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2. R. K. Merton, *The Sociology of Science: Theoretical and Empirical Investigations* (Univ. of Chicago Press, Chicago, 1973).
 3. G. Holton, *Thematic Origins of Scientific Thought: Kepler to Einstein* (Harvard Univ. Press, Cambridge, Mass., 1973).
 4. Holton puts his suggestion in these words: "Elementary particle physics is . . . shot through and through with themes that may well have, as many themes seem to me to have, their origins in a part of the imagination that was formed prior to the conscious decision of the researcher to become a scientist" [*Science* 188, 328 (1975)].
 5. G. Holton, in *Proc. Varenna Course on The History of Recent Physics*, C. Weiner, Ed. (Il Nuovo Cimento, Bologna, Italy, in press).
 6. H. D. Lasswell, *Psychiatry* 1, 197 (1938); — and N. Leites, *Language of Politics: Studies in Quantitative Semantics* (Stewart, New York, 1949). See also B. Berelson, *Content Analysis in Communication Research* (Free Press, New York, 1952); M. W. Riley and C. S. Stoll, in *International Encyclopedia of the Social Sciences*, D. L. Sills, Ed. (Macmillan and Free Press, New York, 1968), vol. 3, pp. 371-377.
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 8. Holton goes on to specify parallel usage of the term "thematic analysis" in the preceding article (p. 328); a term "familiar from somewhat related uses in anthropology, art criticism, musicology, and other fields."
 9. H. A. Zuckerman, "Cognitive and social processes in scientific discovery: recombination in bacteria as a prototypical case," paper presented at the annual meeting of the American Sociological Association, August 1974.
 10. B. G. Glaser, *Science* 143, 1012 (1964); *Organizational Scientists: Their Professional Careers* (Bobbs-Merrill, Indianapolis, 1964); L. Rubin, "Reactions to negative tenure decisions in chemistry and sociology," paper presented at the annual meeting of the American Sociological Association, August 1974.
 11. J. Watkins, in *Explanation in the Behavioural Sciences*, R. Borger and F. Cioffi, Eds. (Cambridge Univ. Press, New York, 1970), pp. 167-217.
 12. B. Barber and R. C. Fox, *Am. J. Soc.* 64, 128 (1958).
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 14. D. J. de S. Price, *Technol. Cult.* 6, 553 (1965); in *Factors in the Transfer of Technology*, W. H. Gruber and D. R. Marquis, Eds. (MIT Press, Cambridge, Mass. 1969), pp. 91-104.
 15. J. M. Keynes, *Essays in Persuasion*, vol. 9 of *Collected Writings* (St. Martin's, London, 1972), p. 276.
 16. A number of these problems are examined in (2).
 17. Some sociologists—P. A. Sorokin, for example—acquired a certain notoriety for questioning the doctrine of unfailing, unilinear progress at a time when it was a doctrine widely held. For an effort to identify quantitative variations in the development of science, see P. A. Sorokin and R. K. Merton, in P. A. Sorokin, *Social and Cultural Dynamics* (American Book, New York, 1937), vol. 2, pp. 125-180, 439-474; for an archeologist's penetrating analysis of "knowledge as a social construction" and the selective accumulation of scientific knowledge, see V. G. Childe, *Society and Knowledge* (Allen & Unwin, London, 1956).
 18. P. Weingart, in *Social Processes of Scientific Development*, R. Whitley, Ed. (Routledge & Kegan Paul, London, 1974), pp. 45-68.
 19. The classical diagnosis of the "whig fallacy" was provided by H. Butterfield, *The Whig Interpretation of History* (G. Bell, London, 1931). Thoroughly in control of his idea, Butterfield does not allow it to deteriorate into a dedicated relativism that denies the selective accumulation of transcultural "objective knowledge"; see his course of lectures, *The Origins of Modern Science, 1300-1800* (G. Bell, London, 1949). J. Agassi may have provided a prophylaxis against the whig fallacy in his "principle of historical reconstruction: apply no hindsight" [*Inquiry* 14, 154 (1971)].
 20. D. T. Campbell, "Objectivity and the social locus of scientific knowledge," presidential address to the Division of Social and Personality Psychology of the American Psychological Association, 2 September 1969.
 21. This work was supported by NSF grant GS-33359X to the Program in the Sociology of Science at Columbia University.

