

provide similar consoles for their ECCP students. However, the course, as it now exists, in no way requires that students or teachers have access to a console.

Those who have contributed to ECCP realize that there is much yet to be done if the project is to realize its full potential. However, we believe that even the present version will give students a start toward understanding the man-made world and how it came to be as it is. They will be made aware of the influences from science and technology that will shape the future. This background will enable them to confront moral issues and make the wise value judgments demanded of today's citizens.

References and Notes

1. *A Statistical Handbook* (American Institute of Physics, New York, 1964), p. 3.
2. A. M. Weinberg, *Science* **149**, 601 (1965).
3. The members of the group were as follows: E. E. David, Jr., Bell Telephone Laboratories; R. L. Garwin, International Business Machines

Corporation; D. A. Huffman, Massachusetts Institute of Technology; J. R. Pierce, Bell Telephone Laboratories; G. I. Robertson, Bell Telephone Laboratories; A. B. Rosenstein, University of California; J. G. Truxal, Polytechnic Institute of Brooklyn.

4. The Commission on Engineering Education is a nonprofit organization dedicated to the development of new educational resources. The commission acts as the administrative framework for ECCP, among other activities, and members of the commission—in particular, N. A. Hall, its executive director—have contributed to ECCP both technically and in other ways.
5. The 27 schools are as follows: Andrew Warde High School, Fairfield, Conn.; Annunciation High School, Detroit, Mich.; Bear Creek High School, Morrison, Colo.; Brooklyn Technical High School, Brooklyn, N.Y.; Episcopal Academy, Philadelphia, Pa.; Glen Rock High School, Glen Rock, N.J.; Highline High School, Seattle, Wash.; Hill School, Pottstown, Pa.; Iolani School, Honolulu, Hawaii; James Caldwell High School, West Caldwell, N.J.; John Dickinson High School, Wilmington, Del.; Jordon Vocational High School, Columbus, Ga.; MacArthur High School, Houston, Texas; Monroe High School, Monroe, Wis.; Nazareth High School, Brooklyn, N.Y.; Needham-Broughton High School, Raleigh, N.C.; Niskayuna High School, Schenectady, N.Y.; Pasadena High School, Pasadena, Texas; Phyllis Wheatley High School, Houston, Texas; Poway High School, Poway, Calif.; Reagan High School, Houston, Texas; Russell High School, East Point, Ga.; Severn School, Severna Park, Md.; Staples High School, Westport, Conn.; Washington Park High School, Racine, Wis.; Weequahic High

School, Newark, N.J.; and West Essex High School, North Caldwell, N.J.

6. The participating consultants are as follows: E. J. Angelo, Polytechnic Institute of Brooklyn; N. W. Badger, Garden City High School, Garden City, N.Y.; Euval S. Barrekette, International Business Machines Corporation; John S. Barss, Andover, Mass.; D. L. Bitzer, University of Illinois; Joseph Bordogna, University of Pennsylvania; Ludwig Braun, Polytechnic Institute of Brooklyn; A. E. Bryson, Massachusetts Institute of Technology; D. R. Coffman, James Caldwell High School, West Caldwell, N.J.; R. L. Garwin, International Business Machines Corporation; J. Richard Goldgraben, Polytechnic Institute of Brooklyn; A. Jay Goldstein, D. W. Hagebarger, and L. D. Harmon, Bell Telephone Laboratories; W. H. Hayt, Purdue University; Charles Hellman, Bronx High School of Science, Bronx, N.Y.; Lester Hollinger, Glen Rock High School, Glen Rock, N.J.; D. A. Huffman, Massachusetts Institute of Technology; W. H. Huggins, Johns Hopkins; C. E. Ingalls, Cornell; L. G. Johnson, Sidwell Friends School, Washington, D.C.; R. W. King, Staples High School, Westport, Conn.; A. E. Korn, James Caldwell High School, West Caldwell, N.J.; George Maler, University of Colorado; J. R. Pierce and G. I. Robertson, Bell Telephone Laboratories; A. B. Rosenstein, University of California; Samuel Schenberg, Board of Education, New York; W. M. Siebert, Massachusetts Institute of Technology; M. Simpson and R. A. Went, West Essex High School, North Caldwell, N.J.; G. Brymer Williams, University of Michigan; J. D. Ullman, Bell Telephone Laboratories; Andries van Dam, Brown University; and E. E. Zajac, Bell Telephone Laboratories.

