

help in devising and executing a sustained policy for the use of science and engineering. At hearings on science policy machinery held in July by the House Committee on Science and Astronautics, both Baker and Stever alluded to a broader potential role for professional societies, and then on 10 September, Stever invited officials of the scientific and engineering professional societies in to explore in general terms the contributions the societies could make to science advisory/science policy problems.

Some initiatives had been taken earlier by the societies. Prompted at least in part by a concern over the change in venue of the science advisory operation and the slow pace of progress toward establishing an Office of Technology Assessment for Congress, American Chemical Society President Alan C. Nixon had taken the lead in creating a Committee of Scientific Society Presidents. The group met in June and again in early October and

appears to have made some progress toward developing a common attitude and policy on taking a more active role vis-à-vis federal science policy. A similar pattern seems to be developing with the engineering societies.

Immediate prospects that the professional societies will make efficacious science advisory inputs seem rather doubtful. Most of the disciplinary societies have only recently begun to come to grips with the problem of modifying their traditional concern with narrowly professional matters to give more emphasis to the economic interests of their members and to public policy issues. Friction between university and industry members or between managers and bench scientists remains to be reconciled in some organizations. And there are also residual jealousies among scientific societies and ill will between scientific and engineering societies.

In favor of greater professional society activity in the policy arena is

that the societies do after all represent a national cross section of scientists or engineers. Furthermore, the elected officials of the societies tend to be somewhat different in personality and interests from the university scientists who have dominated the science advisory apparatus. It is not a clear-cut contrast between organization men and individualists, but there are differences in style and temper which may make the society regulars more congenial to the present Administration. Not least of all, most professional societies have displayed uncertainty about what their aims and functions should be, and the Administration's offer of participation could help fire them with new purpose.

All in all, it would be obviously wise for the scientific community to examine carefully the new terms which President Nixon seems to be offering. However, the recent invitation from the White House did, figuratively, seem to be directed to scientists and engineers in general.—JOHN WALSH

Auto Pollution: EPA Worrying That the Catalyst May Backfire

High-level administrators at the Environmental Protection Agency (EPA) are considering whether they should do away with the catalytic converters that U.S. automakers are planning to install on some 60 percent of their 1975 model cars, which they will start making next summer. The move may be taken to avoid what one official terms a "technological backfire."

This sudden review has been spurred by several tests which show that the catalyst, originally designed to reduce hydrocarbon and carbon monoxide emissions, may at the same time be spewing unacceptable amounts of another dangerous pollutant: sulfuric acid. What officials will determine in the next week or so in a special "white paper" to be sent to the administrator of the EPA is whether, on balance, the benefits of the catalysts outweigh this potential health hazard.

Preliminary testing by EPA scien-

tists, and those at Ford Motor Company and at Esso Research and Engineering, Inc., show that the platinum-lined catalyst is promoting the conversion of sulfur in gasoline into sulfuric acid mist, a process that is often demonstrated in freshmen chemistry courses and commonly utilized in industry. Moreover, the projected roadside concentrations of this sulfuric acid mist range from 3 to 15 times those which top health officials consider safe for asthmatics, elderly people, and possibly children.

EPA's top air pollution enforcement official, Robert L. Sansom, Assistant Administrator for Air and Water Programs, when asked if the catalyst might be withdrawn for 1975 cars, replied that the various studies still need to be correlated, but that "if it shows there's a substantial health hazard, of course we'd consider it." And Stanley M. Greenfield, As-

sistant Administrator for Research and Development, stated, "Both the federal government and the industry have to think seriously about the full implications of catalysts . . . before the decision is made to go ahead." In a recent internal memo he urged a thorough review of the problem and concluded, "If this requires that oxidation catalysts not be utilized in 1975 motor vehicle models, so be it." EPA's new administrator, Russell E. Train, is aware of the problem and is expected to make a statement about it soon.

