

¹Chapter 13: Academy Obsoleted 1972-1975

THE GOVERNMENT'S POLICY REGARDING side effects of food additives was to protect the public against foreseeable health consequences. The basic assumption of the food regulatory agency created by the government to implement federal policy was that food regulations should be based on a scientific understanding of human health and disease as determined from gold-standard animal research. Handler's policy regarding additives was that the food industry should be protected against foreseeable economic consequences. His basic assumption was that additives were safe until conclusively proven otherwise by basic biochemical research. The agency's objective for implementing its policy was to ensure safety but not zero exposure — except for cancer-causing chemicals — when individuals consumed food containing chemical additives. Handler's objective was to create a market for biochemical research, which was then non-existent because there never was an instance in which an additive was conclusively proven to be either safe or unsafe — the clearest possible indication that his objective was little more than a make-work project for his kindred biochemists.

The regulatory agency, which had not yet developed an in-house capability to produce and analyze research results for purposes of setting safe exposure levels, was often directed by the Congress to contract with the Academy to provide advice. Handler, who regarded himself as both a policy wonk and expert on food biochemistry, influenced agency policy by means of his authority over both the Academy's advice-furnishing committees — the membership of which he controlled — and the procedures by which they produced their advisory reports. In his view, protecting public health was not a goal but rather a factor to be weighed against the economic benefits of new chemicals. He regarded the promotion of an optimal balance of public health and economic benefits as the goal of science policy, and considered the balancing process to be scientific and apolitical. Handler insisted that all Academy deliberations be carried out in secret meetings, with only the summary results presented to the agency, devoid of the working papers that revealed how the results was formed. By means of the Academy committees, whose reports almost invariably mirrored his opinions, Handler encouraged the government to implement his policies regarding health risks of food additives.

In the early 1970s, the Congress moved beyond the area of health risks due to food additives and undertook efforts to protect the public against the health risks of chemical pollution in air and water. An environmental regulatory agency was created and authorized to assess the long-term side effects of technology, and to promulgate appropriate regulations to protect the public against any resulting health risks. The difficulties in assessing the health consequences of technology mediated by environmental factors were far more complex than those associated with food additives. Some individuals experienced risks from air and water pollution involuntarily, some did not receive concomitant benefits, and there were no scientific methods to reliably measure individual exposure levels, rates of change with time, or to estimate the consequences of exposure to different combinations of pollutants in different local environments.

The need to confront the complexities of the health consequences that arose from

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technological development was accentuated when a new law established permissible levels of exposure to individual chemical pollutants from automobile exhaust gases, and a new federal regulatory agency was directed to enforce the mandated levels with an “ample margin of safety to protect public health.

The law specified the safety levels for air quality and automobile emissions standards, but did not specify a mechanism for carrying out the directive. Unlike the Administration, which had access to more than a hundred sources of scientific and technological advice in the federal administrative agencies, the

Congress had no source of advice on matters of science and technology that was not biased in favor of the Administration’s policies. At that time, respect for Handler in the Congress was the inverse of that in the Administration; consequently, the needs and politics of the day forced the shotgun wedding between the Academy and the Congress. Awash in scientific naivete, the Congress assumed that the Academy would be a non-biased source of authoritative advice, and instructed the regulatory agency to seek the Academy’s advice regarding how an ample margin of safety could be identified.

In a series of cases involving different pollutants that occurred during a short time span, the Congress’ high regard for the Academy’s capabilities was reflected not only in laws pertaining to control of air and water pollution, but also in other laws that required executive-branch agencies and departments to similarly contract with the Academy for advice regarding assessment of technology. The agency was directed to determine whether specific standards regarding air pollution from automobile exhausts to be met by the industry were “technologically feasible” and to seek the Academy’s advice when doing so. Another law required the agency to examine the scientific evidence regarding the consequences of the use of defoliating herbicides in Vietnam and to contract with the Academy for advice prior to reaching a conclusion.

A law mandating specific water-quality standards required the agency to consult the Academy regarding predictions of the total national economic, social, and ecological consequences of failure or success in meeting the standards within a ten-year period.

The agency was told to examine all the social, ecological, and economic consequences of drilling for offshore oil along the eastern seaboard of the United States and, in the process, to seek the Academy’s opinions regarding the consequences. In a proposed law, the Academy was to be asked to maintain continuing surveillance of what may happen to the United States as a result of the continuing introduction of computers into various aspects of national life. Almost overnight, at this unique time in history, for a brief period, the Academy was regarded by the Congress as an unbiased and reliable umpire regarding disputes between the executive and congressional branches of government in matters pertinent to technological assessment — not only those related to public health, but to any matter involving a scientific, economic, or social aspect of science or technology.

In 1971, Handler appointed a seven-man automobile emissions committee and signed his first government contract requiring him and the Academy to provide advice and expert judgement to the regulatory agency that had jurisdiction over automobile emissions. The scope of the task was amazing, especially considering it was given to Handler and a handful of men who had no obvious training or experience in the area.

They were provided a multi-million dollar budget to hire expert consultants, but the contract stipulated responsibility for the report rested with Handler and the committee. The main question posed was whether it was technologically feasible for the automobile industry to design and produce automobiles, beginning with the 1975 models, that met specific emission standard set in law, and to ascertain the associated costs. Handler was keenly aware that their advice would directly affect every American automobile manufacturer, and every foreign manufacturer that sold automobiles in the American market. He said that meeting the standards provided in the law “would have a broad impact on the economy of the United States, and our social structure as well, and also the health of the American people.”

In mid-1972, the emissions committee advised the regulatory agency to postpone enforcement of the standards for a year because implementation in 1975 was technologically infeasible. The agency implemented the Academy’s advice, prompting oversight hearings by committees of the Senate and House during which Handler and the head of the emissions committee were asked to explain their recommendation. The congressmen, particularly the senators, evinced dissatisfaction with Handler’s testimony concerning the testing procedures for exhaust gases, the statistical evaluation of the data performed by the various Academy consultants, and the economic assumptions and analysis made by the Academy committee in support of its judgement of technological infeasibility regarding enforcement of the standards in 1975. Handler, in turn, was irritated by some of the questions posed — a marked departure from the “no sir” and “yes sir” attitude he displayed in numerous previous congressional testimonies — which seemingly stemmed from his conviction that the Congress had forced the Academy into a contract wherein the right questions were not asked.

