most of his reading these days is in the history and philosophy of science. He agrees that it is necessary for the teacher now to "win his students to the premise that it's all worthwhile." This challenge, which affects faculty across the political spectrum—radical to reactionary—is widely recognized at the center as altering the basic teacher–student relationship. And this change in the relationship, which involves a change in the self-image of the scholar, may be the most important result of the campus "revolution" of the 1960's.

As for the role of the center in the 1970's, there appear to be no plans and no pressure for major change. Like any human institution, the center is not wholly unpolitical or infallible. Friendly critics say occasional appointments are made not solely on grounds of intellectual merit, or a fellow past his scholarly prime is appointed as a reward for past accomplishment, or a fellow who can't take the freedom equates idyll with idle. But, on the whole, the fellows seem to get from the center what they hope for and vice versa.

The record shows an impressive number of books written at the center and projects begun there, but the value of the center probably lies in the impalpable inventory of friendships cemented, ideas germinated, and intellectual batteries recharged.

Unquestionably, as the New Left would say, the center is an elitist institution (although at the rate of 50 a year, the center is going through the elite at a pretty fast clip), and some of the fellows are disturbed by this and also by their absence for a year from their own campuses at a time of troubles. Some, on the other hand, are not only attracted by the isolation but say that more institutions insulated from the campus hurly-burly may be necessary if serious researchers are to make the most of their intellectual capital.

In the aftermath of the fire, discussions began on how to increase security at the center. A decision was made to reject the idea of creating a fenced compound, with the effect on the atmosphere that would have entailed. The major change made is that the center is now patrolled in off hours. Contributions to a "phoenix fund" to assist with rebuilding has reached several thousand dollars and some of the money is being used to buy special fire-resistant, lock cabinets for each of the fellows' studies. One of the few things the staff now insists on is that fellows have duplicates of research materials they leave in their studies.

The prospect is that the center itself will continue to go its way banking on the individuals working on the frontiers of the behavioral sciences. Or as fellow Stevan Dedijer, director of the research policy program at Sweden's University of Lund, put it in his characteristically wry way, "We must devote ourselves to reducing irrationality in human behavior from 99 to 97 percent; it could be the difference between catastrophe and survival."—JOHN WALSH

Academic Finance: British System Smoothly Functions in 50th Year

London. While many American universities are in the neighborhood of financial bankruptcy, Britain's universities are comfortably sustained by a 50-year-old system that combines government money and academic independence. The British system, administered through a body known as the University Grants Committee (UGC), contains many of the principles that American scientific leaders had in mind at the end of World War II when they first sought to establish the National Science Foundation (NSF). Basically, it is a mechanism for reliably channeling public support to the universities without giving government too much of a say in how the support will be used. President Truman balked at that, with the result that NSF was founded as an integral part of the federal government. The UGC, on the other hand, though appointed by the government, is clearly situated outside it as an independent body, and, although it obviously exists at the mercy of government, formidable tradition gives it a degree of discretion and independence that has no counterpart in relations between government and education in the United States. Through the years, the UGC system has proven to be relatively generous, sensitive to changing conditions, predictable, and, perhaps most important of all, continually growing in the resources disbursed at its recommendation, resources which account for perhaps 75 percent of all financing for Britain's 43 full-fledged universities and two university-level business schools.

A contrary impression might be gained from the criticisms that regularly attend its operations. There are those who contend that the universities, abetted by the UGC, are too unresponsive to national needs, and there are those who contend that traditional academic values are being subverted by instant responses to transient fashions. But, when viewed from present American conditions, or from the overcrowding and underfinancing that prevail in higher education in France, West Germany, and Italy, the British way of doing it looks extremely good. It is true that, by American standards, higher education in Britain is still something of an elitist system in terms of the proportion of university-age population enrolled for full-time, post-secondary school studies—about 15 percent as compared with 50 percent, according to generally used figures. But Britain's enrollments have tripled over the past 15 years and they are expected to increase again substantially during this decade. France, with a similar population, admits about twice as many students to university, but its expenditure on higher education is roughly the same as Britain's. And, while Britain's universities hold to the incredibly low student-teacher ratio of 8 to 1, the French figure is placed at 80 to 1; at the Free University of Berlin, it is placed at 50 to 1; in Italy, it is incalculable.

Furthermore, Britain has gone to considerable lengths to widen the accessibility of university education. Any student leaving secondary school with a passing grade in at least two broad subject fields is virtually assured of a place at a university (these are the only institutions within the scope of the

UGC), at a teacher-training institution, or at one of the country's 30 polytechnics, many of which are on a par with universities in all but formal status. The maximum educational fee at a university is under $200 a year, but, subject to a means test, all students are eligible for "maintenance grants" of up to about $850 a year, provided through taxes raised by their local governments. It is also worth noting that little evidence of scrimping is to be found in the construction and equipping of the many universities that have sprung up all around Britain since World War II.