NEWS AND COMMENT

Money for Research: LBJ's Advisers Urge Scientists To Seek Public Support

After World War II, science's emissaries to Washington devised incantations that served well to bring their profession to its present state of corpulence.

What they discovered was that, in seeking support for basic research, they could start up the Treasury's check-writing machines with words such as *Russia* and *cancer*. Since, in prewar days, they and their predecessors had failed with less emotional and more rational appeals, they cannot be blamed for sticking with a method that worked. Nevertheless, after 22 years of a boom in basic research, *Russia* and *cancer* endure as serious problems. The public and its politicians, by and large, remain friendly to the scientific community, but science's ever-growing appetite for money, its unique ways of handling federal funds, and public uncertainty about the payoff it is receiving on its investment in research—all have evoked a good deal of uneasiness.

Congress endlessly pokes and probes into the affairs of the community. Last week, for example, Senator Fred Harris (D-Okl.) held another of the Congress's innumerable hearings on the geographic distribution of research funds. Not unrelated to congressional skepticism about the scale and administration of support for science is a decline in rates of growth of federal research budgets, and scientists wonder whether their government is slipping into a dark age. Against this background, it is interesting to note that two scientists who occupy extremely advantageous positions for observing the science-government relationship—White House science adviser Donald F. Hornig and his deputy, Ivan Bennett, Jr.—have lately taken to admonishing the scientific community for what they consider to be its naive perceptions of political reality. What they have been saying, in effect, is that science can no longer expect to be subsidized on the

basis of vague assertions about its value to society, and that, if scientists want their profession to flourish, they had better put their house in order, formulate an empirically based case for government support, and clearly state it to the public.

To get some idea of the ideological shift implicit in what Hornig and Bennett have been saying, it is useful first to take note of some of the traditional political rhetoric of science. In 1959, for example, a White House panel on high-energy physics proclaimed: "It is not possible to assign relative priorities to various fields of science. Each science, at any given time, faces a critical set of problems that require solutions for continued growth. Sometimes these solutions can be acquired at little cost; sometimes larger expenditures of funds are needed. Hence, the cost may not reflect the relative value but rather the need. Each area must be funded according to these needs."

And, in 1964, Lee DuBridge, president of Caltech and vice president of the National Science Board, appeared before a congressional committee and stated:

"What is it that determines when our national budget for basic research in universities is adequate? Just one thing, I submit. It is adequate when, and only when, every competent research scholar in our universities is finding adequate



BENNETT: The basic research community "needs to develop a more efficient excretory mechanism for the outdated, the mediocre and the inappropriate. . . ."

support for the research program he is able to carry out."

Bennett and Hornig aren't talking that way. Last month, for example, Bennett, who was formerly chief of pathology at Johns Hopkins Medical School, addressed the annual meeting of the Federation of American Societies for Experimental Biology and came close to saying that his White House service had brought him to the realization that there is no Santa Claus.

"The fundamental premise that we need more money for research grants, for training grants, and for the physical facilities to house the activities supported by them so permeates our thinking and our way of life," Bennett said, "that there seems to be something contrived and artificial about any situation that calls for justifying the view that basic research is in the national interest. While the situation may seem unreal or dreamlike, let me assure you that it is not."

Citing "the time honored, academic viewpoint that, as a matter of fore-ordained right, all scientists of competence deserve the funds which they judge to be necessary to pursue the research which they choose to do, subject to the approval of their peers," Bennett stated:

As impressive as such ringing statements may have been to legislators and appropriators in the halcyon days of yesteryear, they are now regarded not as expert testimony, but as special pleading, which (and it is time we admitted it to ourselves) is exactly what they are. . . . While all of us believe that planning of science should be our responsibility and ours alone, most

of our justifications for support until now have taken the form of saying that we should continue to do exactly what we have been doing—only more of it.

