

No Meeting of the Minds on Asbestos

The debate on the health hazards of asbestos has become so polarized that researchers from one camp no longer go to the other camp's meetings

SCIENTIFIC MEETINGS ARE USUALLY RELATIVELY civilized affairs, a chance to exchange research results and thrash out their interpretation. But Bruce Case, director of the Center for Environmental Epidemiology at the University of Pittsburgh, recalls a conference he attended in June 1990 on the health effects of asbestos in a very different light: It "was like nothing I've ever attended before. This is the first meeting I'd ever gone to where I got the feeling that the whole thing was a kind of political setup."

Called "The Third Wave of Asbestos Disease: Exposure to Asbestos in Place. Public Health Control," the conference reflected the view that a spate of asbestos-triggered diseases would strike thousands of construction workers, firemen, custodians, and other people exposed to microscopic asbestos fibers that crumble from building and pipe insulation, brake pads, and hundreds of other sources. According to Case and others who attended the meeting, researchers who hold a contrary view—most of whom were not present—were vilified during discussion periods that followed many of the presentations. The conference organizers charge in turn that a December 1988 conference held at Harvard University was badly slanted in the opposite direction. That meeting, they claim, was dominated by researchers who believe that chrysotile asbestos, the most commonly used type in the United States, poses relatively little health risk to the general public at the levels of exposure generally encountered, and that expensive removal of properly maintained asbestos-containing materials such as insulation and cement is not warranted.

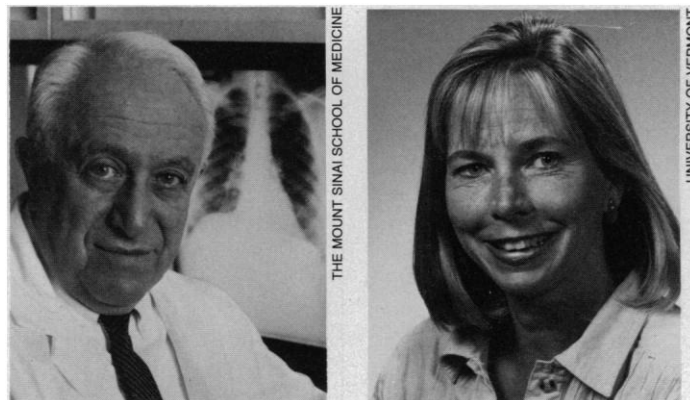
Welcome to the world of asbestos research—a world riven by deep fissures and bitter disputes. It is a world where science and the law dramatically interact in a slew of multimillion-dollar law suits, ranging from legal actions brought by victims of asbestos-related illnesses to efforts by school systems to recoup the costs of removing asbestos-containing materials. And it is a world where scientists with opposing views no longer seem to be able to talk to each other at a scientific level.

"In environmental science it happens fairly regularly that there will be diverse

views like this," says science policy expert M. Granger Morgan, head of the department of engineering and public policy at Carnegie-Mellon University. But "what's unusual," he says, "is for people not to be arguing in the same forums. If they don't go to the same conferences it's [usually] because they have different disciplinary backgrounds, rather than because they don't want to hear the other party line."

The fissioning of a discipline

Asbestos researchers weren't always at odds with each other. In the early 1960s, studies that convincingly linked asbestos exposure to mesothelioma—a rare cancer of the lining of the chest or abdomen that's nearly always fatal—paved the way for a flood of research aimed at figuring out whose health was endangered by asbestos and how much of the silicate fiber had to be inhaled to cause cancer. Non-industry researchers at that time were generally united in a crusade to persuade regulatory agencies and asbestos manufacturers to institute stringent controls on the amount of airborne asbestos fibers that workers were exposed to, says Arthur Langer, a mineralogist and director of Brooklyn College's Institute of Environmental Studies. At this time, says Langer, one scientist galvanized the field to institute regulatory change more effectively than any other: Irving Selikoff, a medical researcher at Mt. Sinai Hospital, who co-authored a landmark 1964 paper on high rates of mesothelioma and other cancers in New York City insulation workers exposed to asbestos. "He was something to watch," recalls Langer, who worked at Mt. Sinai from 1965 to 1988. "I was there when we confronted all of the disbelieving forces of industry and the reluctant forces of the federal government. We were in the trenches in gore up to our ankles and sometimes the



Old guard and revisionist. Irving Selikoff argues that all fiber types should be strictly regulated; Brooke Mossman says the commonest type poses little public hazard.