Handler construed “technologically feasible” to mean he need consider only gasoline engines and could exclude diesel engines, which likely would have met the 1975 standards. In response to objections that the law didn’t exclude diesel engines, Handler responded, “In that case, your legislation may have been unwise,” to which a senator replied, “That is for us to decide. You are to decide whether it is technologically feasible. We did not put you as the Supreme Court on this legislation.” In an attempt to support Handler, the chairman of the emissions committee told the senator that, “Your question leads one to believe it is a good possibility to convert the entire production of American industry to diesel cars.” The senator replied, “I am not the National Academy of Sciences, and I am not the motor car company. All I know is that you do not consider the diesel engine in your report, and you state that you drew your information primarily from the motor car companies, and that relates solely to the engine currently in production, and you anoint it as being the engine, and the only engine to be used henceforth.” In another testy exchange, Handler was told, “You are not a group of economists, you are not anything other than a group of scientists mandated to find out if something was technically feasible, but you took it on yourselves to get into all sorts of other things, including sticker value, cost, economics, and then you decide to use an averaging test instead of the individual car test”

Handler then went off on a toot regarding his interpretation of “technological feasibility” and what he regarded as a failure of the Congress to adopt the correct approach to the problem of air pollution. He made what he called a “small comment” about the consequences of the 1975 regulations as compared with unregulated automobiles — that the

regulations would increase fuel consumption “something of the order of a third.” He said oil would eventually be in short supply “not for us but for our grandchildren” and “eventually cause them serious problems.” “It is almost a sin to burn petroleum, he added, “It ought to be saved for the petrochemical industry. We ought to find some other way to derive energy.”

Handler told the senators they did not seem to understand the big picture. He said: “The problem which led to the clean air law had to do with the quality of the environment in the United States. It did not have to do with how to regulate automobiles. In time, we will have to grope with fouling the air a wise way.” He speculated that having automobiles inside cities might be impossible. “The notion is not tenable,” he said, “that each of us, in his own right, is entitled to eighteen feet of steel on the streets and the vast amount of fuel we burn when in cities.” Handler told the senators that while waiting in a city for the next green light, “a driver is getting zero miles per gallon while he is putting out all of that pollutant.” He said, “A new system for transportation in cities is needed if we are serious about avoiding the consequences to health of automobile pollutants.”

Handler said that the real problem with automobiles was that they killed people in accidents, not the “supposed health impact” of exhaust fumes. He said air pollution might be affecting the health of the American people, but that “the quantitative data are not very compelling.” On the other hand, he said, “the 56,000 deaths and 200,000 people maimed on the highways annually are, in my view, numbers of greater reliability.” He called that “real damage we can count” and said he “suspected it exceeded damage to health by automobile pollutants as a cause of death,” but he couldn’t be sure because “The statistical evidence linking air pollution to health damage is really rather flimsy.” Even so, Handler said he thought “ridding the nation of the discomfort of air pollution in measured steps was probably a good idea.” He said, “I do not like the tears in my eyes from the muck in the air, so I say let’s get rid of it.”

Handler then said there was another drawback to the use of automobiles and that it would be worsened as a consequence of the emission standards imposed by the Congress. He said that if the nation continued to rely on the use of the gasoline engine, “before we finally get rid of automobiles,” the decrease in drivability he called “hesitation” that will result from the measures taken to reduce their pollution “is no trivial matter” and must be confronted. He explained, “The fact that a car will not accelerate, when you tramp down on the accelerator suddenly and tends to stall is a very dangerous fact indeed,” and he recounted his personal experiences with the phenomenon of hesitation. “Where my wife and I live in the summer, to get to from the little road on which we live up on to the highway, I have to come up into the highway on an incline, where the highway is making a big U. I have limited visibility in both directions, and in order to do that, I have to wait for that moment when I see nothing and jump. Twice last summer my car got halfway into that highway and stalled, and I just barely escaped being smashed by the cars coming around the bend.” He said hesitation in the cars that meet the 1975 emission standards “will be quite worse. “

Handler told the senators that offering advice about air pollution caused by automobiles would be the first and last contract the Academy would accept where it was not asked to deal with the entire problem. He said that confronting the problem of air quality piecemeal was a mistake. Handler resented that he was not allowed to evaluate the effect on air pollution of mandating smaller engines, which he pointed out would conserve steel, make it easier to find parking spaces, and reduce petroleum consumption, thereby reducing the level of pollution

consumption more effectively than using the “primitive approach” of modifying the design of the gasoline engine and attaching catalytic converters to the tailpipe. He said he hadn’t thought about these matters before he signed the contract to provide advice to the agency.

Handler offered an example of the kind of broad charge he wanted. He said he was negotiating the possibility of providing advice regarding a bill to provide for clean water. If he accepted the contract, the Academy would be asked “to address the total economic, social, and ecological consequences of achieving or failing to achieve specific standards.” When asked by a senator whether that was outside the scope of technical competence, Handler replied that “only Acts of God are outside of our competence.”

Handler said he and the Academy had had been asked to assess the feasibility of a technology intended to reduce urban air pollution, but told the senators, in his view, technology wasn’t the answer to the problem. Instead, he proposed radical solutions— smaller cars, improved engineering to avoid hesitation and new mode of transportation in cities. And he lined up with industry to the extent that he believed clean air was not either technologically feasible or cost effective.

In a speech to an assembly of biochemists, Handler lucidly revealed that his attitude toward the control of air pollution was an example of his ideology concerning regulation of chemical pollution. He said, “The effect of automobile emissions on human health is not understood biochemically, yet, despite the lack of such understanding, the nation has chosen to spend a large sum of money to control the emissions.” “This immediate solution,” he said, “not only will significantly raise the purchase price of automobiles,” it will also be a threat “to accelerate the depletion of petroleum reserves” because “engines equipped with catalytic devices to remove pollutants from their exhaust gases will utilize about one-third more gasoline than do unregulated engines, thus engendering a huge addition annual bill.” He similarly lamented spending money to combat water pollution based on the absence of what he regarded as scientific knowledge. He said: “One cannot yet make an adequate mathematical model of pollutants in a river or lake that describes their effect on the ability to sustain life. Nevertheless, the new water pollution legislation will prescribe zero effluents in ten years and the bill will exceed \$20 billion.” He continued, “The situation is the same with food additives, drugs, pesticides, and the like.”