What is so potentially embarrassing to the EPA about this development is that, since the agency's establishment in 1970, it has spent untold numbers of man-hours and taxpayers' dollars bringing the reluctant auto industry into compliance with the landmark 1970 Clean Air Act. And, for their part, automobile manufacturers have developed the catalytic converter as the means of achieving the 90 percent reduction in hydrocarbon and carbon monoxide emissions which the act requires.

Originally, the 90 percent standard was to take effect beginning with 1975 model cars. Under an EPA decision of last April, nationwide application of this standard will be postponed until the 1976 model year. However, in the

case of cars to be sold in California, interim standards were set which, in effect, mean that converters must be installed. As a result of these decisions, General Motors, which sells roughly half of all cars sold in the United States, plans for most, if not all, of its 1975 model cars to have the catalyst and not merely those cars destined for the California market; Ford and Chrysler plan to install them on all 1975 cars sold in California. The result is that up to 6 of the 10 million new cars built next year could have catalysts. EPA is due to begin certification tests on the 1975 cars in November, and Detroit's mass production begins next July. If the catalyst turns out to be "a bust," as one agency legal expert said recently, "Can you hold them [the manufacturers] to any standard? . . . What's at stake here is a whole regulatory program."

This by now agency-wide concern originated from some tests made by industry and EPA beginning about a year ago, which showed that relatively large amounts of sulfuric acid, which in the atmosphere eventually become sulfate, were coming from the tailpipes of catalyst-equipped cars.

John B. Moran, director of fuel registration for EPA, is the scientist who first drew the problem of the catalyst to the attention of officials. He says that all researchers who have looked at the catalyst-sulfate problem agree that more sulfates are emitted from catalyst-equipped cars than from cars not so equipped. In his opinion, EPA should not permit catalysts to be used unless they are shown to pose no health hazard.

Data from the tests made thus far vary widely, but they are alarming enough to have caused the EPA to launch a special \$1.8-million research program to examine the problem further. This crash research program is expected to reduce those uncertainties which have arisen from the use of various test methods and assumptions.

Esso Research and Engineering Co., running a catalyst-equipped car fueled with gasoline having 0.04 percent sulfur, found that 14 percent of it was converted into sulfuric acid mist by the time of emission. For pedestrians at the roadside, Esso calculated, this could result in concentrations of 35 to 45 micrograms per cubic meter. EPA scientists in Research Triangle Park, North Carolina, using the same test procedure and sulfur weight fuel, found that 30 percent of it converted

to sulfuric acid mist; EPA estimates roadside concentrations during peak periods could be 60 $\mu\text{g}/\text{m}^3$. The highest numbers so far have been obtained by Ford, whose scientists, using this same test procedure and sulfur weight in fuel, found 80 percent of it converted to sulfuric acid and estimated roadside concentrations of from 80 to 150 $\mu\text{g}/\text{m}^3$. Moran estimates that under "worst case" atmospheric and traffic conditions, where emissions would not disperse away from the roadside, concentrations three to four times these levels could result.

In the above tests a type of catalyst but by Engelhard Co. was used. But GM, using a different catalyst, has ob-

tained different results. GM scientists using 0.04 percent sulfur fuel have found only 10 to 15 percent of it converted to sulfuric acid mist, and found average, 8-hour city-street concentrations of 5 $\mu\text{g}/\text{m}^3$. Frederick W. Bowditch, who is in charge of GM's emissions research, points out that so far virtually everyone's assumptions in these various tests are different. GM's lower numbers, he says, are most "obviously" explained by intrinsic differences between the GM catalyst and the Engelhard one. But he added, "None of us has run our cars in the other guy's lab. It could be a difference in test procedures, or in the cars themselves, or something else."

Science Still in Public Favor

Whatever the strength of the antiscience movement, it is not enough to have shaken the general public's faith in science and scientists or to have turned the man in the street into a raving Luddite. Such, at least, is the gravamen of a survey conducted for the National Science Foundation (NSF) by the Opinion Research Corporation of Princeton, N.J., and published in the 1973 report of the NSF board.* Based on interviews in 1972 with some 2200 people representing a cross section of the adult population, the survey depicts generally favorable attitudes toward science and its ability to solve national problems.