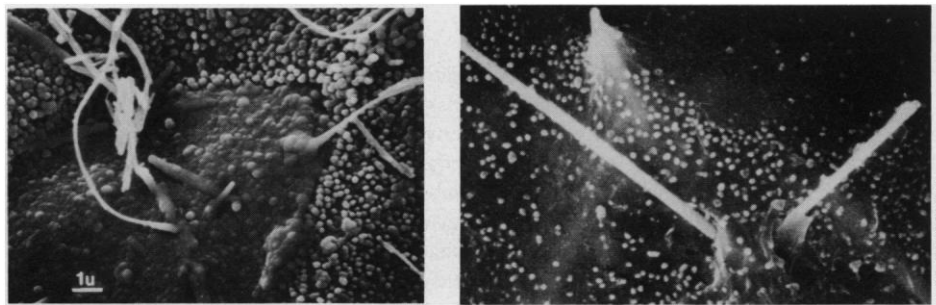
gore was our own gore."

During the 1970s, however, the pangaean began breaking apart. The tectonic force came from a number of epidemiological studies suggesting that some types of asbestos fibers may be more hazardous than others. These studies, which focused on asbestos miners and workers who milled and wove asbestos into fireproof material, indicated that a smaller percentage of workers exposed to chrysotile, or "white asbestos," were dying of mesothelioma than those workers exposed to so-called amphibole fibers such as crocidolite, amosite, or a mixture of fiber types.

During the 1970s, several researchers, including Hans Weill, chief of Tulane University School of Medicine's pulmonary diseases division, and J. Christopher Wagner, former chief of pathology of the British Medical Research Council's Pneumoconiosis Research Unit, began arguing that different types of asbestos fibers should be regulated differently. Indeed, many other countries had already begun to do so, notes veteran asbestos researcher John Higginson, an epidemiologist at Georgetown University Medical Center's Institute for Health Policy Analysis. Huge economic interests were at stake: An estimated 95% of asbestos used commercially in the United States is chrysotile, which is by far the most heavily mined type of asbestos.

This revisionist philosophy was quickly attacked by Selikoff and members of an

influential group of occupational health experts he had established at Mt. Sinai. The Mt. Sinai group, which continues to form the focus of opposition to regulating the fiber types differently, argues that the fiber-type studies are riddled with uncertainty. They argue, for example, that epidemiological evidence suggests that workers exposed to different fiber types were contracting asbestosis, a disease characterized by scarring of the lungs, and were dying of lung cancer (as opposed to mesothelioma) at similar rates. Moreover, Mt. Sinai epidemiologist William J. Nicholson and other Mt. Sinai researchers have pointed to a few studies that show similar mesothelioma rates in people exposed to 98% chrysotile and 2% crocidolite, 60% chrysotile and 40% amosite, and 100% amosite. "All you have to do is see one or two mesothelioma patients to know it doesn't take much asbestos to produce it," says Selikoff. "I'm only interested that



The splitting difference. Everybody agrees that amphibole fibers (right) are extremely hazardous, but researchers are deeply divided over the hazards of chrysotile fibers (left).

human beings not be further exposed to asbestos. And those who say they should be further exposed really have to explain why."

Duelling conferences

Weill got an early taste of what the field was devolving into: In January 1978, when Selikoff was organizing a major scientific meeting, the International Conference on Health Hazards of Asbestos Exposure, Weill called Selikoff and says he was told he could

deliver a paper on how doses of different asbestos fiber types affected the health of workers in asbestos-cement factories. Two months later, however, Selikoff sent Weill a letter informing him that the paper would be relegated to an informal workshop during the conference. Weill responded that the public agencies that funded him and Selikoff "surely...do not intend and would not condone the exclusion of legitimate points of view from all segments of the

Consensus Report Draws Fire From Both Extremes

A \$4-million literature review commissioned by the Environmental Protection Agency (EPA) has corroborated one of the central arguments of the "revisionist" school of asbestos researchers, namely that well-maintained asbestos in public buildings poses little health risk to office workers. But the report, "Asbestos in Public and Commercial Buildings: A Literature Review and Synthesis of Current Knowledge," stops short of siding with the revisionists' contention that different types of asbestos fiber should be regulated differently because they pose varying levels of health risk (see main story). Although it has drawn some fire, the report has won broad support.

