italism to sense the tenuous nature of this link. The second and third phases of this model are common to many parts of the world. Phase I is not.

Jean Mayer (*12*), the eminent food scientist, gave an appropriate conclusion about the cultural basis for our environmental crisis:

It might be bad in China with 700 million poor people but 700 million rich Chinese would wreck China in no time. . . . It's the rich who wreck the environment . . . occupy much more space, consume more of each natural resource, disturb ecology more, litter the landscape . . . and create more pollution.

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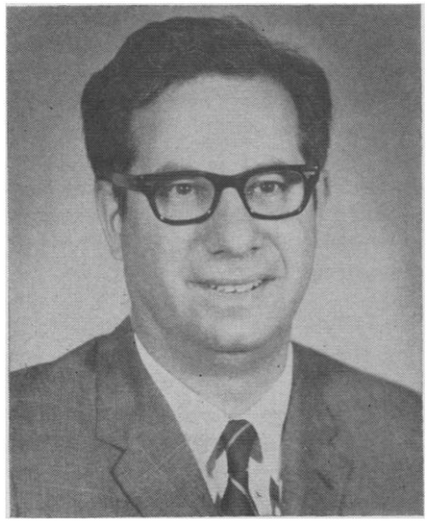
NEWS AND COMMENT

R&D Funding: Top Treasury Aide Decries Blind Faith Approach

The government's top financial officers rarely, if ever, make pronouncements on financial support for science and technology, preferring to leave such arcane subjects to the small band of officials and academics who specialize in these areas. However, a conspicuous exception occurred 22 October, when Murray L. Weidenbaum, assistant secretary of the treasury for economic affairs, strongly assailed some of the criteria that have been employed to get funding—for both basic and developmental research—in the past. Too often, Weidenbaum said, science and technology are regarded "almost as something sacred and inviolable—any retardation of the rate of spending for research and development is viewed as no less a sin than the suppression of truth."

Weidenbaum's remarks were made in a speech prepared for delivery at the annual meeting in Houston of the American Institute of Aeronautics and Astronautics, of which he is an associate. The major thrust of his speech amounted to a complaint that large-scale scientific and technological projects are generally undertaken without hard, objective evidence to justify them. Though Weidenbaum was careful to name no specific projects, he is reliably known to have been referring primarily to the Apollo moon program and the supersonic transport—two projects which have been endorsed rather enthusiastically by his own Administration. To a lesser degree, his remarks also applied to expensive "pure science" projects, such as the building of linear accelerators. Weidenbaum suggested that, in the future, major projects should be justified by rigorous cost-benefit analyses, rather than simply by faith that they will ultimately prove beneficial to mankind. "I am amazed," he said, "when scientists say that we must embark upon a major technical project on faith—faith that through serendipity . . . it will turn out to be worthwhile after all."



Murray L. Weidenbaum

Weidenbaum has no direct responsibility himself for research and development funding, and he stressed that he was presenting his own views rather than those of the Administration, so his speech should not be interpreted as signaling a new "tough" attitude on the part of the federal government toward big science and technology. But to the extent that Weidenbaum's views percolate through to those officials who are directly responsible for research funding, they could end up having an impact on the future course of federal support for R & D. Already several such officials have requested copies of the speech. Moreover, Weidenbaum himself has a direct input into the new Productivity Commission which, among other tasks, is supposed to measure the productivity of government-financed R & D programs.

Though Weidenbaum's specialty is economics, he is no stranger to technological affairs. He served as chief economist for the Boeing Company in Seattle from 1958 to 1963 and he has also worked for the Convair Division of General Dynamics Corp. and for the Stanford Research Institute. Moreover, while serving as a professor and then chairman of the department of economics at Washington University in St. Louis from 1964 to 1969, he headed a study—financed by the National Aeronautics and Space Administration—of the economic impact of the space program and related aerospace activities. He has also served on a National Academy of Sciences committee that studied science, technology, and regional growth. What's more, Weidenbaum has

Antiwar Group Raises $250,000

When U.S. troops invaded Cambodia last spring, many members of university communities responded with strikes and with lobbying trips to Washington, while others began to organize action groups to influence this fall's elections by supporting antiwar candidates. Of the many groups which emerged at that time, the Universities National Anti-War Fund (UNAF)*, headed by Jule Charney, professor of meteorology at M.I.T., is apparently the most significant in terms of national organization and money-raising power.

By next week's elections, UNAF expects to have distributed more than $250,000 to Senate and House candidates who have a clear commitment to a rapid ending of the United States' involvement in Southeast Asia. The organization claims substantial credit for the defeat of several well-entrenched incumbents by narrow margins in primary elections. Among those defeated by candidates with UNAF backing were Representatives Byron Rogers (D–Colo.), Philip Philbin (D–Mass.), and George Fallon (D–Md.), whose collective seniority totals 76 years. In a separate House race, Parren Mitchell won the Democratic nomination in Maryland's 7th District and the chance to become the state's first black congressman—by 34 votes, with substantial UNAF support. In Virginia, another Democrat, George Rawlings, attributed the margin of his victory in the Senate primary contest to UNAF.

