the Academy's political landscape. Take the little things. For example, no one within the NAS who has any diplomatic sense any longer refers to the Academy. The terms has become plural, as in National Academies. In the past, the NAE president had his office on the third floor of the Academy building, as does the president of the Institute of Medicine. White's office is on the second floor, right next to Press's. And, although there is no longer any talk about the engineers splitting off from the NAS altogether as there once was, the NAE's long-range plans include a building of its own.

More substantively, White has been named vice-chairman of the National Research Council (Press is chairman) which publishes some 350 reports a year—nearly one a day. From that seat White can wield considerable influence in the Academy, ensuring an active role for the NAE in virtually any study that touches engineering or technology. White came to the NAE presidency from the University Corporation for Atmospheric Research in Boulder, which he headed since 1980. Immediately before that, he was a member of the NAS staff when he served a 2-year stint as executive officer of the NRC. Thus, White has an insider's knowledge of how the Academy works. A career that includes 12 years in government, seven of them as administrator of the National Oceanic and Atmospheric Administration in the Department of Commerce, makes him a Washington insider as well. It is experience White intends to use to promote the NAE. "I will be up on Capitol Hill a lot," says White, who also intends to make frequent appearances before professional organizations and the press, explaining that "No facet of our society is without its technological dimension."

The NAE's pursuit of a "Technology Society" theme is not brand new but, White says, it is something he plans to see the engineers push with "new vigor. It's a matter of emphasis." By taking a broad interdisciplinary approach to what falls in NAE's purview, White easily moves it closer to the forefront of public policy. ". . . [T]he kinds of problems our government and society face no longer easily compartmentalize into the traditional domains of engineering," he has written the membership. So, although the NAE will continue to advise the government on questions of civil engineering—roads and bridges, for instance—endeavors such as a forthcoming symposium on technology and foreign relations (planned for late spring) are gaining priority.

White joined Press on a recent trip to China where the two discussed plans for exchanges in the area of industrial science, largely "precommercial." As White sees it, the NAE can develop ties with China's industrial ministries, while the NAS, with its predominantly academic membership, works more closely with China's university scientists.

Another new venture which White hopes will materialize during the next couple of years is a series of symposia on the "Technology Society" theme. The relationship between universities and industry, ethical questions about genetic engineering, and issues in technology transfer might be on the agenda.

As the engineers extend their reach, they cannot help but move into territory that once was the more exclusive domain of the NAS and Institute of Medicine. On the record, Academy officials talk about complementary activities and shared responsibility. "It's good to have all three presidents around here talking about the same things," one offered. But the NAE isn't going to become a big kid on the block without creating its share of friction along the way.

—BARBARA J. CULLITON

EPA Faults Classic Lead Poisoning Study

A review questions a study linking lead in teeth with low IQ scores; EPA finds other grounds for regulation

"They are trying to expunge 10 years of my work," says Herbert L. Needleman, a psychiatrist at the Childrens' Hospital of Pittsburgh and author of an influential article on traces of lead found in childrens' teeth. Published in the *New England Journal of Medicine* in 1979, his study made front-page news when it reported that children exposed to modest amounts of lead had suffered intellectual damage that might affect them for life. His research showed that children with high lead levels (which were not considered high by 1979's standards) scored three to four points lower on IQ tests than those with negligible amounts of lead in their teeth.

Recently this work has been strongly criticized by Environmental Protection Agency (EPA) staffers and by outside reviewers who are helping the EPA rewrite its rationale for controlling lead. This rationale, called a "scientific criteria document," has just been released in draft form. It says that Needleman's studies "cannot be accepted as valid" because of sampling and statistical errors. At Needleman's request, an appendix that closely dissects his studies has been withheld pending a final rewrite that reflects his critique of the critique.

The acrimonious debate over the Needleman data reflects the sometimes painful process by which the scientific record is checked and revised. In this case, however, Needleman seems to have a point in arguing that critics would not have focused so intensely on the flaws in his work had there not been an economic reason to do so. For years, the lead industry—which has resisted EPA's cleanup proposals—claimed that Needleman's work was unsound. It is particularly irksome for him to hear the same criticism now from the EPA.

In Needleman's view, the reanalysis is "destroying the main strut" in the argument for holding lead pollution to very low levels. In addition, he chides the EPA for dismissing his data before carefully reading his written responses. The whole process, Needleman believes, has been a "rush job," devoid of the usual courtesies afforded a scientist whose work is being reviewed, leading to a report that is "incomplete and erroneous, tendentious and superficial." The criteria document came out before EPA had taken account of Needleman's written corrections of the record. And the appendix was called back from the printers only because Needleman insisted on it. A friend and colleague in lead research—Phillip Landrigan, an official at the National Institute for Occupational

Safety and Health—says that Needleman definitely was brought before a "hanging jury."

Lester Grant, director of EPA's Environmental Criteria and Assessment Office, replies that Needleman was given plenty of time to explain his work, but became uncooperative when problems turned up and asked the reviewers to return all the data he had given them before leaving his office. In Grant's view, Needleman exaggerates the importance of his data. The EPA now believes there is solid, independent evidence to support the view that lead is dangerous at low levels of exposure.