Asked the predominant emotion they nurtured toward science and technology, 49 percent of the respondents checked "satisfaction and hope," 23 percent confessed to feelings of "excitement or wonder," and only small minorities expressed "fear or alarm" and "indifference or lack of interest" (6 percent each). In a prestige list of nine professions, scientists were ranked second, a notch less esteemed than physicians, but one above ministers of God. Fifty-four percent of the sample believed that science and technology do more good than harm, only 4 percent subscribing to the converse proposition.

Other favorable attitudes toward science were expressed in the answers to questions such as, Do you feel that science and technology change things too fast? (22 percent), too slowly? (16 percent), or just about right? (51 percent). There is quite considerable optimism that science will eventually solve major problems of society such as pollution, drug abuse, and crime. (Thirty percent believe science will solve most problems, 47 percent that it will solve some, and 16 percent that none will be solved.) The NSF's pollsters conclude that, on the whole, "public attitudes toward science and technology appear to be positive."

But the survey turned up some negative or puzzling features. Queried about the role of science and technology in causing society's problems, 48 percent of the sample held them responsible for some problems, 7 percent for most. Asked which areas of science they would most like to see their tax dollars support, the respondents gave first priority to improving health care and fighting crime and pollution, but the area described as "discovering new basic knowledge about men and nature" appeared near the bottom of the public wish-list. This response raises doubts both as to how well the respondents may have understood the not unobvious questions being posed, and to how high the concept of science for science's sake may stand in the public's affections.—N.W.

* *Science Indicators 1972* (Government Printing Office, Washington, D.C., 1972), price \$3.35. For other aspects of the report see *Science*, 21 September, p. 1150.

What makes these numbers alarming is that recent research has found that continuous 24-hour exposure to sulfate concentrations of 8 to 10 $\mu\text{g}/\text{m}^3$ has adverse effects on asthmatics and the elderly, and people with chronic respiratory problems. "Acute asthmatics are 2 to 5 percent of the population," says John Finklea, one of Greenfield's principal research deputies. "People with chronic respiratory disease are 7 to 18 percent of the population." A recent Community Health and Environmental Surveillance System (CHESS) study found that even under existing conditions with no catalysts in use, concentrations of sulfate in California and in states east of the Mississippi fall in the 7 to 13 $\mu\text{g}/\text{m}^3$ range. Readings made in the Northeast show concentrations more than 13 $\mu\text{g}/\text{m}^3$.

Finklea says that previously scientists had not been terribly worried about the health hazard of suspended sulfates because most of them are thought to come from industrial stacks, originally as sulfur dioxide, which disperses in the upper air. However the emission of sulfuric acid from catalysts

would expose people on the ground directly to high toxic concentrations of sulfate. Finklea concludes that "It's very serious in that the law requires us to protect the public from adverse effects. Medically, it's an important problem." Moran expresses a similar view. "Sulfates are now believed to be the number one air pollution health hazard," he says.

The crash program of testing which EPA has launched will, it is hoped, produce conclusive results by April. In addition, the auto companies, catalyst makers, and government scientists are all swapping test data in an effort to arrive at a consensus about what is going on. Meanwhile, the 1975 model prototype cars are to begin arriving at EPA for certification next month, and the EPA administrator will soon be reviewing the "white paper," now in preparation, that will give the agency's evaluation of the problem.

There are some sharp, if not bitter, divisions within EPA over the catalyst issue. Greenfield takes the view that the agency should not force industry to use a control device that it knows is

harmful. On the regulatory side of the agency, however, Eric Stork, Sansom's deputy for mobile source control, has said that Moran raised the issue to get more research funds. Stork insists that the first he heard that Greenfield's staff, including Moran, was seriously alarmed was through calls he received from the press. But even Stork says, "If there is significantly more sulfuric acid coming from the catalyst-equipped car than from the noncatalyst-equipped car, then you probably wouldn't want to use catalysts." He conceded that, if catalysts are withdrawn, his own program of regulating hydrocarbon and carbon monoxide emissions would suffer "an enormous setback."