Handler said, “The automobile is now recognized to be a serious environmental malefactor. We are concerned with the widespread biological damage arising from what comes out of the automobile’s tailpipe.” But he regretted that “there seem to be no credible quantitative estimates of that damage.” Handler told the audience emissions standards established by the Congress “seem to be entirely arbitrary,” and he explained to the audience why that was so. He said science was the only human activity that produced objective knowledge and offered the possibility of providing fact-based answers regarding “the damage caused by chemicals emanating from tailpipes.” However, he asserted, the knowledge needed to answer questions about the health and environmental impact of chemicals doesn’t exist because politicians declined to fund the requisite basic research. It was too late to remedy this error, he claimed, because the law required specific automobile emission standards be implemented by industry within a few years. The only possible way that could be done, Handler said, was for “the scientific community to generate and encourage practical problem-solving

organized research.” He deplored the reality that the Administration was irreversibly opposed to funding the requisite basic biochemical research, but he praised a new form of research being developed with the support of industry that was based on mathematical manipulation of actuarial data. Handler said the calculations could be carried out at two levels in parallel — cost and safety. At the cost level, actuarial data should be analyzed for “the purpose of comparing the cost of producing clean air with the economic benefits of doing so.” At the safety level, the data should be parsed by comparing “the health risks of not producing clean air with the resulting economic benefits.” Handler called the actuarial analyses “mathematical research” and “persuasive statistical analysis,” and explained that “In this kind of research, usefulness is the chief criterion of excellence” even though it does not produce fundamental understanding and the knowledge it yields is imperfect and incomplete.”

Handler said the new form of research he identified had not resulted in any published “persuasive statistical analysis of costs or risks,” but expressed confidence that it was possible to do so. He added that, presently, “The literature reveals only qualitative statements of the risks and no analysis of the benefits” and, consequently, “regulatory decisions are made on the basis of values, not science.” Handler bewailed what he saw as the fundamental problem, that “The United States has not developed science-based policies for decision-making concerning health risks of environmental chemicals.” Instead, he said, decisions were based on public values as perceived by publicly elected representatives, which he derided as “based on politics in the absence of scientific understanding.” Handler concluded, “thoughtful, enlightened risk-versus-benefit analysis” would “avoid the necessity for political expediency.”

Handler was antagonistic toward the principle of governmental action to protect public health from air or water pollution with an appropriate margin for safety. He said “one can reasonably speculate” that the absence of environmental controls was responsible for “the growth of industry, the eradication of slavery and indentured servitude, less crowded housing with central heat and plumbing, rapid transportation and communication, increased literacy and universal education, greater social mobility, penicillin, polio vaccine, safe childbirth, longer life, balanced diets, leisure, the forty-hour week, the minimum wage, child labor laws, and the liberation of women.” He expressed the view that regulation of exposure to environmental pollutants could be scientifically justified only by conclusive biochemical evidence showing that humans had died because of exposure to ambient levels which, quixotically, he conceded was impossible. Equally quixotic, he said, “in theory, the only practical alternative was mathematical research which was also impossible because identifying significant numbers of people who are in fact dying from the side-effects of exhaust gases from automobiles is difficult”

Handler expressed a firm belief in the crudely simplistic notion that toxicity was the sole process by which humans died from exposure to chemicals, and he denied the existence of biomedical process wherein chemicals caused injuries after long-term exposure at relatively low levels — his off-repeated old saw, “dose makes toxicity.” Handler was intolerant toward the idea that adverse biomedical effects could be caused by prolonged exposure to low levels of environmental chemicals. He derided public concern about long-term consequences as nothing more than a fleeting contemporary worry. “Today,” Handler said, “there is concern about the lead in paint on ghetto walls or in gasoline, and mutagens,” and there is a “clamor to clean the waters and to free the cities from smog,” but, he said, “tomorrow, attention will shift to something else.”

Early in 1973, Handler sent the work papers of the three dozen experts he hired to assist the emissions committee, and its report, to the regulatory agency and the Congress. He also provided a personal report describing his opinion of the committee's report — which was almost two years in the making — intermixed with his ideas about policies and issues that were collateral to the contractual task. Handler said the emissions committee concluded that meeting the 1975 standards might be technologically feasible but meeting the 1976 standards was unlikely because the companies were concentrating on the most expensive and least satisfactory means for doing so. Handler reported that the emissions committee said four types of engines could meet both standards but that the companies had made exceedingly costly engineering choices for engine design and reduction of pollution. He said the committee judged the major uncertainty to be the durability of the catalytic converters intended to detoxify automobile exhaust gases and, consequently, recommended creation of a national network of inspection and maintenance stations to ensure the converters work properly. Handler offered his opinion regarding several economic issues. He said the annual cost to customer for adding and maintaining a catalytic converter was several hundred dollars, and that he thought the determination "suggested the need for attention to a series of considerations." One of which was the effect of the cost on the gross national product, and another was whether the funds used for the converters might come from important areas such as "improvement in the health care delivery system. "If so," he said, "it was probably not the wisest use of such funds for protection of the public health." Handler called the Congress' attention to the emission committee's judgement that use of the converters would result in increased fuel consumption which, he said, might contribute to "the depletion of the nations' fuel reserve." He said he wondered whether the catalysts in the converters should be reserved for other more important uses, because were very rare metals and essential for other technologies. Handler warned that if catalyst-free emissions control systems from foreign manufacturers were used, the nation's balance of payments might be adversely affected.

In his personal report, Handler informed the Congress and the agency of what he called a "major quandary" — a foreign-made automobile that met the exhaust standards without the need for catalytic converters. He said the automobile "offers the promise of lower initial purchase costs, greater durability in service and significantly greater fuel economy" as compared with the catalyst-dependent systems now being emphasized by American manufacturers. In addition, he said the mass production of what the committee deemed to be fragile, catalyst-dependent systems of unproved reliability "may engender an episode of considerable national turmoil." Handler said he was also concerned that once the "ponderous" American manufacturers committed to use of catalyst-dependent emission control systems, they would continue to do so for years, trying to solve problems that have already been solved. The "dilemma," Handler said, was how best to meet the emission standards while avoiding dictation by government of the technology to be used or resorting to dependence on foreign manufacturers

Handler raised issues regarding the validity of the government's emission-control policies, the problem of air pollution, and the need for basic research, even though the issues were far outside the terms in the contract he had signed with the agency to provide advice concerning technological feasibility. He asserted that, despite the undesirability of air pollution,

"emission control does not appear to be essential on the basis of either aesthetic or health considerations in large areas of the nation." Handler claimed that air pollution caused by automobiles was negligible, and that production of automobile exhaust gases from natural sources "far exceeds that from man-made sources." He recommended enforcing the emissions standards only in urban areas and implementing them in rural areas when "inexpensive emissions control systems which exact no fuel penalty are available."

