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85. We thank the following specialists for reading an earlier draft of the manuscript and for their many helpful suggestions: A. M. Altschul, Georgetown University; L. R. Brown and E. P. Eckholm, Worldwatch Institute; R. F. Chandler, The Asian Research and Development Center, Taiwan, Republic of China; N. S. Scrimshaw, Massachusetts Institute of Technology; Mark Westoby, Macquarie University, Australia; and, at Cornell University, D. L. Call, M. C. Nesheim, M. H. Pimentel, W. K. Kennedy, E. L. LaDue, K. L. Robinson, F. A. Long, W. R. Lynn, E. B. Oyer, E. H. Smith, W. J. Visek, and R. B. Young. Supported in part by Ford Foundation grant 690-0705 and NSF grant BMS7407900.

NEWS AND COMMENT

Methanol at MIT: Industry Influence Charged in Project Cancellation

Cambridge, Massachusetts. Academic institutions in theory provide a testing ground for ideas which is somewhat insulated from the push and pull of the world outside. But, as they take advantage of the energy R & D dollars now so tantalizingly available from government and industry, these institutions may risk compromising or appearing to compromise their academic independence. The cancellation of a research project on methanol (methyl alcohol) as a substitute motor fuel for gasoline at the Massachusetts Institute of Technology's Energy Laboratory offers a case in point. In the opinion of the scientist who initiated and led the project, it was killed because the laboratory yielded to influence from the oil and automobile industries.

Authorities at MIT deny that outside influence had any bearing on the decision, and they say that the project—which was to involve the testing of a blend of methanol and gasoline in 200 faculty and student cars—was terminated because it was technically weak and inappropriate for a university. Yet the attendant circumstances, which include the active involvement of an Exxon employee as well as the fact that the laboratory had received $1 million in grants from Exxon and Ford, put the termination in an ambiguous, and perhaps suspicious, light.

The project in question began some 18 months ago at a time of considerable debate over the feasibility of using methanol in automobiles. Several academic researchers were touting methanol's potential, and among them Thomas B. Reed of MIT's Lincoln Laboratory was perhaps the most vocal. Spokesmen for several oil and automobile companies, notably Exxon, Chevron, and General Motors, were contesting the feasibility of methanol fuels. Reed, a 49-year-old chemist who holds 10 patents and whose specialty is crystal growth and high temperature processes, had in his spare time experimented extensively with his own automobiles and those of his colleagues. He found that adding about 10 percent methanol to a tank of gasoline improved performance, gave better mileage, and reduced pollutant emissions. Results similar to Reed's have since been reported by West Germany's Volkswagen, now generally acknowledged as the leader in methanol research. In this country, however, oil and automobile companies have continued to report that methanol-gasoline blends cause drivability problems.*

Because of the ensuing publicity, Reed received an unsolicited $100,000 grant for methanol research. The money, ironically, came from a Minnesota oilman, John B. Hawley, who had become concerned with

impending petroleum shortages. Reed took the money to MIT's Energy Laboratory—then newly formed and struggling for funds—which eagerly adopted Reed, the money, and the methanol program. A major component of the program was to be a fleet test designed to settle the question of drivability and to explore any problems that might arise from the use of methanol-gasoline blends.

Primed by Reed's enthusiasm, plans for the fleet test and related research began to take shape in the summer of 1974. Albert G. Hill, then vice-president for research at MIT, gave permission for the test, and a major chemical company offered to donate a large quantity of methanol. Reed hired a test director and an industrial consultant, and they began contacting organizations with experience in fleet testing for advice on the practical details. The city of Cambridge gave permission for MIT to refurbish an abandoned gas station near the campus and leases for the property were negotiated and drawn up.