Those who favor keeping the catalysts, if possible, point to the investment that the industry and the nation has made in them. General Motors alone, for example, has invested \$891 million since 1970 in pollution control work and, of that amount, \$16.3 million has been spent on catalyst development. To assure a steady supply of platinum, GM is said to have invested substantially in South African plat-

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Former Delaware Governor Named Chairman of CEQ

Russell W. Peterson, an industrial chemist who went on to become governor of Delaware, has been nominated by President Nixon as chairman of the Council on Environmental Quality (CEQ). During his term as governor from early 1969 through 1972, Peterson took a strong and controversial stand against the intrusion of heavy industry into Delaware's coastal zone. His nomination is expected to please environmentalists, who have been concerned that the CEQ might be falling into obscurity and hard times since the recent departure of its first chairman, Russell E. Train, now administrator of the Environmental Protection Agency.

Peterson, 57, is a native of Wisconsin and holds a Ph.D. in chemistry from the University of Wisconsin. He joined E. I. DuPont de Nemours & Co. in 1942 and remained with the company until his successful bid as the Republican candidate for governor in 1968. Peterson held various high level research

jobs with DuPont, his last position having been that of director of the research and development division of DuPont's development department.

In 1971, the Delaware Legislature, at Peterson's urging, passed the Coastal Zone Act. This measure established a permit system to control industrial growth in Delaware's coastal area, with heavy industry and oil terminals to be flatly excluded. An immediate effect of the new legislation was to frustrate plans for a deepwater oil terminal in the Delaware Bay. The long-term effect will be to confine the expansion of heavy industry to the Wilmington area.

Peterson's nomination must be confirmed by the Senate, but this seems likely to be done routinely. Last fall, two of CEQ's three original members, Robert Cahn and Gordon J. F. MacDonald, resigned and were replaced by Beatrice Willard, an ecologist from Colorado, and John A. Busterud, formerly deputy assistant secretary of defense for environmental quality. Although respected, neither Willard nor Busterud is widely known. Hence the feeling among environmentalists that

Train's successor had best be someone of sufficient reputation and prestige to give the CEQ some much needed weight on the Washington stage. Peterson may or may not prove himself a heavyweight in the capital's bureaucratic in-fighting, but he will at least arrive with a well-known name.—L.J.C.

The "Tainted Fruit" of U.S.-Soviet Détente

The American Academy of Arts and Sciences has sent strongly worded protests to the Soviet Academy of Sciences and the Ministry of Culture on behalf of Andrei D. Sakharov and Aleksandr Solzhenitsyn. And Sakharov, who, like Solzhenitsyn, has been subjected to repeated acts of harassment by the Soviet government, has been nominated by the board of the New York Academy of Sciences (NYAS) to receive the highest distinction the academy confers, honorary life membership.

In a recent letter to Ekaterina A. Furtseva of the Ministry of Culture, Harvey Brooks, president of the Ameri-

inum futures, and to be planning to sell catalysts to the other big auto manufacturers. Asked about these rumors, Bowditch replied that GM was willing to sell catalysts to anyone interested.

EPA's alternatives are several. If the agency rigidly observed the strictures of the now-prescribed regulatory program, the following scenario would unfold in the event that the agency concluded that the catalyst will do more harm than good. Detroit would start sending in its prototypes for certification. Because its regulations say that no pollution control device shall emit "noxious or toxic" substances, EPA would then refuse to certify the prototypes. Then, says one EPA official, "Detroit can't build half its cars; the place shuts down; one out of every five workers in the country is out of a job; they march on Washington."

A less horrendous measure would be partial catalyst use. The EPA could certify only those catalysts that emit sulfates below a certain threshold for 1975. Or, without going to Congress, EPA could rewrite the interim 1975

standards in such a way as to not require the use of the catalysts until 1976.

Yet another route would be for the EPA to permit catalysts to be used in 1975, and to let the industry, the Congress, and the public decide whether to change the law for 1976. Since each year's supply of new cars on the road is only 10 percent of the total vehicle population, a case could be made that 1 year's worth of catalyst-equipped cars would not pose serious health hazards.