"Day's Pay for Peace"

UNAF was organized by a small group of faculty from Harvard and M.I.T. around the theme, "Give a Day's Pay for Peace." The basic idea was to bring together those individuals in the academic community who opposed the war. The organization has coordinators and chapters on more than 500 campuses in all sections of the country including essentially all major universities.

The fund-raising process operates primarily at a local campus level, with the national organization providing literature and coordination. The campus coordinator, who most often was recruited by a friend on another campus, establishes a group of local sponsors, mails appeals for funds to faculty members, and follows up with person-to-person canvassing. Contributions are received by the seven-person staff at the Cambridge, Massachusetts, headquarters, which has records of more than 6000 individual donors.

UNAF is supporting candidates in 27 states spread across the country. The organization attempts to put its money into races which are close and in which UNAF money might swing the balance. The announced criteria for selecting candidates are the foreign-policy position of the candidates, the differences between the candidate and his opponent (a dove running against another dove is not supported), the chances of winning, and the amount of money available for distribution.

So far, the policy of investing political risk capital in tight races has paid off. Of the candidates who received substantial support (more than $1000) in the primary campaigns, 14 of 16 were elected. A total of $74,000 was given to candidates in primary races. For the November congressional elections, UNAF has endorsed 14 Senate and 50 House candidates and allocated more than $200,000 to help elect them.

—ALLEN L. HAMMOND

* The 27-member policy-making national board of UNAF includes Father Colman Barry, St. John's University; Mary Bunting, Radcliffe; John Coleman, Haverford College; Barry Commoner, Washington University; Bernard Feld, M.I.T.; John Galbraith, Harvard; H. Bentley Glass, State University of New York, Stony Brook; Christopher Lasch, Northwestern; Franklin Long, Cornell; Hans Morgenthau, University of Chicago; Franz Schurmann, University of California, Berkeley; Jacqueline Wexler, Hunter College; Jerome Wiesner, M.I.T.; and Herbert York, University of California, San Diego. The 70-plus member list of sponsors for UNAF includes Felix and Konrad Bloch, Harvey Brooks, Jerome Bruner, Owen Chamberlain, Max Delbrück, Carl Djerassi, Nathan Glazer, George Kistiakowsky, Salvador Luria, Edward Purcell, B. F. Skinner, Lionel Trilling, Harold Urey, Victor Weisskopf, and Jerrold Zacharias.

dealt with federal budget-making close up—as an economist in the Bureau of the Budget from 1949 to 1957. So when it comes to matters involving technology and federal funding, Weidenbaum can be presumed to have some expertise.

Weidenbaum opened his prepared speech by lamenting that most public discussion dealing with the role of science and technology in the United States is "both discouraging and unproductive" because the dialogue is generally limited to "a heated exchange between two polar alternatives." One of these alternatives, he said, tends to "view with alarm the extent to which 'uncontrolled' science and technology are supposedly destroying our society." The other alternative is the one which he claimed "looks upon science and technology almost as something sacred and inviolable." Weidenbaum suggested that some "holders of this position do not really view science and technology as being beyond criticism, but, perhaps worse yet, as ends instead of means." When a layman tries to enter this science policy debate, Weidenbaum said, he gets caught in a "forensic crossfire" and is greeted with "cries of interference, short-sightedness, and worse."

Nevertheless, Weidenbaum stuck his neck out and called for "an honest and sensible position—one that tries to balance the collective benefits against the social costs of certain technological advances or proposed scientific research undertakings." He argued that "every human undertaking, including the basic research and development process, involves the utilization of certain resources"; that the general public should decide how public resources will be used; and that "there is always the need for thorough analysis and justification before undertaking a major project."

Unfortunately, in Weidenbaum's opinion, the nation's track record in performing such analyses is poor. "When in the past I examined the actual justifications for undertaking many new major scientific projects," he said, "I was often struck by the absence of that objectivity and hard, factual quantitative analysis that I associate with the core of the scientific method."

As an example of the blind faith approach to R & D funding, Weidenbaum cited a speech he heard at an important meeting of a national scientific and engineering society. "The audience was assured by one very distinguished

speaker," Weidenbaum said, "that a specific current major technological undertaking [Weidenbaum almost certainly meant the Apollo moon program] would produce great benefits, of which by far the most important would be those that we cannot presently conceive of." Weidenbaum said this particular speaker—an aerospace and military leader—"saved his greatest contempt for what he called the present-day doubters" and "contended that in future periods we all will look back with disdain upon these people as men of little faith."