In December 1974, however, energy lab director David C. White informed Reed that the fleet test was under review. In January, most of Reed's remaining funds were transferred out of his account—without his knowledge or consent, according to Reed. And in early February, after a meeting of energy lab administrative heads and others at which Reed presented his test plans and rationale, White canceled the project. Reed, who has since returned to Lincoln Laboratory, says "industrial opposition to the fleet test and to the credibility it would have given methanol fuels played in my opinion a major role in the program's cancellation." He believes "the use of methanol as a motor fuel is no longer a technical question, but a political one with implications for our national energy policy."

White and many of his colleagues in the energy lab who were party to the decision see things differently. There appear to be four principal areas of contention.

First is the question of whether the energy lab's industry money and contacts have made it susceptible to influence. The laboratory's hopes for establishing its own research program have for the past year and a half been nourished primarily by the two unrestricted $500,000 grants from Exxon and Ford (specifically, the Ford Motor Company Foundation), grants that arrived shortly after the Hawley money. In addition, the laboratory's advisory board includes 7 oil and automobile industry people among its 24 members. And the laboratory as a whole makes no secret of its desire for still greater interaction with industry in the energy field. Hill, who was active in landing the Ford and Exxon grants, says that there were no strings attached to the money. He thinks there may have been some discussions concerning the methanol project with those companies, but that, as far as influence being attached to their money, "we are man enough—no, person enough—to stand up to anybody." Reed is not so sure.

Oil and Auto Ties

A second point in contention concerns the institutional loyalties of the key participants in the actions that led to the demise of the methanol fleet test. The precipitating event seems to have been a recommendation by a mechanical engineering professor, John B. Heywood, and by a visiting scientist, John P. Longwell, that the test be canceled. Heywood is head of MIT's Alfred P. Sloan Automotive Laboratory, and much of his research on engines has been supported by the auto industry; Longwell is an Exxon research scientist who was on loan to MIT as a visiting professor to help it set up the energy research program. Their recommendation was contained in a letter to White dated 19 December 1974. The letter said that "the methodology developed to evaluate and quantify vehicle operating problems during the fleet test program is inadequate." Also, it referred to those conducting the project as people of "limited experience in this area" and observed that there were other tests of methanol-gasoline blends already under way. Heywood and Longwell also said that the test would have little national significance and was inappropriate for the energy laboratory. In its stead, they proposed more basic research on the chemistry of methanol-gasoline blends and their behavior in laboratory engines.

Heywood and Longwell took part in the meeting in early February at which the project was canceled. Reed says he specifically raised with White the question of whether their participation constituted conflict of interest. White does not recall the question being raised, and he believes their participation was entirely appropriate in that he regards them as the most knowledgeable experts at MIT on motor vehicle engines and fuels. And, although acknowledging that institutional alliances can affect technical opinions, White does not think that Longwell's Exxon affiliation was relevant to or affected his scientific judgment.

A third matter concerns the $100,000 for the methanol program, which was in an account under Reed's control in his capacity as principal investigator. Late in January 1975, and shortly before the fleet test was canceled, the energy lab transferred $30,000 to another account for laboratory engine tests with methanol blends under Heywood's control. Reed, who says that he never agreed to the transfer and did not learn of it until March, believes it was intended to make it appear that he had spent all his funds, thus adding weight to the arguments for canceling the fleet test. White and Jan Louis, who in January became White's lieutenant in charge of methanol, deny the charge. They say they are sure Reed was told about the transfer, and they insist there was an earlier understanding that Heywood would get the money from Reed's account. Moreover, White points out, he did provide Reed with additional money later on (after the fleet test was canceled), so that the total Reed spent during his stay at the energy lab came to the full $100,000.

Finally there is what Reed now sees as an attempt to restrict public debate concerning methanol's potential. Shortly before the Heywood-Longwell recommendation to White, a lead article by E. E. Wigg of Exxon appeared in *Science* (29 November 1974) challenging the feasibility of methanol-gasoline blends. Since the article was explicitly a critique of an earlier article by Reed (*Science*, 28 December 1973), Reed prepared a rebuttal letter to the editor. White, however, asked Reed not to submit it, saying that it would do no good to stir up controversy. Reed went along with the request although he now wishes he had not. White says he remembers that it was, in his opinion, too ad hominem. In fact, the thrust of the letter appears to be technical. It points out that Wigg's critique was based on tests with only a few automobiles and a fuel blend which Reed believes to have been excessively rich in methanol; where the experimental conditions overlap, Reed says, Wigg's results are reasonably similar to his.