Handler offered his ideas for new policies to address the problem of air pollution caused by automobile emissions, which he said was only one aspect of "the problem of the automobile in society." He said the automobile had "enriched the personal experience" and "broadened our horizons" and helped turn "American geography into one nation," but that it "has begun to be defeated by its very success." The automobile, Handler said, had accelerated depletion of "critical natural resources including petroleum" and political implications "scarred the land and choked the city," resulting in "deterioration of the quality of urban life." He opined that the only "truly effective mechanisms for emission control" must include "a significant reduction in the number of cars allowed to operate in cities," a "public mass-transit systems," and "a reduction weight, volume, and horsepower of automobiles allowed in cities," as well as a "redistribution of the pattern of physical relationships among dwelling and working areas." "Patently, these are relatively long-term goals, achievement of which will require extensive, meticulous study and planning with subsequent large public expenditures and careful public intervention into the behavior of the private sector," he said. Handler concluded his report by emphasizing that the nature and magnitude of the risks to health posed by pollutants in automotive emissions was controversial, and the relationship of the level of pollutants to health effects was unknown. Consequently, he said, it was imperative that the Congress initiate a comprehensive study, and that "This Academy would be pleased to be of assistance in such an effort."

In May 1973, Handler testified in a hearing held by the Senate committee that wrote the Clean Air Act, and defended his report and that of the Academy emissions committee. He was courteously greeted by, the chairman of the committee, Edmund Muskie who thanked Handler for allowing the Academy to take on the public responsibility of providing advice regarding the technological feasibility of the emission standards in the Act. Muskie emphasized the importance of the independent advice provided by the Academy and said the subject of hearing involved "highly complicated technical and technological questions" that senators and congressmen were not equipped personally to evaluate. "It was our feeling," he continued, "that we ought to have recourse to independent judgments." "Independent," he told Handler, meant "independent of the industry" and "other built-in prejudices that might conceivably influence other sources of scientific opinion." He said the reason the Congress mandated asking the Academy for advice was that "Independence of view is very Important to us."

Handler told the committee that the Academy's almost two-year effort regarding air pollution from automobiles "has been a most useful learning experience to us at the Academy." He detailed the steps he took to ensure the Senate committee appreciated the "strength and value" of the Academy's advice, so that "our findings and conclusions may yet more firmly warrant the full confidence of the Congress and the agency." Handler said he implemented a "rather searching" and "elaborate procedure" to guarantee that his unpaid emissions-

committee appointees and the experts he hired to assist them were “independent and unbiased,” or at least “had a reduced potential conflicts-of-interest.” When there were questions involving conflicts, he said, he appointed a committee to resolve them, and if it couldn’t, “I became the final referee.”

Handler told the senators that the emissions committee was concerned about the durability of catalyst-dependent control systems after they went into actual use by the public. He said the most significant advice in its report was that the nation should not commit to catalytic converters as a pollution control system because alternative technologies appear imminent and are better. Handler opined that the industry’s commitment to the use of converters made it unlikely they would ever pursue a better technology, even though the converters are expensive and will increase gas consumption. He suggested allocating federal funds to universities to support research and development on alternative technologies. When asked what action the government might take that would have the effect of inducing the industry to pursue alternatives, Handler said he had no answer “that truly satisfies me.” Instead, he offered what he called a long-term answer to the problem of air pollution that would be based on a study that asks the right questions, which not he said the Congress has not be done. Handler said if the Congress and the regulatory agency “wish to initiate appropriate studies of these and related matters, the Academy will help.”

Handler explained to the committee what he considered to be its fatal mistake when it drafted the Clean Air Act. He said the Act did not “ask the right questions” because it failed to consider “emerging problems” that “should be given further consideration.” He told the senators that controversies concerning the nature and magnitude of health risks posed by automotive pollutants were inextricably connected to risks from other sources of air pollution. Further complications resulting from the law requiring public health be protected from air pollution, he said, could arise from the law’s social and economic consequences. Handler predicted new problems will occur as consequences of these collateral impacts. He said that after he and his staff began “thinking about many social, economic, institutional, and technical issues,” he realized there were many areas related to air pollution that had not been considered and should be explored.

Among the areas Handler intuited were important for consideration was the development accurate methods for measuring presently unconsidered air pollutants including sulphur oxides, carcinogens, trace metals, asbestos, and allergens. He said basic research on air pollution was needed regarding how it was transported in the atmosphere and converted into smog, and applied research was needed on how internal combustion engines could be modified to control nitrous oxides, soot, sulphur oxides, and particulates. Equally critical, Handler asserted, was the need for health-related research into the biochemistry and epidemiology of pollutants and mixtures of pollutants, and their effects on animals, plants, and materials. He said such funding was essentially non-existent and should begin immediately. Educational programs should be created, Handler said, to train workers in the various categories of research regarding monitoring, regulation, health effects, technological design, and mathematical methods of cost-benefit assessments of the economic, social, and environmental consequences of each air pollutant. He said the government should foster improvement and innovation in automotive technology, and encourage reassessment of present automobile design criteria such as horsepower, acceleration, and size. Additionally, Handler said, the problem of bringing

about technology for controlling automobile emissions that was better than catalytic converters should be confronted using various strategies include tax incentives and penalties, car-pooling, staggered work hours, mass transit, gas rationing, and restrictions on advertising.

Handler told the Senate committee that the influence of the tax structure on air pollution should be examined, because factors such as the depletion allowance, amortization rates, and development of new technology can all affect transportation, which produces air pollution. Future problems should be anticipated, Handler asserted, including those brought about by new engine designs, fuels, gasoline additives, and by emissions from polymer additives in car interiors; procedures to avoid the problems should be developed. He said systematic research should be conducted into all societal activities that can affect air pollution such as transportation, production of materials and food, manufacturing, and construction projects by federal, state, and local government, industry, and private individuals

In response to committee questions, Handler expanded his purview of the issue of air pollution, and told the senators that coping with the problem of controlling air pollution and achieving the goal of a cleaner atmosphere required trade-offs between economic values and health values rather than reliance on scientific research. He said the best approach was economic, not than scientific — a sea-change in attitude from his earlier opinion that the solution was biochemical research. Handler reconceptualized the health consequences of air pollution as an economic rather than scientific problem, and described a general method that should be used to be resolve the problem. “It should be clear,” Handler said, that each aspect of the general problem of air pollution will result in an “exercise in cost-benefit analysis and risk-benefit analysis,” and that basing solutions on statistical analysis was a “wise pursuit.” Handler asserted that all factors relevant to decisions regarding air pollution, including risks and benefits, should be quantified in dollars. “Only when the risks are measurable in the same terms as the benefits can risk-benefit analysis be a rational, self-sufficient endeavor,” he said. The limiting factor, Handler testified, was insufficient data to estimate costs and risks in dollars, and effects on the economy or employment of enforcing the present standards of air pollution;” he said only research could provide reliable answers.