Weidenbaum said he was not trying to stifle scientific inquiry or inhibit technological innovation. "If a professor of engineering wants to devote his leisure time to designing a commercial submarine or planning a linear accelerator, he should be entirely free to do so," Weidenbaum said. "However, when he asks for $100 million of taxpayers' money to start building the gadget, he should have to justify it—and not in the soft, theological terms so often used by the natural scientists in such matters, but in the hard, objective manner of the social scientist.

"He should have to answer questions such as these: Are the expected benefits worth the cost? How well can he measure the benefits? Has he omitted important elements of cost to society, such as polluting the environment? Finally, and most crucial, are the returns from this use of public funds likely to be greater than from alternative uses?"

Weidenbaum is reliably said to believe that the SST in particular would not fare very well if subjected to the kind of rigorous cost-benefit analysis he has in mind. He is said to have been dubious about the SST while he was still at Boeing, at least partly because he believes the project will yield a relatively poor rate of return on investment.

Weidenbaum said his way of thinking about resource allocation is highly pertinent to current discussions on how to utilize the technical capabilities

Smoking Dogs: Tobacco Institute Tries to Discount Cancer Studies

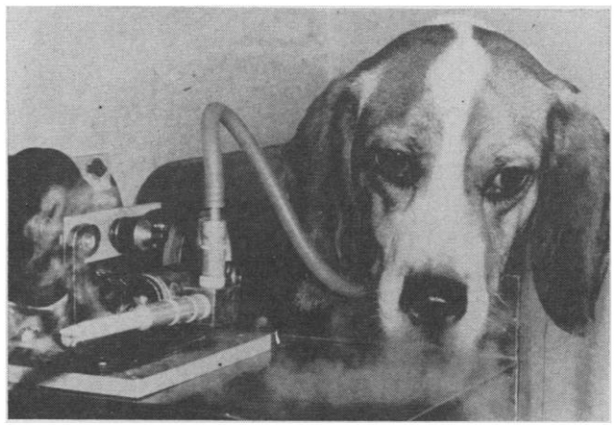
The tobacco industry has routinely countered the statistical and epidemiological evidence linking smoking and lung cancer by proclaiming the fact that no one had been able to induce lung cancer in experimental animals with cigarette smoke.

To silence this objection, two scientists had 86 beagles inhale the smoke from 415,000 cigarettes over a 3-year period. Oscar Auerbach of the Veterans Administration Hospital, East Orange, New Jersey, and E. Cuyler Hammond of the American Cancer Society accomplished this by pumping smoke from a cigarette-smoking machine through the tracheal stroma of the dogs (see photograph). A significant percentage of the dogs developed lung malignancies. That would seem to settle the issue, but it didn't.

The American Cancer Society was jubilant for having finally defeated its old adversary, the Tobacco Institute, the tobacco industry's lobbying and public relations body. ACS asked Auerbach and Hammond to present their results at a press conference during an ACS meeting last February. The Tobacco Institute, however, would not accept defeat that easily.

In a barrage of press releases and newspaper advertisements, the Tobacco Institute questioned the validity of the smoking dog experiments and demanded that ACS submit the data to a panel of independent experts to be designated by the Tobacco Institute. The cancer society refused. After the Tobacco Institute repeated the demand for independent review several times, ACS asked the Surgeon General to appoint a body to review the data. The Surgeon General refused.

Meanwhile, Auerbach and Hammond had submitted their work, in two papers, to the *New England Journal of Medicine*. The journal, however, refused to publish the papers, not for lack of scientific merit, but because the editor of this journal disapproves of prepublication disclosures.* The papers were then submitted to the *Journal of the American Medical Association*, which



Beagle inhaling smoke from cigarette smoking machine. [Wide World Photos]

sent them out to 18 referees. *JAMA* editor Hugh Hussey claims that this extraordinary number was necessary because of the authors' style and *JAMA*'s difficulties in interpreting the photographs of the lung sections. *JAMA* returned the papers to the authors with the referees' criticisms, but Auerbach and Hammond decided to send the papers to a third journal rather than attempt to satisfy 18 critics.

The Tobacco Institute made an issue of Auerbach and Hammond's difficulties with the journals, suggesting that this showed the experiments to be of questionable validity. Recently the Institute's press releases have stated: "It is likely that none of the dogs developed cancer." This claim is unsubstantiated.

Auerbach and Hammond's papers have now been accepted for publication in the December issue of *Archives of Environmental Health*, an AMA specialty journal. Both men admit that it was a mistake to release their data prior to publication; they are looking forward to their work being judged by the normal processes of scientific evaluation rather than by the mass media.