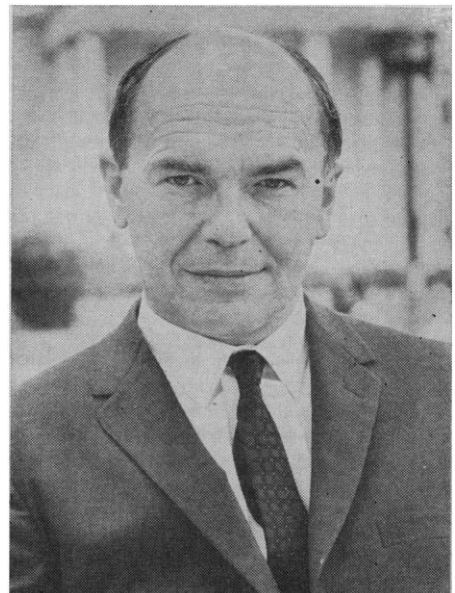
We have been extremely reluctant to make qualitative judgments concerning the relative importance of various fields of science, to set priorities, or to discuss goals. We say, and rightly, that science has changed the world but we steadfastly refuse to admit that we should change anything that we have been doing—we will add new enterprises, but never at the expense of old.

It is abundantly clear that if we don't take the lead in jettisoning some of the excess baggage, others will—and the job may be done by those who can't tell a carpet-bag from a treasure chest. In essence, I am saying that basic science needs to develop a more efficient excretory mechanism for the out-dated, the mediocre and the inappropriate and if we want the mechanism to be a *selective* one, we had better design it ourselves, and quickly.

Without committing himself on the simmering issue of whether too much basic research is disengaged and remote from practical applications, Bennett observed that various witnesses have recently been advising Congress that such is precisely the case. Arguments to this effect, he said, have come from "non-scientists and, therefore, are not automatically labeled as special pleading. Furthermore, these individuals somehow found the time and made the effort to express their views and opinions where their words are most likely to have an effect. Can we do less than this and expect to reverse the trend?"

The line of argument running through Bennett's address was also to be seen in the talk Hornig delivered the following week to the American Physical Society (*Science*, 5 May). ". . . [If] support of scientific research is to continue to grow," Hornig stated, "it is no longer adequate to arrive at a subtle conviction of the needs within the scientific community or to communicate those needs to me and to the relevant agencies. The scientific community is going to have to learn to articulate its hopes, to describe the opportunities which are before us for practical advance, to express the excitement of the new intellectual thrusts—but to do these in terms which the American people, who are expected to pay the bill, will gradually understand and have faith in. There is no alternative."

Dovetailing in part with the Bennett and Hornig speeches is a strongly worded address delivered to the Federation by Bentley Glass, a former Johns Hopkins geneticist who now views the science and government scene from the position of academic vice president



HORNIG: "The scientific community is going to have to articulate its hopes . . . in terms which the American people . . . will generally understand and have faith in."

of the State University of New York at Stony Brook. While Glass argued that federal support is inadequate in the biological sciences, "puny" in the social sciences, and "negligible" in the humanities, he criticized what he said "may be badly described as the capture of available funds by senior, established investigators and the lack of support on a sufficient scale for new men and new ideas." When the AEC tried to cut back on the support of



GLASS: The grant system has permitted "the capture of available funds by senior, established investigators and the growing lack of support . . . for new men and new ideas."

some of its long-time grantees in biology and medicine, Glass reported, "the furor was considerable. . . . In the end, the effort . . . was a colossal failure." Nevertheless, he said, "all students of history of science, know . . . that most important scientific discoveries and the most significant scientific work is done not by the elders but by young, often very young men. . . . I do not mean that all senior investigators are dodos who should be painlessly eliminated. . . . Yet I do challenge the value of a system that continues to pour the largest sums of support of basic research into their hands."