"The panel would certainly not concur that asbestos poses no problem.... But there's a grave danger of overgeneralizing about asbestos as if all hazards are the same," says Archibald Cox, former Watergate prosecutor and chairman of the board of directors of the Health Effects Institute-Asbestos Research (HEI-AR), the non-profit organization that administered the review. According to the report, which was published in September, the literature indicates that levels of airborne asbestos fibers inside buildings containing well-maintained asbestos insulation vary little from levels in the environment. However, it notes that janitors, renovation workers, and asbestos removal workers can be exposed to higher levels of airborne asbestos fibers and should be adequately protected.

The report has angered some public health officials because it fails to suggest changes in EPA policy—specifically, that owners of public buildings institute asbestos monitoring procedures similar to those mandated for schools under the EPA's Asbestos Hazards Emergency Response Act of 1986. "To those of us who have been in the field a long time, this [report] is discouraging," says Mt. Sinai epidemiologist Philip Landrigan. "[It's as if] the tobacco industry had suddenly come out with a brand new report saying that all the research on the tobacco-cancer connection for the past 40 years had been shown in their own little studies to be worthless," he says.

Epidemiologist William Nicholson, a colleague of Landrigan's

at Mt. Sinai, also criticized the report for playing down the health risks of asbestos fibers less than 5 micrometers in length. The report states, "Animal data suggest...that very short fibers have much less carcinogenic activity than longer fibers and may even be relatively inactive." Nicholson contends shorter fibers may cause more cancer than longer fibers simply because shorter ones are far more numerous. "Unless one can demonstrate their carcinogenicity is 100 times less, their importance as a public health concern remains," he says. Nicholson, a member of the HEI-AR panel, refused to sign the report.

Revisionists, too, have found plenty to disagree with. In addition to sidestepping policy recommendations, the review tiptoes timidly through the minefield of data on the health effects of different asbestos fibers, charges panel member J. Christopher Wagner, former chief of pathology of the British Medical Research Council's Pneumoconiosis Research Unit. The report notes that there's strong evidence linking long and thin asbestos fibers with mesothelioma, a rare cancer that virtually always leads to death. But it fails to absolve chrysotile fiber—which constitutes nearly all the asbestos used in U.S. building insulation—of a role in triggering mesotheliomas. Because of this, Wagner refused to sign off on the report. In a letter appended to the study he states, "I do not accept the fact that pure chrysotiles will cause mesotheliomas." Moreover, Wagner told *Science*, "Several others [on the panel] felt as I did, but felt the pressure to sign it anyway." Arthur C. Upton, an epidemiologist at New York University and chairman of the review panel, confirmed that other panel scientists felt similarly to Wagner. However, "this issue cannot be resolved with certainty from the available data," Upton states in a letter appended to the review.

But in as contentious a field as asbestos, the fact that 16 of the 18 panel members signed off on the review was remarkable, says panel member Arthur Langer, a mineralogist at Brooklyn College. If any study can be said to represent a consensus in the field, this is probably it.

■ R.S.

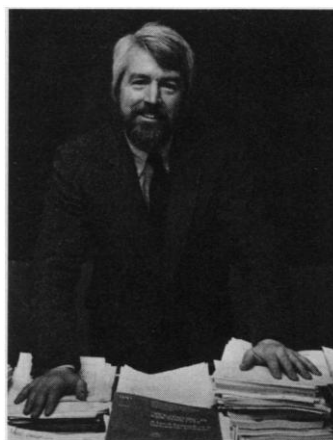
biomedical research community.”

After these early salvos, both sides dug in and amassed further ammunition during the 1980s, says Higginson. The revisionist camp was the first to launch a major offensive: the Harvard symposium, held 14-16 December 1988 at Harvard University's Energy and Environmental Policy Center. It concluded that the health risk posed by the roughly 30 million tons of asbestos in buildings is small—far less than most other environmental health hazards, such as tobacco smoke and radon.

Though the symposium, whose proceedings were published in August 1989, received little public attention at the time, these conclusions burst into the public spotlight last year when Brooke Mossman, a research pathologist at the University of Vermont School of Medicine who was a key speaker at the meeting, and four colleagues published an article in *Science* (19 January 1990, p. 294). It states: “The available data and comparative risk assessments indicate that chryso-

tile asbestos is not a health risk in the non-occupational environment.” The article triggered a spate of news reports and magazine articles, many of which stated that it was safer—and certainly cheaper—to leave asbestos in place than to remove it. This theme was echoed recently in a report from the Health Effects Institute, an independent nonprofit organization (see box).