Handler urged adoption of a policy for controlling health effects of air pollutants that was based on dollars, thereby ensuring emission standards were not set too high in relation to the level of health protection they provide. If that policy is not adopted, Handler testified, the regulatory agency “has no choice, because of the law,” but to set strong emission standards to protect public health regardless of cost, which he said was unreasonable because there was no conclusive scientific evidence to warrant strong standards. One of the senators expressed concern that Handler was advocating a policy of mandating weak safety standards when the scientific information was uncertain. Handler replied he thought such a policy was necessary and desirable with regard to all federal programs, “whether it be our tax policy or our attitude toward how clean the air should or shouldn’t be.” He said that regulatory standards should be weak absent conclusive scientific evidence to support adoption of strong standards. The senator said, “If we are going to err, I would rather see us err on the side of the standard that may be a little too stringent.” Replying like Janus, one Handler said, “I thought that is what I said,” but the other Handler said, “When we are uncertain, then we must err on the side of conservatism in the public interest.”

During a hearing before a House committee regarding emission standards for automobiles, doubt was cast on the probity of Handler and Academy in the management of the emissions committee and its subordinate consultant committees. A law professor testifying in favor of the emissions standards in the Clean Air Act expressed concern that the issue was not treated fairly by Handler and the Academy's automobile emission committee. He said he raised the issue because Handler had refused to provide public access to the working papers of the emission committee, and did so without justifying his decision except to say he thought disclosure would be inappropriate. Consequently, the law professor testified, the public could not judge whether the deliberations were unbiased. "Thus arises the possibility that a good portion of the health basis of the Clean Air Act will be worked over in secret under the Academy's flabby conflict-of-interest rules that have inspired considerable grief in the past," he said. The law professor urged the House committee to insist that the Academy's ongoing study of air pollution health standards, like any other worthy scientific enterprise, proceed fully in the public view and without hint of bias.

He asserted that Handler's rules dealing with bias were weak because the required disclosures of possible conflict-of-interest were made only to committee members, without any public disclosure, a process he said was inconsistent with the totally open scientific inquiry that was expected from the Academy. The difficulty with Handler's arrangement, the law professor testified, was that scientific judgments were being made on the basis of secret documents and, consequently, the occurrence of undue bias toward one point of view was obscured. He cited two recent examples of past undue bias by Academy committees; in an Academy study on fluorides, the Academy's committee contained industry employees, and, in a story reported in detail in the science press, an Academy committee on herbicides was alleged to be biased.

The professor listed his reasons for believing the aura of secrecy surrounding Handler's automobile emission committee and their sub-committees indicated their advice may have been tainted, resulting in compromised conclusions and diminished confidence in their reliability. He said the Academy did not disclose evidence that all points of view in the scientific community were represented on the committees, and there was a similar lack of evidence that possible conflicts-of-interest did not compromise the reliability of their advice. Thirdly, the information and data upon which decisions were made were undisclosed, thereby preventing independent judgments of their validity. Thus, the basic proposition in scientific research — that full disclosure is necessary — was not followed. When asked by a House committee member, "Have we, in this country, reached a point where we can't trust anybody to do research for us," the professor said he doubted the problem was that serious, but he emphasized that the best test of the reliability of scientific advice was public exposure of the bases upon which conclusions were reached. "If the advice doesn't stand the test, it is not good science," he said, and the gist of his testimony was that the Academy was not meeting the test.

In a rebuttal letter to the House committee, Handler accused the law professor of making a "gratuitous slur upon the ability of the Academy to conduct objective, unbiased studies." He said concern for the Academy's willingness to hear both sides of the question was unfounded, and that "when we can, we do avoid inviting individuals already known to us to be in some way conflicted." Handler conceded that the Academy's conflict-of-interest procedures rested heavily on the willingness of his appointees to describe their conflicts with complete candor, but claimed, "I am not aware of a single instance in which a committee's judgment has

been shown to have been flawed by virtue of such conflict.” He continued, “What I am stating is that I have seen no evidence that those appointments ever influenced unduly the reports which emerged from those committees. “Left unconsidered in his oily statement were the questions whether he looked for evidence and what he meant by “unduly.”

During his testimony before the Senate committee, Handler lamented the limitation of the Academy’s contractual responsibility to evaluation of the technological feasibility of the emission standards. He said all of the consequences and ramifications automobile exhaust gases had on human health should be investigated, and the automobile industry’s claim that there was no scientifically established evidence proving the emissions had adverse consequences on human health should be evaluated. He told the Senate committee that the Academy was willing to explore the many scientific and non-scientific factors that play a role in determining the effects air pollution can have on human health. Shortly thereafter, the scientifically naive Senate committee agreed to a large contract with the Academy for Handler to design and manage the type of study he recommended, and the committee gave Handler carte blanche to choose the study objectives. Heady with confidence regarding what he thought he could accomplish, Handler promised the Senate committee that, within a year, the Academy would provide the answers the committee needed to make the political judgement whether the emission standards struck a reasonable balance between their public health benefits and the costs entailed by their implementation.

Handler sent the Senate committee a list of nine specific study objectives, expressed as questions, that he intended to address in the study: Was there adequate scientific evidence to support the health-related air quality standards in the clean air law?; To what extent do the margins of safety built into the standards represent a reasonable measure of protection against scientific unknowns?; Are the standards based on the health of normal healthy adults or on the health of susceptible groups within the population, and which is a more reasonable basis?; Are the standards based on the assumption that each pollutant has a threshold below which it is harmless and, if so, what is a reasonable margin of safety for determining threshold levels?; What improvement in ambient air quality will result from meeting the present emission standards?; Assuming the standards are met, what groups within the population, as characterized by socioeconomic level, unusual sensitivity to pollutants, age, illness, and geographical location, will still be subjected to health hazards?; What information is available about synergism or antagonism in the automotive-related air pollutants?; What proportion of the total health hazard to the city dweller comes from air pollution, and what fraction thereof is due to automobile emissions?; What are the limitations to predictive judgments on alternative pollution control strategies that are dictated by the probabilistic nature of science, the complexity of environmental health relationships, and the variability among persons?

Handler invited a group of scientists and Edmund Muskie, the senator mostly responsible for the Clean Air Act, to a meeting at the Academy for a discussion the biomedical effects of automobile emissions. Handler told the audience that the Congress “took it upon itself to specify precisely how much of a given pollutant should come out of a tailpipe,” and that, “At the time I was not at all certain that the Congress was doing the right thing.” But he said, in retrospect, he was wrong because doing so led to progress. He warned that the

regulations would not survive politically unless they were based on “firm scientific information” rather than “emotion.” Handler said he began to “examine what was known about the human health effects of air pollution” and assess whether the standards were appropriate, and told the scientists that the emission limits specified in the law might not be justifiable on the basis of protection of public health. He asked the scientists to determine whether the available data suggests that automobile emissions have health effects while keeping in mind that removal of automobile emissions from the atmosphere is not cheap. He warned the scientists to be precise about their judgements concerning the appropriateness of the mandated standards, and their judgement of the “rational” amount of public health protection should be.