Beyond these specific points of contention, there appears to be a wider difference of opinion between Reed and many of the energy lab scientists regarding the significance of methanol to the national and international energy picture. Reed believes that synthetic fuels are an urgent matter

*Controversy over alcohol fuels is not new despite the extensive German experience with them during and before World War II. According to S. J. W. Pleeth in his book [*Alcohol—A Fuel for Internal Combustion Engines* (Chapman Hall, London, 1949), pp. 221 and 227], "The bias aroused by the use of alcohol as a motor fuel has produced results in different parts of the world that are incompatible with each other. In general we can detect two schools of thought with regard to the use of alcohol as a motor fuel. Countries with considerable oil deposits (such as the United States) or which control the oil deposits of other lands (such as Holland) tend to produce reports antithetical to the use of fuels alternative to petrol; countries with little or no indigenous oil tend to produce favorable reports. . . . The contrast between the two cases presented is most marked: one can scarcely avoid the conclusion that the results arrived at are those best suited to the political or economic aims of the country concerned, or of the industry which sponsored the research."

and that methanol offers an opportunity for the country to begin substituting for imported oil in the near future. Support for Reed's view is most evident in Europe, where methanol as a motor fuel is being widely and enthusiastically investigated. Volkswagen has had a major research program for several years, and in combination with the West German government and other industrial companies (including the German branch of Shell Oil), has been conducting an extensive fleet test since March of this year. In Sweden, Volvo and the government have started a 3-year effort that will include fleet tests of cars as far north as the Arctic Circle. In both countries the use of methanol-gasoline fuels in the near future as a means of lessening the

History of American Technology—A Fresh Bicentennial Look

The study of the philosophy of science and the history of science are accepted, respectable pursuits as scholarly disciplines go; but the study of the history of technology is another story. The Society for the History of Technology (SHOT) held a bicentennial meeting in Washington from 17 to 19 October, and the gathering illustrated how this field is gradually winning acceptance in academic circles.

SHOT was founded in 1958 by Melvin Kranzberg, a historian at the Georgia Institute of Technology, who had been struggling with the problem of devising history courses that would interest his engineering students. Today, after arranging SHOT meetings every year for 16 years, and editing its journal, *Technology and Culture*, for 17 years, Kranzberg remains a zealous enthusiast. He is equally ardent about the history of technology as a discipline and about his society, which—correctly or not—he calls "The SHOT heard round the world."

Kranzberg's aim, shared by other historians of technology, is to elevate the field to a position of academic respectability, to have it taught at as many colleges as possible, and to have other branches of history recognize its importance. There is evidence of success. In 1973 the American Council of Learned Societies admitted SHOT as a member; the organization has also been made an affilitate of the American Historical Society. Finally, Cyril Smith, who is a metallurgist-historian at the Massachusetts Institute of Technology and is one of SHOT's more prominent members, told *Science* that, despite its brief existence, "The field has become more and more professionalized."

Smith was describing the fact that the history of technology seems to be changing, influenced by recent public questioning of technology's benefits. Several SHOT members explained that, in the 1960's, a typical paper in the field tended to revolve around a single invention or inventor. It would describe why the invention was needed, the inventor's origins and education, and the discovery itself. The paper would conclude with a catalog of the benefits that the invention brought to American society. Finally, since a number of prominent American technologists,—among them Henry Ford and Thomas A. Edison—rose from obscure backgrounds to wealth, fame, and a place in the panoply of American folk heroes, these papers would have the ring of Horatio Alger stories.