The Open University

Visiting academics from Western Europe, mindful of the vast overcrowding with which they must contend in their own institutions, are often astonished at the amount of space devoted simply to well-furnished lounges. Thus, Britain probably holds the lead, at least among Western countries, in mass lowering of barriers to advanced education, combined with the maintenance of reasonably high traditional academic standards. In response to those who argue that traditional standards of admission are ridden with biases, Britain can point to its pioneering Open University (*Science*, 29 August 1969), which, when it starts next year, will give large numbers, regardless of credentials, access to high-quality university education.

In these conditions, it is perhaps mystifying why still more students do not continue their education. The answer is that more and more are doing just that, but, in Britain, going on to university has not yet acquired the American-style status of "the thing to do," regardless of one's work ambitions. Also, with job openings fairly plentiful, many young people apparently prefer to earn rather than to study.

Quasi-governmental is probably the simplest tag for the UGC, but even in Britain it is something of an administrative oddity. Consisting at present of a full-time chairman, 20 or so part-time members drawn from education, research, and industry, and a professional staff of about 35, it is not a statutory body and there is no law underlying its existence. It is perhaps best described as a well-established habit for financing the universities. Founded in 1919 simply through an announcement of the Treasury, it was given the task of advising the government on the financial needs of the universities. In 1964, when these needs had grown to relatively large proportions, a move was made toward bringing the UGC closer to government policy by relocating the appointment power from the Treasury to the newly organized Department of Education and Science. The move inevitably aroused many misgivings about the implications for academic independence, but though opinions differ, the most widespread one is that the shift has worked out well for promoting economy and coordination without painful interference in the autonomy of the universities.

Viewed against the financial uncertainty that now afflicts American higher education, one of the principal charms of the UGC system is that it allocates funds on a 5-year basis, with provisions for meeting increased costs and unforeseen problems. The current annual sum is $640 million, which represents a considerable increase over past years. And the figure does not include earmarked research support that is provided by a separate system of research councils. In preparation for each quinquennium, each university submits a detailed description of its plans and programs. The criteria employed by UGC in scrutinizing these are not among the most visible matters in British affairs, but obviously it would recommend restraint if all 45 of its institutions proposed establishing centers for Slavic studies. After all the proposals have been examined and presumably pared, UGC takes the total to the Department of Education and Science. Its recommendations to the Department are never made public, and no figures are ever issued to indicate how well it fares in dealing with the government.

But the bulk of the sums that are forthcoming are delivered to the universities as block grants. At this point, a delicate balance between autonomy and direction comes into force. As stated in a Memorandum of General Guidance which the UGC issued for the 1967–72 quinquennium, "Each university is free to determine the distribution of its annual block grant in the light of the guidance, general and particular, which the Committee has given. It would, however, be in accordance with generally accepted convention that the Committee should be consulted before any major new developments outside the framework set by the universities' quinquennial submissions and the guidance contained in this general memorandum and in the individual allocation letters, are undertaken."

The universities are, of course, free to go their own way. They can exceed the

NEWS IN BRIEF

● **POPULATION RESEARCH CENTERS:** The National Institute of Child Health and Human Development has announced that it wishes to receive applications from organizations and universities for establishment of Population Research Centers. The centers will conduct research on population growth, structure, and distribution; they will receive continuing support from the National Institute. Information and applications may be obtained from James F. O'Donnell, Center for Population Research, National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, Md. 20014.

● **INTERDISCIPLINARY RESEARCH GRANTS:** The National Science Foundation has announced the first major grants under its new projects of Interdisciplinary Research Relevant to Problems of Our Society. The largest and most comprehensive program, to cost $1.5 million, will include eight projects of environmental research and technology assessment to be done at Oak Ridge National Laboratory. Another $3 million in grants has been given to nine universities which will research ten problems, including energy needs, urban engineering, and problems of fire.

● **STATES SUE AUTO MAKERS:** Fifteen states have filed suits in the Supreme Court asking the Court to force auto manufacturers to install at their own expense pollution control devices on all cars sold since 1953, and to start a "crash program" to develop better devices and a pollution-free engine "at the earliest feasible date." The states charged that General Motors, Ford, Chrysler, American Motors, and the Automobile Manufacturers Association conspired to eliminate competition in pollution control devices, and that such conspiracy violates the Sherman Antitrust Act. The Justice Department brought a similar suit against the auto makers last year but settled it with a consent decree under which the manufacturers agreed not to obstruct development and installation of the devices.