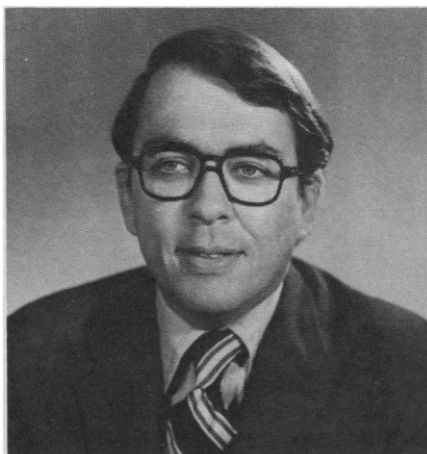
NEWS AND COMMENT

Congress: House Votes Veto Power On All NSF Research Grants

In a move that has dumbfounded officials at the National Science Foundation (NSF), the House of Representatives on 9 April voted that Congress should have a veto power over all of the 14,000 grants which NSF awards every year. To accomplish this, NSF would have to submit a list of all proposed grant awards to Congress every 30 days as well as justifications for them. Either house could veto the award of any grant, but if no action were taken inside of 30 days, the grant award would be made.

The provision would put Congress in the position of effectively approving research grants in every area of NSF support, from education to basic science. Needless to say it would revolutionize—some would say jeopardize—NSF's method of research support, which hitherto has exclusively involved NSF bureaucrats, grant applicants and their institutions, and the 40,000-odd scientists whom NSF invites to make peer review judgments on proposed projects.

The amendment was sponsored by Robert Bauman of Maryland, a second-term Republican, and passed by a vote of 212 to 199 just before the house overwhelmingly approved the entire NSF authorization of \$755.4 million by a vote of 390 to 22. The amendment came up after a long debate which



Robert Bauman (R-Md.)

focused on another controversy concerning an NSF-sponsored introductory anthropology course titled "Man: A Course of Study" (MACOS).

Conservative House members have attacked MACOS for an array of reasons, ranging from its course materials and films aimed at 10-year olds—which allegedly deal with "adultery, cannibalism, killing female babies and old people, trial marriage and wife-swapping, violent murder and other abhorrent behavior"—to the question it raises of the role of the federal government in shaping local school curriculums. And, at the end of an emotional, 3-hour debate, during which several proposals to control NSF in various ways were narrowly voted down, Bauman rose to propose his amendment to the surprise of many house members and staffers. As one staffer said later, "They passed it because they were ready to pass something."

The Bauman amendment is not yet law since the Senate has not completed action on its version of the NSF authorization bill. Senator Edward M. Kennedy (D-Mass.), who will have some influence as to whether the Senate passes a parallel measure since he is chairman of the NSF subcommittee of the Committee on Labor and Public Welfare, has stated that he is "shocked" by the House action and will "lead the

effort to ensure that the Congress does not include this damaging provision in the final version of the NSF authorization." Nonetheless, even if the Senate does not pass a similar amendment, the Bauman provision could become law by surviving the subsequent conference reconciling the two bills. In short, no one can predict at this time whether the Bauman amendment will stick.

But the reaction to the amendment in some quarters has been strong. The Senate's best known critic of NSF, Senator William Proxmire (D-Wis.) told *Science* that he was opposed to the amendment. Proxmire castigated NSF for a number of management failures, but added, "I don't believe that the answer is to make 535 members of Congress a part of the grant approval process. The answer is to reduce NSF funding, forcing the agency to sharpen priorities."

NSF's director, H. Guyford Stever, admits that the Bauman proposal took NSF by "complete surprise." But he says that, even if the amendment itself goes away, the motivation behind it will not. He told *Science*: "I am strongly opposed to the Bauman amendment. . . . I don't think it is a practical amendment or a good one. But it is a signal which all scientists should heed."

If implemented, Stever says, the amendment would distort NSF's research support and therefore American science. Most congressional critics, he explained, have focused on projects with odd-sounding [to them] titles in the biological and social sciences. Hence, he says, Congress would tend to veto projects in those areas. Untargeted basic research would also suffer, since many members are under pressure from constituents not to fund seemingly irrelevant projects with seemingly incomprehensible titles.

The fundamental issue behind the Bauman amendment, Stever says, is "whether the science foundation should be sponsoring research in certain fields," in biological and social sciences, and this, he says, is a legitimate question. Congress and the public are not anti-science, but they are asking what they are getting for their money. "Times are changing; I think the scientific community should be realistic about that." Hence, the Bauman amendment is something of a watershed, like the Mansfield amendment of 1970, which, although it lasted only a year, has had a long-term effect on the Department of Defense's justification for its basic research program. "I think this is a

bigger turning point than the Mansfield amendment," Stever says.