The British government has already adopted this as policy. A royal commission concluded in April that there is no threshold below which exposure to lead is safe. Shortly afterward, the secretary of state for the environment announced that Britain would eliminate lead from all gasoline and establish a timetable to do this as soon as a cooperative program with the rest of Europe has been agreed on. Concrete action may be far off, however, for Italy opposes lead controls.

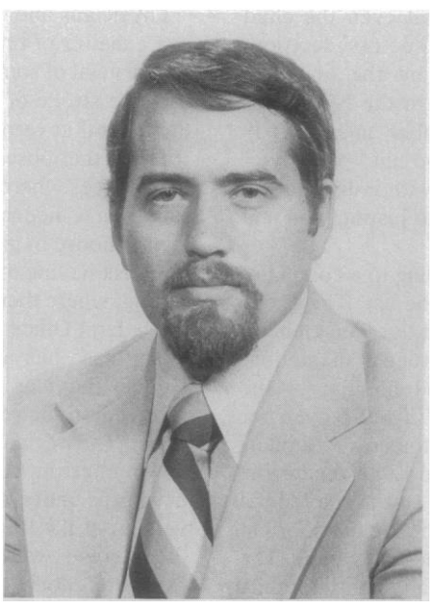
The EPA's review of the IQ controversy began last March when Grant convened a special panel* to look into research done by Needleman and an adversary whose work is partially supported by the lead industry. The adversary, Claire Ernhart of Cleveland's Metropolitan General Hospital, has maintained since 1981 that there is no proof of a causal relationship between high levels of lead in children's blood and low scores on IQ tests (although her earlier work found that there was a relationship). The review panel reached a Solomon-like conclusion: Ernhart's and Needleman's assertions are both faulty. Ernhart has taken the criticism more docilely.

One typical but egregious problem with Needleman's work, according to biostatistician Lawrence Kupper of the University of North Carolina, was that the computer program automatically "kicked out" data sets if even one variable was missing. The consequence, which Kupper says Needleman apparently failed to notice, was that the analysis may not have included as many data sets as Needleman assumed. And for this reason, the effects which he observed may not have been statistically significant. The draft report notes that "the committee came away with the impression that most [computer] runs led to nonsignificant findings."

Child development psychologist Lyle Jones of the University of North Carolina found that the studies did not adequately compensate for "confounding variables," things such as a child's age or parent's education, which are known to have a bearing on IQ. In addition, Jones says, "The basis for excluding certain children is still not totally clear." At least two members of the group found Needleman less than cooperative, raising the suspicion that they might have found other problems had they been allowed to continue pouring over the raw data, according to Kupper.

At least two members of the review group found Needleman less than cooperative.

Needleman's general response to challenges based on statistics is that there is no overwhelming virtue in meeting the exact standard of significance (the rule of $P < 0.05$), especially since other researchers have now used his techniques and come up with similar results, all of which are "borderline significant" if not strictly so. He also says that some of the panel's lesser criticisms were mistaken; these are corrected in the final report.



Lester D. Grant

Director of EPA's critique of Needleman's work.

One major charge—that Needleman may have biased the results because he knew the children's IQ scores and lead rankings before he designed the study—is simply being dropped.

The panel recommends that Needleman and Ernhart sift through their data and reanalyze it, correcting the weaknesses. Grant has offered to obtain EPA financing for this, but Needleman is not interested. "I don't know that it would add anything," he says. "My study has undergone stringent peer review by eminent scientists in the past, and I think I'll let it stand on that." He refers specifically to the work of Michael Rutter, psychologist at the Institute of Psychiatry in London.

Rutter, a skeptic, looked over Needleman's data and concluded in a 1980 paper that this work "provides the most impressive evidence to date on the possibly damaging effects of raised lead levels . . . which are found in some 20 percent of children in the general population." He also said at a conference in May 1982 that Needleman had not proved the hypothesis that lead poisoning at very low levels affects intelligence. But, he continued, "it is evident that the best of the most recent studies have indeed failed to disprove the hypothesis," leading him to conclude that it would be safer and "scientifically more appropriate" to act as if the hypothesis were true.

Regardless of how the Needleman controversy is settled, the EPA claims to have strong evidence that lead is a threat to public health, and that by far the most important source of pollution is gasoline. According to the draft criteria document, atmospheric lead levels are now about 2000 times greater than before the industrial revolution, and the use of leaded gasoline contributed about 86 percent of the lead dumped into the atmosphere in 1981.

People absorb airborne lead not by breathing it so much as by eating food and water containing lead which has settled out of the atmosphere. At high levels of intoxication, lead is known to cause neurological damage. At lower levels, it slows the rate of nerve signal transmissions and heme formation in blood. As the EPA report concludes, the latest data "indicate that large numbers of American children (especially low income, urban dwellers) have blood lead levels sufficiently high . . . that they are clearly at risk for deranged heme synthesis and, possibly, other health effects of growing concern as lead's role as a general system toxicant becomes more fully understood."—**Eliot Marshall**

*The panel members were Lyle Jones, director, L.L. Thurstone Psychometric Laboratory, University of North Carolina; Lloyd Humphreys, Department of Psychology, University of Illinois at Champaign-Urbana; Paul Mushak, Department of Pathology, University of North Carolina; Richard Weinberg, Department of Educational Psychology, University of Minnesota; Lawrence Kupper, Department of Biostatistics, University of North Carolina; and Sandra Scarr, Department of Psychology, University of Virginia.