● **GRIZZLY BEARS:** Skins and skeletons of grizzly bears may be requested by educational institutions from the Office of Natural Science Studies, Yellowstone National Park, Wyo. 82190.

enrollment approved by the UGC, or start or stop any program they desire. The UGC, however, is free to recommend withholding payment if it disapproves of the changes. And, in maintaining the balance between autonomy and direction, the UGC extends to itself the right to restrain the universities from unilaterally setting up independently funded programs that might later be presented as a *fait accompli* that requires UGC support. As was noted in a UGC report several years ago, "it is customary for a university which is considering an offer of outside financial support for a development which may eventually become a charge on its general funds to consult the Committee; and universities are aware that unwise developments are liable to prejudice their claims in the next quinquennium."

In unsympathetic hands, this centralized source of finance could obviously be used to press the universities in directions against their will. But even though the UGC was brought closer to government than ever before when it was moved from the vicinity of the Treasury to the Department of Education and Science, its membership remains overwhelmingly drawn from universities. The present chairman, Kenneth Berrill, is an economist who was formerly at Cambridge, and 16 of its present 21 members hold full-time positions in universities.

Clearly, there are pressures for the universities to diverge from their traditional indifference to the outside world. A hint of possible pressure toward this goal came in 1967, when the government acquired the right to look into the universities' financial records and examine, if it chose, the manner in which public funds were being used. But there have been no complaints of undue intrusions. The main source of tension between the universities and the government arises from the booming public demand for higher education and the fact that the costs are becoming so great that the means are no longer available for each university to follow its interests without regard to the others. In this setting—and, again, with reference to the financial crisis that has enveloped American universities—the British system looks golden. It would be nice to emulate its attractive features, but it is probably no more transplantable to the American scene than is the unarmed status of British policemen.—D. S. GREENBERG

The Global Environment: M.I.T. Study Looks for Danger Signs

For several years now there has been talk and speculation about disastrous upsets of natural systems possibly resulting from the impact of technological growth and change on the world environment. But no program for mounting a comprehensive investigation of global environmental problems has been developed, although proposals for a research effort on this scale are now germinating within the international scientific community—proposals that will be brought before the 1972 United Nations Conference on the Human Environment. An M.I.T.-sponsored "Study of Critical Environmental Problems" conducted on the Williams College campus last month by some of the nation's most eminent environmental scientists could provide important groundwork for such a research effort.

The study group, its 70 participants representing more than a dozen disciplines and drawn from numerous universities, laboratories, federal agencies, and corporations, sought to determine what can be said authoritatively about global problems and what further research is needed. Not surprisingly, the findings announced by the study group on 1 August generally were tentative and, for the most part, dealt with potential problems abstractly.

However, the finding that attracted the most attention from the press—and the one most certain to arouse interest in Congress—focused on environmental implications of a specific new product of advanced technology: the supersonic transport, a costly and controversial new aircraft which will again come under congressional debate later this summer (*Science*, 24 July).

The American SST, propelled by the most powerful aircraft engines ever built, would fly at about 1800 miles per hour at an altitude of 65,000 to 70,000 feet. According to Department of Transportation estimates, 500 of these aircraft would be in commercial service by the mid-1980's, not to mention the French-British Concordes and Soviet SST's that would also be flying. The M.I.T. study group, using data provided by General Electric (builder of the SST engines), developed estimates as to the amount of combustion products a fleet of 500 SST's would introduce into the stratosphere.

In the past, environmentalists have raised fears that the SST, by putting substantial amounts of water vapor into the stratosphere, might reduce the ozone balance and thus impair the earth's shielding from ultraviolet radiation, or that it might cause clouds to form and bring on climatic change in that way. In announcing its major conclusions, the study group made no mention of possible change in the ozone balance, having accepted as conclusive research findings indicating that changes in this balance caused by the SST would be much less than variations occurring naturally. But the group expressed "genuine concern" about the possibility that a large SST fleet might cause increased stratospheric cloudiness. It said that the SST's may cause water vapor in the atmosphere to increase by 10 percent globally, or by as much as 60 percent over the North Atlantic, where the SST traffic is expected to be heaviest.

Moreover, the group raised a possibility apparently never considered heretofore in the SST debate—that the SST fleet, by discharging combustion products such as soot, hydrocarbons, nitrogen oxides, and sulfate particles, would cause stratospheric smog, a condition that might also be especially pronounced over the North Atlantic. The group said that the amount of fine particles formed as the result of SST operations might be comparable to the amount put into the stratosphere by the volcanic eruption of Mount Agung in Bali in 1963.

Fine particles absorb radiation from the sun and the earth, although they