Whether the congressmen who voted for the amendment wind up reviewing NSF grant awards, or, whether their message survives only as a "signal" to the scientific community, their opinions about NSF and science generally are suddenly very important. Their complaints, as expressed by Bauman and other conservatives who supported the amendment and by critics outside the Congress, seem to add up to frustration with the way NSF manages its research money and the way in which Congress oversees—or fails to oversee—it. Finally, because Proxmire and others have ridiculed the esoteric titles of many NSF research grants, there

seems to be a strongly held view among the critics that NSF is wasting money in a cavalier manner. As syndicated columnist James J. Kilpatrick wrote recently, some of the grants

amount to a reckless and irresponsible rip-off of the taxpayers. They reflect the extravagance and elegance of an agency with too much money to spend, and not enough supervision over the spending of it.

In homelier language during the debate, Representative Robert J. Lagomarsino (R-Calif.) nicknamed the proposed measure the "Polish frog bill," and he delivered a harangue against the federal research establishment:

Mr. Chairman. . . . This is the Polish frog bill, or as it is otherwise known, the comic book bill. It is being brought to you by

Nuclear Industry Girds for Battle

With an expansive flourish, the Atomic Industrial Forum (AIF) is picking up the gauntlet thrown down by nuclear critics advocating a moratorium on new reactor construction. For 22 years the AIF has been a low-key, somewhat passive spokesman for the nuclear industry. Now, in the face of rising opposition to nuclear power, the forum is surrendering its status with the Internal Revenue Service as a tax-deductible, educational organization and is adopting the aggressive image of a full-fledged trade association.

In a stepped-up public relations program, the AIF plans to double its operating budget to \$1.4 million and move its 90-member staff from New York to Washington. Although AIF officials say the forum itself plans no federal lobbying activities and will not register as such, the organization is considering setting up a lobbying unit. One proposal, advanced by John W. Simpson, a senior Westinghouse official, calls for setting up a Nuclear Energy Association that would spend up to \$500,000 a year lobbying the federal government. The money would come from dues assessed on participating utilities, equipment manufacturers, and engineering firms. Former Congressman Craig Hosmer (R-Calif.), long a passionate advocate of nuclear energy, has been mentioned as a possible head of the new organization. Its format—and its relationship to the AIF—have not been decided yet, however.

According to the April issue of *Nuclear Industry*, an AIF publication, an early sign of the forum's new activism will be its sponsorship, with three electric power trade associations, of a "Nuclear Power Assembly" in Washington on 13 and 14 May. The meeting is intended to bring utility and industry executives to town for a "briefing and a round of visits to congressmen to carry the nuclear message to Capitol Hill."

The planned assembly bears a superficial resemblance to a widely publicized gathering sponsored last November by consumer advocate Ralph Nader and given the catchy name "Critical Mass." Nader's ability to rally some 800 grass-roots critics from more than 30 states convinced the industry that the "anti-nuclear" movement was fast becoming a potent political force. This conviction, plus the demise of the Atomic Energy Commission, and the fact that efforts to enact various forms of nuclear moratoriums in several states were gaining strength, helped impel the transformation of the AIF and the rapid escalation of its budget.

By comparison, the critics' main national organizations probably spend a total of around \$100,000 a year in their lobbying and public relations efforts.—R.G.

the same people who gave us the treatise on perspiration odor among Australian aborigines, for only \$70,000. Along with the \$121,000 essay on why people say "ain't."

Well I have just returned from the district, Mr. Chairman, and I think I can tell you why the people say "ain't"; and it would not cost you \$121,000 either. The people say "ain't" because they figure the Congress ain't got any sense when it votes for expenditures such as these. The history of comic books, which was one of the projects undertaken in my own district, may be interesting to some 10-year-old, or to someone who thinks like a 10-year-old. But it sure "ain't" worth \$71,000 in tax funds. And it ain't worth your vote, either.

Bauman, introducing his amendment, was more specific. He made fun of an Executive branch report defending NSF's proposed authorization of \$755.4 million, which declared it would have "no" inflationary effect. "Imagine that!"

Moreover, the largesse of the government research enterprise encourages "grant shopping," Bauman said, and

this distracts scholars from their responsibilities to students. He added,

Of increasing importance to educational institutions these days are not good teachers and scholars, but those who are adept in the fine art of grantsmanship—getting Government and foundation money for chic research projects.