To the Mt. Sinai camp, the Harvard symposium was tainted because part of the funding came from the Safe Buildings Alliance (SBA), a lobbying group for former asbestos makers, and it was dominated by researchers from the revisionist camp. In addition to Mossman, the list of speakers included Morton Corn, an envi-



Third waver. Philip Landrigan says the other side was invited but chose not to show up.

ronmental scientist at Johns Hopkins University and a co-author of the *Science* paper. Nobody from the opposing camp was on the program. Mt. Sinai's Nicholson had been scheduled to give a talk on “Airborne levels of mineral fibers in the non-occupational environment,” but he told *Science* he skipped the symposium because he felt that he'd been invited as a token advocate of the Mt. Sinai views. “I felt that the various views with respect to research results on asbestos were not appropriately represented,” he says. Many of the speakers, he also contends, had either testified or consulted for former asbestos manufacturers associated with SBA. Mossman dismisses the notion that her conclusions are influenced by industry and squeezes off a round of her own: At Mt. Sinai, she says, is “a group of individuals who basically have said, ‘The hell with the scientific community—forget it, we’re going off on our own.’”

Soon after the release of the Harvard report, Selikoff set about organizing the “Third Wave” conference. As its title indicated, the meeting would focus on the possibility that a wave of new asbestos-related diseases would show up in the general public. (The first two waves had struck miners and asbestos workers.) To help pay for the conference, Selikoff was given \$50,000 from a fund administered by lawyers representing school systems suing former asbestos manufacturers to recover billions of dollars in asbestos removal costs. The meeting was organized by the Collegium Ramazzini, a non-profit, international body of 150 environmental health scientists, of which Selikoff is president.

With cash in hand, Selikoff and Philip J. Landrigan, chairman of Mt. Sinai's department of community medicine and the meeting's co-chair, put together a program committee to help plan the list of speakers. Selikoff and Landrigan maintain that they tried to have a balanced program, but some prominent researchers from the revisionist school say they were not invited, and others declined to participate. Mossman already had made other plans that prevented her from delivering a paper titled “Why I think asbestos should not be removed from buildings.” But she suggested that either Corn or Bernard Gee, a medical researcher at Yale University and a co-author of the *Science* paper, would be better able to address the issue. Gee recalls Landrigan telling him

“Third Wave”: Roiling the Waters

Although the “Third Wave” conference took place more than 16 months ago (see main story), it is still roiling the asbestos-research community. In December, the *Annals of the New York Academy of Sciences* (NYAS) plans to publish the 56 conference papers and the edited discussion that occurred in the formal sessions. This has infuriated several researchers, who told *Science* they tried to alert the academy to what they saw as a biased conference.

Take J. Corbett McDonald, director of the Institute of Occupational Health and Safety at McGill University in Montreal, who along with several other researchers had been contacted by Bill Boland, executive editor of the *Annals*, 2 months prior to the conference. Boland had asked the researchers for their “overall impressions” of the conference program and to advise him whether publication of the conference would be an asset to the *Annals*. McDonald blasted the proposed conference in his reply dated 1 May 1990, stating: “The program...reflects the Mount Sinai position to an almost unbelievable degree. The topics to be discussed make little attempt to address objectively the relevant scientific and policy issues....Few of the scientists responsible for important research in this field were invited to the meeting let alone to speak.” McDonald concludes by stating, “I think it most unlikely that the papers will make any important contribution to knowledge or do more than add fuel to a situation in which there is already more heat than light.”