Senator Muskie, in his speech at the meeting told the scientists, “You are here at the request of the United States Senate Committee on Public Works; the Clean Air Act was a product of that Committee.” He said the committee was concerned that the adequacy of the data upon which its policy was built had been questioned by the automobile industry and the Academy, and that resolving the issue was crucially important. The emission standards in the law will be enforced, he promised, assuming they are not too high or too low, because the health of people must be protected from the dangers of air pollution. He said scientists had the responsibility to show how conclusions from experiments, as opposed to their value judgements, could be used by the Congress to make public policy decisions. “Public policy makers need this guidance in order to ensure that adequate protection is provided for everyone without creating costs and dislocations that are not justified by the needs of public health,” he said. To obtain the needed guidance, the senator added, the Committee asked the Academy to gather the best minds that it could find and challenge them to evaluate the adequacy of the safety margin provided by the standards, to identify which population groups would be protected, to show areas where research was most needed, and to provide its best judgement to the Congress in ten months

Senator Muskie was unaware that a bifurcation of scientists based on employment had occurred, resulting in the creation of industry scientists in addition to the historical university scientists. He was oblivious to the implications of who actually paid for the production of the scientific data the Academy was hired to parse, and even more serious, he was heedless of Handler’s routine practice of selecting biased members for the committees he appointed. Muskie mistakenly assumed all scientists recognized a responsibility to the public, and that were free to choose their research objectives and interpret data without undue influence or constraint by their employers. His most significant shortcoming, however, was naive acceptance of Handler’s false claim that scientific answers could be found to the questions he posed.

In reality, Handler was inherently untrustworthy in the roles of posing questions as study objectives and appointing unbiased scientists to provide answers — Handler may have believed they could be found, but he was an inveterate ideologue also believed in the ultimate possibility of creating life by pouring chemicals into a beaker.

Handler published a detailed record of the Academy meeting, but it had no practical or inferential significance because it was written in dense, circular, technical language, that started in the middle of the problem and wandered aimlessly. The record contained no conclusions, but its tone was a harbinger of the path Handler charted for the Academy committees he

appointed. He emphasized increased federal spending for biochemical research and maintenance of the status quo regarding emission standards until the results of research are available to guide decision-making. He sought reliance on cost-benefit analysis to resolve questions that must be answered in the absence of what he imagined was forthcoming reliable, dispositive scientific data created by the biochemical research.

Handler created a group of Academy committees ostensibly to achieve the nine study objectives he promised the Senate committee he would achieve, and to provide the guidance he described when he testified before the committee and Muskie echoed at the meeting. The contract with the senate committee Handler signed on behalf of the Academy had two goals: to ascertain whether the emission standards were justified on the basis of public health; to evaluate industry charges that the standards were too stringent. In September 1974, Handler released a four-volume report of the Academy committees. After surveying the literature regarding health effects of air pollution, the committees, speaking unanimously with one voice, concluded that much further research was needed to provide a firm scientific basis for automobile emission standards. But even though the available scientific evidence was weak, fragmented, and far from conclusive, the committees said, it was sufficient to support the intuitive view that air pollution adversely affected human health, and thus that there was "no substantial basis" to weaken the emission standards. Notwithstanding what was considered an absence of essential research, the Academy committees said it seemed clear the evidence showing automobile emissions caused human disease was sufficient to justify the present emission standards, and that there was no scientific basis for changing them. The seeming clarity perceived by the committees was derived from subjective economic analysis of the cost-benefit relationship wherein the health benefits of the emission standards, expressed in dollars, were said to be greater than the predicted cost of implementing the standards, indicating they were "cost-effective." The committees guesstimated air pollution would cause 4,000 deaths, even though levels ten times higher or lower were equally likely, based on other, equally valid choices of economic models. The irrelevant fact that automobile accidents annually killed ten times more people than did air pollution was emphasized in the report, as if to derogate the impact of air pollution on health.

The report was larded with fact-less statements and wishy-washy subjective claims that frustrated many legislators and sent positive and negative signals to industry and environmentalists, both of which saw much they liked and much they abhorred. There was "no substantial basis" to change the standards because they were "cost-effective." The safety factors provided by the standards were "judged to be much smaller" than those typical in regulating other environmental pollutants, that were unnamed because they didn't exist. The standard for soot were said to possibly be "too lax" and those for nitrogen oxides possibly "too stringent." The Academy report could be, and was, interpreted to support either side of any pet issue.

When Handler presented the four-volume Academy report during a senate hearing, Edmund Muskie, the committee chairman, thanked him for the effort but expressed consternation with what he perceived as a kind of scientific aporia. Muskie said, "What we want is some one-armed scientists who give definite conclusions; not ones who say, "on the one hand . . . but on the other hand." At the request of the Senate

committee, Handler collated all the recommendations for research in the various volumes of the report and identified five scientific areas — biochemistry, epidemiology, engineering, mathematics, and gold-standard studies.

Additionally, he identified the need for research in two economic areas — techniques for assigning dollar values to identified health benefits attributable to clean air, and methods for identifying costs for achieving cleaner air.

During his testimony, Handler said that until the necessary research and analyses were performed, “any discussions or recommendations concerning the adequacy of air quality or emission standards will, of necessity, be couched in language which emphasizes the deficiencies in the available data.” He predicted that, in the absence of further research, policy-making would continue to be hindered by industry and regulator self-interest, and determinations of the costs and benefits of emission controls would remain educated guesses. He added, “It should be understood that cost-benefit analysis is a young and difficult art, and that quantitative assignment of benefits in monetary terms will ever be arbitrary for those values that we cherish most: love, truth, beauty, joy, freedom, honor, health and life.”

The ponderous Academy report generated little attention in the lay or science press; when reviewed, the report was mostly interpreted as supporting the regulatory agency in its attempts to establish vehicle emissions standards that reduced key pollutants in vehicle exhaust gases. The motor-vehicle industry offered no official reaction when the report was first released, although unofficially it expressed disappointment because it expected the Academy to recommend relaxation of the emission standards. In the spring of 1975, however, the Association that represented the American manufacturers of motor vehicles filed with the Senate committee a detailed censorious analyses of the Academy’s four-volume report. The Association’s analysis —its aggressive tone, adversarial style, and judgement the Academy’s conclusion supporting the existing emission standards was wrong — was unprecedented in the Academy’s history.