The theory among professional grant-shoppers is that, once you have mastered the subtleties of proposal-writing, if you cannot get money from one agency of government, you can find it in another corner of our Federal leviathan.

Another supporter, Representative Robert H. Michel (R-Ill.), who is regarded as having considerable power, explained how questionable grant titles affect the lives of ordinary congressmen, saying:

Doggone it, my credibility is destroyed when there are even just one or two of these items [grant titles].

Mr. Chairman, I want to know this: When the legislative committee is hearing the testimony are you asking some of these serious questions? That is all that is

being reflected here today. We are seeing reflected the Members' frustration over some of these silly things that are proposed.

Whether or not congressmen start thumbing through NSF proposed grants when the 1976 fiscal year begins, there is no question but that the agency is in for a period of sustained scrutiny. Moreover, as Michel's comment implies, some members were also critical of the committee which oversees NSF, the Committee on Science and Technology, chaired by Olin Teague (D-Texas). One upshot of the debate, then, might be to galvanize the committee's members and staff, who in the past have not been known for their hard-driving investigations of the agencies under their purview.

Stever says that the committee will have to alter its role toward the NSF because of the new Congressional climate. "The committee did a grand job in the past but times are changing. There are economic problems in the

Arms Controllers Are Pessimistic

Representatives of the approximately 80 nations that are party to the Treaty on the Non-Proliferation of Nuclear Weapons, or the "NPT," will be in no congratulatory mood when they meet in Geneva in May to review the first 5 years' experience with the treaty. In the year since India's entry into the nuclear club, fears that the NPT is in danger of unraveling have, if anything, intensified.

As a preliminary to the Geneva conference, the Arms Control Association, a Washington-based group made up in part of former U.S. officials who have had responsibilities in the arms control field, held its own miniconference on the NPT on 9 April. It was conducted, ironically enough, at the Capitol in the hearing room of the Joint Committee on Atomic Energy, which has been one of the most resolute proponents of an advancing weapons technology.

One of the first speakers, Fred C. Iklé, director of the U.S. Arms Control and Disarmament Agency (ACDA), summed up the situation that the Geneva conference will confront. "The news on nuclear proliferation is bad," Iklé said. "Several countries, not now nuclear states, appear to be making determined efforts to acquire a capability that would enable them to build their own atomic bombs. How far they will go, and how many others will join them, are still open questions." Later, Iklé made this even a bit stronger by saying that, in the case of several countries which still lack the ability to make nuclear weapons, "now we suspect . . . the intent to make [them]."

Although Iklé did not specify which nations were suspected of developing a nuclear weapons "capability,"

the list is believed to include, besides India, nations such as Argentina, Brazil, Israel, Libya, Taiwan, South Korea, and Pakistan.

A noteworthy thing about this list is that, besides several nations that have refused to sign the NPT, it includes two nations that have signed (Libya and South Korea) and even one that has both signed and ratified the NPT (Taiwan). What this obviously means is that the NPT will not stop proliferation as long as some nations, whether parties or nonparties to the treaty, perceive nuclear weapons as either an antidote to feelings of insecurity or an answer to a desire for higher status.

On the matter of security, Iklé said that the United States had to choose between, on the one hand, terminating its alliances and resigning itself to further proliferation, or, on the other hand, playing a leading role in maintaining a "world-wide security structure that will give nonnuclear nations the confidence to forego their own nuclear forces."

One of the few foreign participants, Minister Lennart Eckerberg of the Swedish Embassy in Washington, argued the need for the nuclear weapons states to pledge to the nonnuclear states that nuclear weapons will never be used against them. Sweden is expected to make a particular point of this at Geneva, where it will chair the NPT conference. The only existing guarantee for nonnuclear nations depends on action by the United Nations Security Council, any one of whose five permanent members can invoke the veto. The Security Council has never been viewed as more than a weak reed; since China became a council member, nations such as India have regarded this body as no shield at all.

country now, and other pressing concerns. I think the committee and Teague are up to the challenge."

The controversy over the Bauman amendment is far from resolved; that over MACOS is now similarly in limbo. The House debate leading up to the Bauman proposal focused almost exclusively on MACOS and John B. Conlan (R-Ariz.) led the fight against the program. Conlan had raised objections to MACOS when the committee had examined the NSF bill previously; in response, NSF voluntarily suspended funds for MACOS dissemination in fiscal 1975, which total approximately \$300,000. But the course itself will go on being used in the 1728 schools in 470 school districts around the country, which now use it. Stever has appointed an internal committee to study the issue and has pledged not to spend any fiscal 1976 funds for curriculum promotion pending the outcomes of the internal review and a simultaneous one by Teague's committee.