Another alternative under serious consideration, according to high-level administrators, is for EPA to require the oil companies to reduce the level of sulfur in fuel. This could have a special effect in California, where gasolines usually have 0.08 percent sulfur, or twice the national average of 0.04 percent. However, opinions seem to vary on whether cleaning up the gasoline would be prohibitively expensive or whether it could be economically achieved in a year or two.

The prospect of a catalyst snafu that would weaken the government's credibility and, as one official said, gut "a

whole regulatory program," has generated some bitter feelings in the EPA. The obvious point of contention is why, a year ago, when Ford first brought its disturbing findings to the attention of Stork's staff and Moran in North Carolina, the agency did not perceive that it might have a major problem on its hands. Stork says that he sent the data to Greenfield's staff and never received a reply from them. Greenfield's people say that they tried to alert others in-house, but got little response. Some blame the staffs of congressional committees, who had the data early but did little more than ask a few questions in hearings. Others blame industry for not checking out the catalyst more thoroughly before it committed itself—and the country—to the device. It is to be noted also that a recent National Academy of Sciences report evaluating catalysts virtually ignored the problem of sulphate pollution. EPA officials, in interviews, seem somewhat stunned that the catalyst program could boomerang. "It could be a monstrous blunder," said one. "No matter who's at fault."—DEBORAH SHAPLEY

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can academy, said the ministry had a "grave responsibility" to look to the welfare of Solzhenitsyn, a Russian Nobel prize winner in literature. His letter reads in part:

"We ask you to convey to those responsible for the unwarranted and dishonorable campaign now being directed against Mr. Solzhenitsyn that they imperil the cause of détente and normalization of relations. We support that cause. Many of the members of our organization have been in the forefront in efforts to liquidate the cold war. But our willingness to promote, or participate in, cooperative relations with the Soviet nation is inevitably diminished by actions which deny a man we look upon as our colleague his right to earn his livelihood or to speak his conscience. Until such time as it becomes clear how détente is to be reflected in the lives of Mr. Solzhenitsyn and our other Soviet colleagues, the fruits of détente can only seem to us to be tainted."

Earlier, in a letter to M. V. Keldysh, president of the Soviet Academy of Sciences, Brooks alluded to a letter by Keldysh and 39 other Soviet academi-

cians which appeared in *Pravda* on 29 August. Brooks said: ". . . [We] harbor the hope that the attack on Sakharov signed by 40 academicians was a product of haste and pressure from other circles and not a true reflection of the principles that must guide Soviet science if it is to continue its imaginative and constructive course. We realize that in a legal sense this is an internal affair of the Soviet Union, and we wish to avoid either the appearance or the fact of interfering in your internal affairs. But a growing détente that depends so much on an increasing commitment to cooperation and joint programs of research and technological development requires greater understanding and respect among our scientists and technologists. . . . no amount of official goodwill can compensate for the disillusionment of the scientists and scholars on whom the implementation of these official agreements depends."

"In closing, let me recall that many times in recent years American intellectuals have been vigorous in urging restraint and moderation upon their government in areas where they felt that peace and international coopera-

tion were jeopardized by its policies. I and my colleagues urge you also to use your great influence to protect those conditions which make it possible for the scientists of our two countries to work together for the common goals of mankind."

Besides nominating Sakharov to honorary life membership in the NYAS, the academy board has adopted a resolution expressing "apprehension" about the advisability of continuing the increasing exchange of scientists between the United States and the U.S.S.R. in "the face of what appears to be repression of freedom of speech of scientists in the U.S.S.R. . . ." The resolution, which has been sent to Keldysh, endorsed the "principles and spirit" of the cablegram dispatched to the Soviet Academy on 10 September by the National Academy of Sciences. That cable also warned that harassment of Sakharov could impede U.S.-Soviet scientific exchange.

The NYAS board, in a letter informing Sakharov of his nomination to membership, cited his "high achievements in science and exceptional contributions in theoretical physics."—L.J.C.