Based on its analysis of the Academy report and Handler’s supporting testimony, the Association leveled two serious charges against him and the Academy committees —that they were unscientific and ignorant of economic realities. According to the Association, the questions considered by the Academy committees were inadequate to insure a broad review of the problem of determining emission standards, and further, the questions did not reflect an awareness of contemporary developments such as the energy crisis and the variability in the economy. The Association said there were numerous inconsistencies in the body of the report, its summary statements, and in Handler’s supporting congressional testimony. “Time after time,” the Association asserted, “the report says, in effect, ‘On one hand, there is insufficient data to justify the published standards or relationships or effects, but on the other hand, there is insufficient data to justify the recommendation of different levels for these standards, relationships, or effects.’” The Association accused the Academy of misleading the reader by obscuring the fact there was no scientific evidence to support the emission standards. It said Handler’s testimony showed a lack of understanding of some issues and was misleading regarding other issues, as was the Academy report. As an example, the Association said the Academy’s estimation of the cost-benefit ratio was undoubtedly lower than indicated in the

report because the estimates of the monetary value of improved health were far too high and the costs of meeting the emission standards were far too low.

The Association agreed with Handler regarding the need for the research outlined in the Academy report, although their reasons for doing so were quite different. The Association argued that research was necessary before sufficient information was available to scientifically establish emission standards — a scenario that would significantly, or even permanently, delay implementation of emission standards, and concomitantly benefit the members of the Association financially.

Handler supported the report's call for research because the sixty-six research projects it described as essential to the establishment of a scientific emission control program would entail a decade-long need for increased funding of pointillist biochemical research, thus hugely benefitting his constituency, and industry.

The criticism leveled against Handler and the Academy by the Association, however self-serving, shocked and emotionally wounded Handler. He had never previously been personally and systematically challenged, even by an individual much less an economically and politically powerful industry. The detailed nature of the Association's criticism of the Academy was also unprecedented, for which Handler was responsible because he micromanaged every aspect of the emissions study, from its creation to the publication of its report. The Association's criticisms of Handler and the Academy were only the beginning of antagonism toward them from American industries. A groundswell of discontent emerged from parties whose interests were impacted by the conclusions in the Academy report, especially companies in the automobile and oil industries. Their scientists, engineers, and economists constructed technical and economic arguments that were similar to those of their opposite numbers hired or appointed by Handler, but they reached opposite conclusions. During congressional hearings, industry experts unabashedly criticized the Academy report, mostly on the basis that its conclusions were merely personal opinions that addressed essentially irrelevant questions and ignored economic realities. The general impression created by the industry critiques — which were couched in facile technical language previously the exclusive domain of the Academy — was that its halcyon days of the Academy's unchallenged prestige were over.

Despite the tide of criticism and absence of deference traditionally afforded to Academy advice-giving, Handler stubbornly believed in the validity of the questions he had given Muskie and posed to the Academy committees, and in the soundness of the answers and conclusions he had personally nurtured in the massive report of the Academy committees. Having alienated industry, however, Handler was in mortal danger of losing its political support. And even more disorientating to Handler, he became estranged from the senate committee — which for several years had been greatly impressed by his highfalutin language, never imagining it was vacuous — because he failed to provide answers to even one the questions he promised he would answer. In essence, the Academy committees gave the senate committee only statements of one-armed scientists.

In desperation, Handler decided on a Hail Mary tactic he believed would remove the stigma attached to the Academy's reputation as a consequence of the four-volume report on

automobile emissions published under its aegis. In an attempt attempted to prove that the Academy's advice was the epitome of the scientific endeavor to explain the multi-dimension caused by automobile emissions, Handler sponsored and funded a one-day event at the Academy in early May 1975, which he called a "Conference." He invited two dozen of his previous appointees to Academy air-pollution committees and about a dozen members of his staff, and asked them to, "assess the current situation and identify key issues" concerning automobile emission standards. During the high-profile Conference, Handler instructed the attendees to create defensible regulatory policies regarding emission standards, and to identify what he called "their technological feasibilities and consequences." He asked the attendees to pay attention to the balance of costs and benefits to society in achieving the desired air quality. Handler said he wanted the Conference's report to be about twenty pages, not a thousand pages like the previous Academy report, so that the advice it provided could be understood by laymen and would be reported in the press.

The Conference attendees prepared a report of the requested length in about two days; after modifications by Academy functionaries, which took almost a month, Handler released it publicly in early June 1975. The report — a series of annotated conclusions dealing with vehicle emission controls and management of air pollution — implemented Handler's strategy of posturing the issue as an example of the complexity of acquiring and using scientific information in political decision-making. According to the Conference report, meeting the target emission standards for hydrocarbons and carbon monoxide was "both feasible and worthwhile and should be met," and that it was "probably feasible," using catalytic converters, to achieve the emission standard for nitrogen oxides. The report asserted, however, there would have been less uncertainty concerning the nitrogen oxides standard if the automobile industry had not slackened in its development of converter technology.

There was disagreement among the Conference attendees as to whether the marginal benefits of achieving the standards for nitrogen oxides would exceed the marginal costs, and whether the actual costs might be less than what the Academy's earlier committee predicted because it had assumed a fuel-economy penalty in its calculations that was too high. Achieving the emission standards for hydrocarbons, carbon monoxide, and nitrogen oxides, the report said, could and should be done in a manner that did not significantly increase levels of sulfuric acid. The report further advised that, to ensure the catalytic technology chosen by the industry for meeting the standards was consistent with this goal, a sulfuric acid standard should be established.

In the view of the Conference attendees, there was no evidence to justify relaxing the ambient air-quality standards for the regulated pollutants, and it was important to examine the health effects of non-regulated pollutants from motor vehicles. The attendees predicted that significant improvement in fuel economy could be achieved by taking certain steps that had nothing to do with emission levels, and they said standards should be developed for trucks and motorcycles, evaporative emissions from vehicles, and emissions from various stationary sources.

The Conference report was strongly antithetical to the policies of President Gerald Ford, whose main concerns at that time were the energy crises brought on by the country's heavy dependence on foreign oil, and the economic impact of the emission standards on the nation's automobile industry, which was heavily concentrated in his home state. Ford's proposed

solutions for the energy crisis were strongly opposed by the Congress, and his advisors saw Congress' initiative in establishing emission limits — which would increase energy consumption — as further opposition to the Administration's energy policies. According to Ford's aides, the overwhelming weight of the testimony in recent agency and congressional hearings was contrary to the conclusions reached in the Academy Conference report, the gist of which was to regard the emission levels as feasible. The Administration view of the Academy Conference report was that the public welfare, from the standpoint of energy consumption, jobs, the cost of transportation, and other factors affecting personal well-being, were regarded as secondary, if considered at all. According to the Administration, the appropriate basis for deciding emission control standards was the general welfare of the people of the nation, with the role of emission control in protecting their health playing a necessary part, but only a part.

In late June 1975, Texaco, one of America's large oil companies, publicly disclosed a scathing analysis of the Academy's Conference report, which contained what President Ford's aides called "many and often flagrant shortcomings." The critique, written by experts who worked for Texaco, described in detail the company's intense disagreement with the reasoning, interpretation, and conclusions in the report.