A number of presentations at the SHOT bicentennial meeting were of this type. "The Invention of the Caterpillar Tractor," for example, centered on its inventor, Benjamin Holt (who became rich and famous), and ended with a discussion of how the tank, which was a natural development of this farming machine, revolutionized land warfare and helped the Allies win World War I.

But now, as Smith said, historians of technology are interested in "how the object relates to other forces in the culture." Indeed, some of those at the meeting focused on technology's negative impacts, or ways in which technology has been oversold in America. John G. Burke, of the University of California at Los Angeles, discussed the simultaneous rise, after 1880, of advertising, of the pulp and paper industry, and the increase in water pollution in the United States. Another report, about technology and government during the Depression, criticized the New Deal's promotion of technology as a cure for the nation's ills—such as its attempts to mechanize agriculture or sell thousands of household appliances in the Tennessee region so that there would be a market for the electricity generated by the Tennessee Valley Authority. This report noted that, even then, there were voices warning about the ills brought on by technology—the most obvious being unemployment.

The historians seemed to be taking a second look not only at technology but at its heroes. For example Edison, who is usually portrayed as the consummate inventor, was the complete capitalist as well. According to Thomas P. Hughes of the University of Pennsylvania, the notebooks that Edison compiled while devising the nation's first urban public power system (for the Pearl Street District in New York) show on every other page calculations of the system's market potential, the price charged for competing gas illumination, the cost of copper wiring, and other entrepreneurial concerns.

Feminists in the field are reexamining some of the heroes, too. Charles Martin Hall, the inventor of the electrolytic process by which aluminum is made, could not have succeeded without the aid of his sister Julia, according to Martha Trescott of Southern Methodist University. In 1886, Charles was working in his woodshed (now a shrine of the aluminum industry). But Julia, who also had training in chemistry and electricity, kept an eye on him from her kitchen, a stone's throw away. According to Trescott, it was Julia's care with their correspondence, which described the discovery in detail, as well as her recollection of the date of the invention (a date which Charles could not remember) that clinched a vital patent challenge in their favor. This made Hall, and not an obscure Frenchman, the founder of the modern aluminum industry.

Kranzberg was obviously pleased with the attendence at the bicentennial celebration of 150 people, compared with the typical attendance of 50 or 60. The society's membership has climbed recently as well, to 2100 members. He thinks that the increased acceptance of the history of technology as a discipline is partly responsible. At the same time, he notes, many colleges are teaching courses in values, technology and society, in technology transfer, and in technology assessment—all of which is sparking student interest.

Besides, he says, "It's a fun subject. There are a lot of new avenues to explore and ways of looking at things. It's not like going over and over the same old kings and the same old battles."—DEBORAH SHAPLEY

almost total dependence on imported oil is being seriously considered. In South America, Brazil is reported to be already introducing ethanol-gasoline blends into general use. In the United States a variety of industrial organizations are considering plans to build coal- or wood-based methanol plants, but the oil and automobile companies appear to be holding back. A bill recently introduced into the California legislature that would have required methanol-gasoline blends to be sold in that state by 1980 was strongly opposed by oil and auto company spokesmen and eventually killed. No existing U.S. research efforts on methanol use are comparable in scale to the MIT fleet test, which might possibly have had considerable national impact, as Reed claims.

The alternative point of view—that methanol should be discounted for the present as an energy option because shortages of oil are not imminent and the United States can live very well on imported oil—does have supporters beyond the major oil companies. White and many of his colleagues at the energy laboratory subscribe to this argument. At issue in the MIT affair, then, is whether the decision to cancel the fleet test went beyond honest differences of opinion.

Reed certainly believes that it did, and although he continues to pursue research on synthetic fuels and to interact with the energy lab on some matters, he is obviously badly shaken by the experience. In recent correspondence with his Minnesota benefactor, Hawley, he received a second check, this time for $50,000, to further his methanol work. The check, however, was made out to MIT, and Reed, rather than risk a repeat of the whole affair, sent it back.