But on the floor of the House, Conlan and his allies argued that Congress should pass on the marketing of individual programs, like MACOS. He offered an amendment to this effect, saying NSF's promotion of such courses is "a dangerous plan for a federally backed takeover of American education." Congress would be more responsive than NSF bureaucrats to the wishes and values of local communities, he said. But foes of his amendment noted that NSF sponsors only a tiny share of the federally developed curriculum materials used in the nation's schools, and the amendment would result in lopsided "censorship" of educational programs. The Conlan amendment lost by a vote of 215 to 196, a vote narrow enough to signal the powerful momentum which anti-MACOS forces have gained in the House.

Whatever news breaks in coming weeks about the Bauman amendment or the MACOS controversy, clearly, as columnist Kilpatrick wrote, "chilly

winds" are blowing for the NSF on Capitol Hill.—DEBORAH SHAPLEY

Text of Bauman Amendment

Sec. 7. (a) Notwithstanding any other provision of this or any other Act, every 30 days the Director of the National Science Foundation shall transmit to both Houses of Congress a message containing:

(1) A list of grants, proposed to be made by the National Science Foundation and,

(2) All facts, circumstances, and considerations relating to or bearing upon the decision of the National Science Foundation to approve said grants, including to the maximum extent practicable the manner in which the national interest will be fostered by the approval of such grants.

(b) The grants transmitted under subsection (a) of this section shall be effective at the end of the first period of 30 calendar days of continuous session of Congress after the date on which the message is transmitted to it unless, between the dates of transmittal and the end of the 30 day period, either House passes a resolution stating in substance that the House does not approve all or any number of the grants listed therein.

on Eve of Non-Proliferation Treaty Review

A point underscored by those at the conference was that the United States and the Soviet Union have not met their obligations "to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race . . ." as the NPT required.

"Let us break the old habit of seeing problems of nuclear weapons solely in terms of U.S.-Soviet relations," said Senator Edward M. Kennedy (D-Mass.), who opened the conference. In his view, if many nations beyond the six now in the nuclear club develop nuclear weapons or explosive devices, the security provided by superpower deterrence will fail, perhaps even for the superpowers themselves.

Kennedy's first priority, and seemingly a high priority of most of the conference participants, was the negotiation of a comprehensive test ban treaty. Also, Kennedy expressed a widely shared view in describing the 150-kiloton threshold treaty negotiated by the Nixon Administration at Moscow last summer as a "virtual mockery of commitment to restraint."

The Unresolved Problem of "Peaceful" Explosions

Inextricably tied to the problem of obtaining a comprehensive test ban is the problem of "peaceful nuclear explosions" (PNE's) and how to either ban them or put them under international supervision. Even the ratification of the threshold treaty itself is subject to further negotiations with respect to that feeble document's glaring loophole for PNE's.

Herbert Scoville, Jr., a former assistant director of ACDA and a conference speaker, said that PNE's would probably never be of any practical value in nations such

as the United States and India. In his opinion, none of the many PNE experiments either proposed or actually carried out in the United States for purposes such as canal building, gas stimulation, in situ retorting of shale oil, and the generation of electricity has shown any promise of success. If PNE's were ever found to be of any value, Scoville predicted, it would be in a country such as the Soviet Union that has huge uninhabited regions where contamination from radioactivity might be tolerable.

Such pessimistic evaluations of PNE's are regarded with distrust in many nonnuclear countries, where the suspicion remains that the nuclear powers may be on to something good and don't want to share it. One of the conferees, Rihki Jaipal, India's ambassador to the United Nations, as much as said that India's "peaceful explosion" of last May was simply a matter of Indians wanting to find out something for themselves.

There was wide agreement among the conferees that when nations not party to the NPT receive nuclear technology or materials from nations that are, nonmembers should be made to accept NPT safeguards against theft or diversion. This was strong indirect criticism of the offer by former President Nixon to sell Egypt and Israel each a 600-megawatt nuclear power reactor, with only these facilities to be subject to safeguards rather than all nuclear facilities in the two countries.

No actual changes in the NPT are in prospect at Geneva. The participants in the Washington conference were simply joining in an effort to help formulate ideas for better implementation of the treaty as it stands.

—LUTHER J. CARTER