Oakland Research Associates (after the name of the Staten Island street on which he lives) and identified himself as William Fox, of Oakland Research. That helped a bit, but Fox was up against the fact that the major federal agencies are in the business of wholesaling money, and despite the official party line of federal support for independent scientific research, the apparatus was too big and insensitive to take note of a full-time policeman doing research in a Staten Island basement. In 1959 an inquiry to the Office of Naval Research brought the reply that "the statutory authority [of ONR] permits the making of grants only to educational institutions and certain other non-profit organizations and only for the purpose of basic research." Fox replied that Oakland Research Associates was a nonprofit organization and that he was engaged in basic research, but ONR wasn't interested.

In May 1961, in response to an inquiry, the National Aeronautics and Space Administration told him that it has "considerable interest in the physics of fluids," and invited him to submit a proposal. Fox promptly submitted a proposal related to investigating the phenomena of fluids in space vehicles. When 5 months had passed without a reply, he sent NASA an inquiry. A month later NASA informed him, "We have carefully evaluated your proposal . . . but do not feel that the work is closely enough related to our space-sciences mission to warrant support. Please feel free to submit any future proposals you may have to this office."

Last April, when Fox was invited to present a paper in Brussels at the congress on surface activity, he noted that NSF had announced that it would have available a limited number of travel grants. He applied for $526.30 for round-trip air fare. Twelve other persons applied. Travel grants were provided for six. Fox was not among them. He attended the meeting at his own expense.

It can be argued, of course, that Fox has no one to blame but himself if he chooses to be a scientist outside the scientific reservation. It can also be argued that science long ago moved out of the basement, and it is only reasonable to expect multi-billion dollar federal agencies to rely on institutional affiliations as a guide to competence. And, finally, it is necessary to concede the possibility that Fox's proposals simply didn't make the grade scientifically with the agencies whose support he wanted.

But his Columbia teachers say that they have seen ample federal assistance go to lesser scientists who were fortunate enough to have the right institutional credentials. Kusch, who has boundless admiration for Fox's drive and determination, looks at it another way. "I don't want to say if I think he's better or worse than the people who are getting government grants. But he is obviously competent and enthusiastic. He has made an investment in science at his own expense. He didn't dream up projects to get support, as some people do. He followed his own curiosity, he had a vision of what life could be and that's what led him on. And if somehow or other we can't work out public policies to encourage and help people like Fox, then there's something very wrong with the whole system."

—D. S. GREENBERG

Federal R&D: Congress Continues To Boost Budget, but Increases Are on Last Year's Reduced Scale

The financial fortunes of federal science can be roughly charted from year to year by comparing the original budget requests of the administration with the final appropriations voted by Congress. By this imperfect measure, the science budget this year continued to burgeon, though at the more modest rate imposed by Congress last year.

A horse-trading tradition prevails for science as it does in almost every sector of the budget, with the President naming a high figure, one house of Congress, usually the House of Representatives, countering with a low one, and the final figure falling somewhere in between.

As Representative Otto Passman (D–La.) is reported to have put it this spring, "There's an asking price and a settling price." Passman is chairman of the House Appropriations subcommittee which handles the foreign aid money bill and, until this year, held the long distance record for persuading his committee and Congress to cut foreign aid appropriations to his specifications. This year, however, the settling price was a lot closer to the asking price in foreign aid and in other budget areas. Largely responsible for this turn of events was President Johnson's tactics of first announcing that he was presenting a "barebones" budget trimmed to total less than the big round number of $100 billion and then exercising his considerable skills in getting what he asks from Congress.

It is difficult at this early stage to go beyond science agency budgets to analyze the effects of the appropriations at the level of programs, but it appears that total funds for federal R&D (lumping together basic and applied research, development work, and money for construction of facilities) will rise to about $16 billion. A somewhat larger proportion of the total amount this year seems to be earmarked for basic research, although this basic research portion still amounts to about a tenth of the total. Primary explanation for this shift lies in the reduction this year in expenditures by the Defense Department for development work.

Defense. The Department of Defense remains far and away the biggest spender in the federal R&D budget. This year, however, funds for military R&D, like the overall defense budget, declined somewhat. (The authorization for military procurement was down $1.3 billion from fiscal 1964.) Spending on conduct of research and development is expected to total about $7 billion compared with $7.3 billion-plus last year. Only about 3 percent of this goes into basic research. Defense Department funds for basic research this year will go up to an estimated $220 million compared with about $205 million last year. The reduction in the military R&D budget, according to the Defense Department, is primarily due to declining costs for development, testing, and evaluation in such major weapons systems as the Atlas, Titan, Polaris, and Minuteman.