Handler received the critique in a letter from a company vice-president in which he told Handler that since the Academy was presumed to be the ultimate scientific authority in the United States, the report should have been based on intense study and careful documentation and reflected "cogent, relevant, objective, and scholarly analysis." But to the contrary, the company officer said, "The report resulted from only a few hours of discussion by a committee that included no one involved directly with the manufacture of engines, automobiles, or the products which lubricate and fuel them, which indicated the committee lacked the expertise to validate its conclusions."

He suggested that Handler withdraw the report because the Academy did not remain above reproach, as expected of a putative authority on scientific and technological matters.

The company's critique consisted of three dozen critical comments, each linked to one of the Academy Conference report's eight conclusions. The company's experts said that although attainment of the statutory hydrocarbon and carbon monoxide standards was technically feasible, the report's conclusion that they were "worthwhile" was indefensible, considering the available evidence. They argued that emission control standards must be viewed not as entities in themselves but as they interrelate with air quality, energy requirements, and the national economy. The experts said the report's predictions of the effects of the standards on fuel consumption conflicted with the predictions of all American automobile manufacturers, and that Academy calculations of the costs entailed by the standards were invalid because they were based on faulty data and false assumptions. In view of the limitations and shortcomings in the analysis provided by the Conference report, the company experts said, there can be no rational basis for arbitrarily concluding that the imposition of emission standards for hydrocarbons and carbon monoxide is "worthwhile." They also accused the Academy of evading the basic question of "what nitrogen oxides standards are necessary and justified," and argued that the present standard was indefensible regardless of whether or not its attainment was feasible.

According to the company experts, the claim in the Conference report that "It is probably feasible with catalyst technology to achieve the statutory emission standard for

nitrogen oxides" was speculative and misleading because it implied that the catalyst technology needed to achieve this goal on a mass production basis was imminent, which was untrue. Further, the experts said, the report assumed that the industry had a practical method of testing each car as it comes off the assembly line to ensure that manufacturing variability didn't result in cars that failed to meet the standard, which was also untrue because no such method existed. Considering these and other factors, the experts asserted, the credibility of the statement on feasibility can be seen as speculative, not factual. They also claimed that, although the report concluded implementation of the standard for nitrogen oxides would discourage development of alternative technologies that offered the benefit of fuel economy, "it does not offer this fact as a strong argument that the emission standards should be relaxed." Their position, the experts said, would be understandable if the evidence showed the nitrogen oxides standard was required for the protection of health but, "This is not the case. "

The experts interpreted the report as evidence the Conference attendees placed themselves "in a position of favoring overly restrictive emission controls at the expense of energy-saving developments," a choice that was "not in the best interests of the people of the nation." Moreover, according to the Company experts, the failure of the attendees to even question the use of catalyst technology similarly could harm public health and the economy. Since neither these or other issues surrounding use of catalytic converters were addressed in the report, the experts contended, advocating in favor of the emission standards was irresponsible because reliance on converters could force the use of a problematical technology, mandate huge capital expenditures unnecessarily, increase costs to consumers, and waste the country's resources.

The experts viewed the Academy report's estimation of the cost of removing sulfur from fuel as seriously wrong because it ignored the costs and consequences of major aspects of the process. They said improved technology or less severe emission standards might obviate the need for low-sulfur fuels in the future. In either case, a tremendous waste of capital, manpower, and construction would have needlessly occurred. Further, the experts pointed out, both American associations of petroleum producers and refiners projected that the desulfurization costs for small refineries would be about twice that for large refineries, which could force many small refiners out of business, thereby impeding achievement of the national goal of energy self-sufficiency.

The experts said the Academy report seriously erred when it supported the establishment of emission standards based solely on consideration of health effects.

They maintained it was imperative that equal attention be given to many other factors including the time it takes to develop the remedial technology and the effects of the standards on the overall economy. The experts concluded there was "a need to control harmful emissions within tolerable levels," but insisted that: "In discussing this need it would have been appropriate for Academy to point out that such control should be cost-effective and only imposed upon society where there is a commensurate and needed benefit."

National and international automobile manufacturing companies, and companies in related industries opposed the conclusions reached in the Conference report, and their scientific and economic experts also attack Handler and the Academy on the basis that their policies and advice regarding emission control were unscientific and economically devastating.

A vice-president of Ford Motor Company notified Handler and Muskie's Senate committee about its concerns regarding the procedures and conclusions in the Academy Conference's report. He told them that, in his company's view, "The conclusions and recommendations of the Conference report were "completely contrary to the engineering and scientific data put into the public record in sworn testimony," and that, "These conclusions also contradict many of the earlier findings of the Academy as reported in late 1974." He continued, "Unless the new evidence, which must exist to support these contradictory conclusions, is made available, this report must be regarded as nothing more than the personal opinion of a portion of the small group which you assembled." He told Handler and the Senate committee that, "Any attempt to use the conclusions of a one-day study, unsupported by evidence, to influence national policy is unworthy of an institution with the prestige of the Academy."

The Motor Vehicle Association also objected to the 1975 Academy Conference report. The Association told Handler and the Senate committee that although the stated purpose of the Conference was to consider "new and additional information," there was no new information in the report, and that although "the facts are not new" the "conclusions in the Conference report are." Further, it said, the report was heavily laced with value judgments using subjective words such as "should," "ought to," and "can be met," all without proof. According to the Association's experts, conclusions in the Academy Conference report directly contradicted the findings of the 1974 Academy report on air pollution. The Association's experts also rebuked the Conference report writers for repeatedly characterizing the results of their marginal-costs and marginal-benefits analyses as "worthwhile" when in fact the writers included no such determinations in their report.

The Association alleged the cost-benefits relation for the nitrogen oxides standards described in the report— that costs might be reduced and more benefits might be discovered — was only speculative, and the claim that the emission standards could be achieved while improving fuel economy was also speculative because it was unsupported by evidence. The Association called the report's accusation of industry slackening its efforts to develop catalytic converters as "puzzling," and said not only was the claim made without a factual basis, the facts were actually contrary to the opinion. Additionally, the Association's experts suggested the Academy was hypocritical because, on one hand, its report said the industry had not produced a system for controlling nitrogen oxides that "has been proven feasible" but, on the other hand, it characterized the system as "probably feasible." Overall, the critique writers asserted, the Academy Conference report, "ignored the interaction of the major pollutants with one another and offers no new insights into the questions of cost benefits and pollutant effects on human health." "Most disheartening," they said, "the report carries the tone of an opinion paper rather than the well-documented evaluation expected of so prestigious an institution as the National Academy of Sciences."