—ROBERT J. BAZELL

* *New England Journal of Medicine* editor Franz J. Inglefinger wrote an article on this problem in the 28 August 1970 issue of *Science*.

being made available by reductions in defense spending. In a passage which could not have been congenial to his aerospace audience, Weidenbaum suggested that the proper way to plan for a postwar economy is not to look first at the existing technical capability of industry and then decide what civilian needs to apply it to. Instead, he said, we should first identify the highest priority civilian needs and then seek the best way to fulfill these needs. This latter approach, of course, opens up the possibility that the aerospace industry, which is already in a decline, might lose out in the competition for civilian work and thus continue to decline even more precipitously. That prospect does not alarm Weidenbaum. "Change is an essential aspect of modern society," he said. "This should not surprise us as we have seen in recent decades the tremendous expansion of the aerospace industry require attracting people and capital from other parts of the economy, often to the discomfort and displeasure of those other companies and their employees, stockholders, and suppliers. Pleasant or not, we should not expect that type of movement always to be in one direction."

In an interview with *Science*, Weidenbaum stressed that his remarks applied mainly to the "D" part of R & D, but he also called for more rational analysis of basic research spending. Weidenbaum's speech had quoted favorably remarks made by Lee A. DuBridge, President Nixon's former science adviser, in which DuBridge said that technology should be subjected to a cost-benefit analysis but "a national policy for science should be to use our scientific talent to its maximum potential continuously and hopefully to stabilize the budget for scientific discovery as much as possible." In the interview, Weidenbaum said he thought science should have fairly level funding in terms of real purchasing power so as to offset the inroads made by inflation and avoid the "tremendous swings of a feast and famine cycle." However, Weidenbaum expressed dissatisfaction with the analytical underpinning of most science budgeting. He said that in allocating funds for basic science "we need greater understanding of the annual increment of funding by fields and of the base of the investment to help us identify those fields that merit higher priority." Weidenbaum said he was not proposing "a plan for less support of science and technology" but instead was calling for "a more intelligent application of that support."

That Weidenbaum believes it is only fair to make scientists justify their projects more intelligently was made clear in his speech. "We now expect such greatly maligned types as administrators of social welfare programs to make these benefit/cost calculations to support their budget requests for new training, health and antipoverty programs," he said. "I see great charm in extending the use of the scientific method to public resource allocation in the areas of science and, especially, technology."—PHILIP M. BOFFEY

Labor-Campus Link: Union Heads, Academic Leaders Discuss Alliance

Cambridge, Mass. A group of top national labor leaders and politically active academics held discussions here 16 October aimed at eventually forming an academic-labor alliance "to achieve common social and political objectives." The meeting, a 5-hour session at the Harvard Faculty Club, was attended by some 50 persons, including Leonard Woodcock, president of the United Auto Workers; Nat Weinberg, director of special projects and economics, U.A.W.; Jack Sheehan, legislative director, United Steelworkers of America; Jerry Wurf, president, American Federation of State, County, and Municipal Workers (the fastest-growing union in the nation); Anthony Mazzocchi, legislative director, Oil, Chemical, and Atomic Workers Union; and Cleveland Robinson, a former associate of Martin Luther King and a civil rights leader.

From the universities came three Nobel prizewinners: George Wald, of Harvard, Salvador Luria, of M.I.T., and Albert Szent-Györgyi, of the Marine Biological Laboratories, Woods Hole, Massachusetts. Also present were Jerome B. Wiesner, science adviser to President Kennedy, and now provost of M.I.T.; Douglas Dowd, the Cornell University economist; Howard Zinn, professor of political science at Boston University; and Wassily Leontief, Henry Lee Professor of economics at Harvard. Students present included Joseph Rhodes, Jr., a junior fellow at Harvard and the sole student member of the President's Commission on Campus Unrest; and David Ifshin, president of the National Student Association.

After the meeting, the group issued a statement drafted by Wald and signed by 27 of those attending. It said, in part: "The most urgent concerns of American workers—among them peace, racial justice, job security, decent environments in which to work and live, adequate medical care and social security, housing, schools, stable prices—all represent equally the needs of students and faculty members." The statement criticized the "tendency" of universities to align with big business rather than with labor. "It is high time that this great and powerful force in American life began to play a larger part in our universities," it said.

The group agreed to meet again to locate specific social and political issues on which the two elements can work. Possibilities under discussion are a unionlike faculty and student organization, and formal support for the General Motors strike. Another type of activity would be faculty and student research on labor legislation. Endorsement of bills, such as the Occupational Health and Safety Act of 1969, now before congress and strongly supported by U.A.W., is another example.

The meeting was largely the brainchild of Wald, a Nobel laureate for his work in vision, and, in recent years, a popular figure on the student left. Wald traces its origins to two events of last summer: the joining of a local of the teamsters' union by a group of faculty members at the University of Wisconsin at Whitewater, and a statement by Victor Reuther of U.A.W. that "there are people in this country who are trying to divide the workers