NASA. The space program accounts for the second largest lump of money in the R&D budget. The National Aeronautics and Space Administration chalks up most of its expenditures to research, development, and R&D facilities. This year Congress voted a total $5.25 billion to NASA, with about $4.9 billion of it earmarked for R&D and construction. The fiscal 1965 appropriation represented a cut of some $76.5 million, which can be viewed as minor cheese-paring when compared with the $600 million cut by Congress last year. The rough handling of the space budget in the '63 session seems to have been prompted by congressional shock at the steep upward trajec-

tory of the space budget. Congress, in effect, decided that the space budget should level off to remain between $5 and $6 billion annually. Having made its point, Congress this time dealt more genially with space agency officials in hearings, and, despite a close vote on a move in the Senate to reduce funds for the manned lunar landing, the final amounts appropriated over the year were very close to those deemed necessary by NASA to achieve a manned landing on the moon by 1970.

It is possible that the most recent Soviet exploit in space, the change in leadership in the Kremlin, and the detonation of China's first nuclear device might have had some direct effect on congressional action on defense and space programs had Congress been in session, but it is unclear what might have been done or might be done.

AEC. The Atomic Energy Commission, with its combination of military and civil functions, this year got about $2.26 billion for operating expenses compared with $2.32 billion last year. While the cut amounts to about $62 million for the total operating budget, increases are included in the fiscal '65 budget for research in the physical and biological sciences and for civilian applications of isotopes. Funds for basic research in the physical sciences go up from $197 million last year to $214 million this year and in biology and medicine from $71.2 million to $78 million.

NIH. Outside the realms of defense and space, medical research continues to claim an ample share of federal science funds. The National Institutes of Health get $965 million for their operating budget in the current fiscal year compared with $918 appropriated (but not all obligated) last year. The increases went generally to finance growth in the research and education programs of the eight national institutes. Funds available for the "general research support grants" to institutions were increased $5 million to a total of $45 million. Congress returned to its old habit of topping the administration request—the budget estimate was $956 million, but the $10 million extra roughly equals the cost of a special cancer research project (*Science*, 9 Oct. 1964, p. 236).

NSF. The National Science Foundation, chartered as the chief federal patron of basic research and science education, had better luck this year both in the tenor of its reception at hearings and with appropriations. While the original budget request was for $487 million for fiscal '64 and the appropriation was $420.4, this still represents a very substantial increase over the $353.2 million on which NSF operated in 1964.

The science foundation enjoys considerable leeway in alloting funds to programs, and it is not yet clear what adjustments will be made to absorb the reductions in the budget estimate. But it appears that about $25 million will be spent on Project Mohole this year with something over half that going to finance procurement of a drilling platform. The plan is to go immediately to a floating platform which is designed for deep drilling, but which will be used in an intermediate program of drilling at shallower depths. The purpose is to acquire the experience and skill needed to go on to the task of drilling through the mantle.

Last year, Congress, in the form of the House Appropriations subcommittee which handles NSF matters, put NSF officials over the jumps. The congressmen were upset over NSF's transfer of research funds to other federal agencies, over their handling of Project Mohole, and with the agency's ingenuity in starting new programs. At the time, the subcommittee wrote a "no new programs" injunction into the appropriations report.

The air cleared rapidly, however, and, with the knowledge of Congress, NSF did make a start on a new program making graduate "traineeships" available. These traineeships are granted through institutions rather than to individuals on the basis of national competition as regular federal fellowships are. The traineeships are popular with institutions not in the first rank as far as prestige and funds are concerned, and therefore popular with legislators from districts where these institutions are.

This year will see the start of a major new program growing out of the idea that the federal government has a responsibility to foster new "centers of excellence" in scientific research. About $25 million in NSF funds this year will go into this effort, now called the science development program. Only those institutions which have overall plans to upgrade science research and teaching and which have specific proposals on how to do it will be in the running. The self-improvement plans must include ways of tapping new sources of outside money to be added to the federal funds. It is assumed that the development funds will be granted to institutions which are neither the most nor least affluent and distinguished in higher education, and there is a good deal of interest in seeing where the money actually goes.

Judging from the tone of hearings and the size of the appropriations, NSF has come through the congressional squall of fiscal '64 with no serious damage.

Congress this year has also been friendly to conservation and resources legislation. The two most notable examples are the Water Resources Research bill (*Science*, 4 Sept. 1964, p. 1022) and the "Wilderness bill," both of which passed this summer. The latter creates a National Wilderness Preservation System with about 9 million acres of federally owned land included at the outset and another 52 million acres authorized for inclusion later.

In general, the second session of the 88th Congress held no new and unpleasant surprises for science. The investigatory inclinations which Congress showed in 1963 when the Elliott, Daddario, and Price committees were formed in the House has so far produced neither recriminations nor reprisals against federal science.

Last year Congress reacted to the rapid and sustained rise in funds for federal science by cutting the rate of increase. This year Congress continued to apply the checkrein. If this new change in pace is maintained, one question which arises is how the scientific community, which has grown accustomed to the gallop, will adjust to the slower gait.—JOHN WALSH

Comsat: U.S. Satellite Company Leads New International Venture; System To Be Ready around 1966

In creating the Communications Satellite Corporation, the U.S. Congress performed in a way worthy of Hans Christian Anderson, for the key to Comsat—as to so many children's tales—is that you can only see it if you "believe." In the 21 months since its official incorporation, Comsat has acquired more and more of the attributes of a conventional business—it has stockholders and partners and contractors and a regular payroll—but it still