Increased use of institutional grants would help correct this situation, Glass said. "On his own campus . . . the younger scientist may be well appreciated and his needs better understood. A wise administration can devise an internal system that assists the young man, the new appointee, or anyone whose potential may be great, although his past record of published research is scanty."

The Hornig-Bennett-Glass admonitions for science to revise its ways of doing business feed upon and in turn reinforce a trend toward both introspection and public awareness among various segments of the scientific community. The leader in this field has been the Committee on Science and Public Policy of the National Academy of Sciences. The Academy of Engineering has a Committee on Engineering and Public Policy. Two years ago a Committee on Chemistry and Public Affairs was established by the American Chemical Society.

At its recent meeting the Federation authorized the establishment of an Office of Public Affairs and a Federation Committee of Public Affairs. In an announcement, the Federation said these steps were being taken because "the membership of the constituent societies have felt increasingly the need for mechanisms to inform themselves and the biomedical community generally about important relevant national issues and public policy. The responsi-

bility of the individual scientist to be aware of the nature and state of national biomedical activity was recognized as well as the value of a continuing scrutiny of the biomedical community's posture in relation to trends and tendencies in biology and in government." Officers of another major scientific society, this one in the physical sciences, also are contemplating the establishment of some sort of public affairs office.

It should be noted that nothing of major significance happens very fast in the internal affairs of science or in its relations with the federal government. But the insularity of the scientific community and its traditional insistence upon sovereignty and subsidy are clearly on the way out. Political necessity now dictates that science must be more responsive to the needs and tastes of the public. Inherent in this development are obvious dangers to the quality and progress of science. But there are also many opportunities.

—D. S. GREENBERG

Harvard: Beginning to Worry About Maintaining Its Faculty

Cambridge, Massachusetts. In former generations, major universities, such as Harvard, would speak of "calling" professors to fill positions. As in the case of a "call" from a religious institution, the man was expected to come when asked. Times have changed. "We don't talk about calling people anymore," notes Franklin L. Ford, Dean of the Faculty of Arts and Sciences at Harvard. The hard truth is that, like every other university in the country, even Harvard is having trouble attracting faculty members. A novel "Harvard hustle" is now necessary to entice professors despite the university's worldwide reputation and despite the fact that it has the highest average faculty salary in the nation—\$15,700 for the current academic year, according to the recent AAUP study.

Harvard President Nathan M. Pusey gave formal recognition to the problem last month when he appointed John T. Dunlop, an economics professor, to

head a seven-man committee* to examine the selection and retention of members of the Faculty of Arts and Sciences, the group which is responsible for the instruction of undergraduates and of graduate students in the academic disciplines. The Dunlop committee will be the first body charged with a close scrutiny of the faculty system since the 1939 "Committee of Eight" which established the present junior faculty structure. Under this system, the new Ph.D. at Harvard is hired for an instructorship which he usually fills for 3 years. At the end of that period, the promising scholar is given a 5-year appointment as an assistant professor. This is the "up or out" testing time; those who are not given tenure toward the end of the 5-year period must seek positions elsewhere. Many in the junior faculty think that this is too long to wait, and some of the senior faculty agree. Stanley H. Hoffmann, a professor of government,

says: "This 8-year probationary period demoralizes people and is unnecessary. We know what we think of them well before 8 years."

Even those junior faculty members who are talented enough to win tenure eventually at Harvard usually fail to get such assurances early in their assistant professor period. Consequently, this uncertainty, when combined with the other frustrations of Harvard life, leads many to be receptive to offers from other institutions. Even the most self-confident realize that, at a generous estimate, only one out of every three or four assistant professors will receive tenure after fulfilling the Harvard apprenticeship. To some, it seems important "to get out while the getting is good."

The Junior Faculty "Jump"

In many Harvard departments in recent years, more than half of the assistant professors have broken their 5-year contracts to take positions at other institutions. Although this "jumping" is not so widespread in the natural

* The other six full professors on the committee and their departments are: George B. Kistiakowsky, chemistry; J. C. Street, physics; Oscar Handlin, history; Merle Fainsod, government; Edward S. Mason, economics, and Herschel C. Baker, English.