there is an arguable case for one—but it is essential that there should be ultimate centralised responsibility.
>
> My second contention is that the Government are wrong in proposing to cram down the narrow administrative channels of individual Government Departments research and development decisions which must be taken either centrally or by those most closely in touch with opinion, advances and knowledge outside. Key decisions of scientific importance cannot always be crammed into the narrow departmental channel. If we are not careful, if that kind of method is followed too slavishly, we shall soon find ourselves back into the 1960 situation. That is more or less where we came in on this business, when all the emphasis was on means and not much emphasis was given to ends.

The idea of a minister for science and technology seems to appeal to legislators. Creation of a cabinet-level office to deal with science and technology has had strong proponents in Congress in the United States. The idea may well appeal because even legislators have difficulty in discerning how major science policy decisions are made. Britain does have a science adviser at cabinet level in the Chief Scientific Advisor to the Government. The post was first occupied by Sir Solly Zuckerman, now Lord Zuckerman; the present incumbent is Sir Alan Cottrell. The limited staff assigned, however, makes it impossible for the adviser to deal with the whole sweep of science problems. Then there is Lord Rothschild's think tank—Rothschild reportedly played a key role in the British decision to carry on with Concorde—but that too has limited manpower and must also deal with economic and social problems. Big decisions involving science in Britain seem to be made like other big decisions in Britain. That is, by the cabinet and Prime Minister through a rather ad hoc process. Individual ministers figure in this, and a strong part is apparently played by shifting committees of permanent secretaries, the top level civil servants, who, it is said, often prevail through personal influence and the persuasiveness of their position papers.

While circumstances differ in Britain and the United States, the recent reorganizations in science policy represent attempts to deal with similar problems. Neither country has found a surefire way to increase the yield from R & D. And on major decisions on technological projects, politicians still tend to be deficient in science and scientists poor at politics. After more than a decade of trying to achieve the delicate balance desirable through centralizing their science policy efforts, both countries seem to be moving the other way.

—JOHN WALSH

RECENT DEATHS

Mark M. Atkinson, 52; chairman, education department, Shaw University; 2 January.

Harold H. Boyers, 60; former professor of operative dentistry and dental anatomy, West Virginia University; 7 January.

Kalman J. DeJuhasz, 79; retired professor of engineering research, Pennsylvania State University; 2 January.

Nelson H. Eisenhardt, 48; research chemical engineer, Eastern Regional Research Laboratory, U.S. Department of Agriculture; 1 January.

Bennington P. Gill, 74; professor emeritus of mathematics, City College, City University of New York; 17 January.

Roy F. Nichols, 76; retired dean, Graduate School of Arts and Sciences, University of Pennsylvania; 11 January.

Siegfried H. Nothman, 53; professor of psychology, American University; 30 December.

John W. Nuttycombe, 72; professor emeritus of zoology, University of Georgia; 6 December.

Harry S. Vandiver, 90; emeritus professor of mathematics. University of Texas, Austin; 4 January.