White, while rejecting any suggestion of improprieties, says that a more carefully designed test would probably have attracted the cooperation of Heywood and Longwell and have been approved. But this merely raises the question of why the test was not redesigned, rather than canceled. It would not appear to have been beyond salvaging. One energy lab scientist, who did not want to be named, says "the design may have been a little sloppy, but to say that it wasn't scholarly is ridiculous."

This ambiguous incident is troublesome because it raises the specter of universities adjusting their perspective as to what is important and their research programs to mesh more smoothly with government and industry. Even the suspicion of improper influence tends to weaken confidence in academic independence and hence the potential for university leadership in energy research matters.

—ALLEN L. HAMMOND

Prevention of Heart Disease: Clinical Trials at What Cost?

With the passage of the Heart, Lung, and Blood Act in 1972, several large-scale clinical trials were planned to see whether people can voluntarily decrease their risk of heart disease. Now, 4 years later, screening for participants in the two most extensive and most expensive of these trials is nearly complete, but the trials are turning out to cost far more than anyone anticipated and the National Heart and Lung Institute (NHLI) budget is far less than was projected in 1972.

Since corners cannot be cut on these clinical trials and since no knowledge of heart disease would be gained if the trials were terminated early, some critics are asking if it was a mistake even to begin these studies. In particular, many point out that the irreversible commitment to these clinical trials means that larger and larger portions of the NHLI budget are being drained away from basic research. Others contend that the cost of conducting such large-scale trials is minuscule in comparison with the social and economic costs of heart disease to this nation. Moreover, information gained from such large-scale trials can provide the best means, at present, to prevent heart disease, the major U.S. cause of death.

In 1972, there was promise of a vast increase in government spending for research on cardiovascular disease. At that time, the Lipid Research Clinic (LRC) Primary Prevention Trial and the Multiple Risk Factor Intervention Trial (MRFIT) were conceived and were expected to cost at most $80 million. Unfortunately, inflation and certain other costs were not anticipated, and now these trials are expected to cost at least $200 million. The NHLI budget, on the other hand, has been pared down so that instead of receiving $520 million in fiscal year 1975, as was expected in 1972, the NHLI received only $325 million.

Most investigators agree that there is a need for information on whether the variables affecting incidences of coronary heart disease can be controlled. Whether diet affects risks of heart disease, for example, is a major social and medical issue in this country. Few Americans are unaware of the statistical correlations between high concentrations of serum lipids and cholesterol and coronary heart disease. A national obsession with dietary fats and cholesterol seems to have developed despite the fact that there is as yet no conclusive evidence that people can voluntarily decrease their risks of heart attacks by changing their diets. Nor is there conclusive evidence that modifying other risk factors, such as smoking and high blood pressure, can affect incidences of heart disease. Until more is known about the biochemical etiology of heart disease, the only way to decide whether incidences of heart disease can be reduced is to conduct large-scale clinical trials.

The LRC Primary Prevention Trial and MRFIT concentrate on select high risk populations in order to reduce the number of people who must be studied and the length of time the trial must continue before statistically significant results can be obtained. Because, on the average in any year, only 1 middle-aged man in 100 suffers a heart attack, large numbers of people must be studied for years to see if the variables that influence heart attacks can be controlled. For example, an NIH group concluded, in 1969, that a national dietary study of the population at large would necessarily involve about 50,000 to 100,000 people and might cost as much as $1 billion. According to Robert Levy, director of the NHLI, such a study would take up all the funds allocated to the NHLI.

Although they are more modest than studies of the entire population, the LRC Primary Prevention Trial and MRFIT nonetheless involve formidable managerial problems, not all of which were anticipated when the studies were proposed, and these tend to escalate costs. For example, measurements of serum cholesterol must be carefully standardized. According to Basil Rifkind, director of the LRC, cholesterol