Academy officials concede that there have been criticisms of the conference. “A couple of people thought it would be a bad idea [to publish the proceedings], but they were at least, how should I put it, concerned parties,” says Boland. In fact, the academy tried—in vain as it turned out—to add balance to the publication by the *Annals*. On 20 November 1990, Oakes Ames, the executive director of NYAS at the time, wrote to McDonald stating that, “Dr. Philip Landrigan [co-chair of the conference] believes that there was ample opportunity at the conference for different views to be expressed,” but he invited McDonald to contribute a paper to be appended to the proceedings to “present the different arguments fully.” McDonald declined: He told *Science*, “I didn’t think it was appropriate to add any sort of credibility to the [conference].” Two other scientists possessing “different views”—Case and epidemiologist Graham W. Gibbs, an asbestos consultant based in Alberta, Canada—were also offered the chance to “amplify” their conference presentations. Case declined, saying “that wouldn’t have been much of a step if I’d agreed to do it,” while Gibbs wrote a forward to the proceedings that Landrigan says was “simply not appropriate.” ■ R.S.

about the Third Wave conference at a congressional hearing on 26 April but denies he was asked to present the paper. As for Corn, who headed the Occupational Safety and Health Administration in 1976, Landrigan stated in a 1 June letter to Mossman that "although Dr. Corn is an old friend and colleague, we did not invite him to present, because the focus is on health rather than on engineering aspects of the problem." Two other authors of the *Science* paper declined to attend, both pleading prior commitments. In addition, Selikoff invited Wagner, who declined. He told *Science*, "They did not want to hear my side anyway." Adds Mossman, "We were invited in a way that made us feel that they didn't really want us there."

One uninvited revisionist was epidemiolo-

gist J. Corbett McDonald, director of the Institute of Occupational Health and Safety at McGill University in Montreal, whose research—by his own accounting—had a "direct bearing" on about two-thirds of the Third Wave conference's papers. At the meeting, McDonald was one of the revisionists harangued in absentia by audience members. Five months after the conference, Landrigan wrote to McDonald to apologize for "the several unflattering remarks that were made about you and your work."

For many U.S. asbestos researchers, there seems to be little movement toward a ceasefire: The Third Wave meeting's proceedings are about to be published by the New York Academy of Sciences, and that has set off another round of skirmishing (see box, p. 930), and an attempt by the Health

Effects Institute to come up with a consensus document has also drawn fire from both sides (see box, p. 929). The further apart Mt. Sinai researchers and the revisionists drift, the harder it will be to mend the rift, says Dorothy Nelkin, a New York University social scientist who has studied controversy in science. The only way to resolve the issues, adds Morgan, is for the scientists to get back to doing science. "If there are legitimate scientific disagreements," he says, "they're not going to get resolved unless people spend time paying attention to each other's arguments and try to design experiments that come to grips with those arguments." Until that happens—if it ever does—judges and regulators will continue to be caught in the middle of this long-distance scientific "debate." ■ RICHARD STONE

Scientific Sleuths Solve a Murder Mystery

Truth can sometimes be stranger than fiction—or at least as strange as a made-for-TV movie. Take, for example, the case of Patricia Stallings. Convicted of the murder of her infant son, she was sentenced to life in prison—but was later found innocent, thanks to the medical sleuthing of three persistent researchers.

The story began in the summer of 1989 when Stallings brought her 3-month old son, Ryan, to the emergency room of Cardinal Glennon Children's Hospital in St. Louis. The child had labored breathing, uncontrollable vomiting, and gastric distress. According to the attending physician, a toxicologist, the child's symptoms indicated that he had been poisoned with ethylene glycol, an ingredient of antifreeze, a conclusion apparently confirmed by analysis by a commercial lab.

After he recovered, the child was placed in a foster home, and Stallings and her husband, David, were allowed to see him in supervised visits. But when the infant became ill, and subsequently died, after a visit in which Stallings had been briefly left alone with him, she was charged with first-degree murder and held without bail. At the time, the evidence seemed compelling as both the commercial lab and the hospital lab found large amounts of ethylene glycol in the boy's blood and traces of it in a bottle of milk Stallings had fed her son during the visit.

But without knowing it, Stallings had performed a brilliant experiment. While in custody, she learned she was pregnant; she subsequently gave birth to another son, David Stallings Jr., in February 1990. He was placed immediately in a foster home, but within 2 weeks started having symptoms similar to Ryan's. David was eventually diagnosed with a rare metabolic disorder called methylmalonic acidemia (MMA). A recessive genetic disorder of amino acid metabolism, MMA affects about 1 in 48,000 newborns and presents symptoms almost identical with those caused by ethylene glycol poisoning.

Stallings couldn't possibly have poisoned her second son, but the Missouri state prosecutor's office was not impressed by the new developments and pressed forward with her trial anyway. The court wouldn't allow the MMA diagnosis of the second child to be introduced as evidence, and in January 1991 Patricia Stallings was convicted of assault with a deadly weapon and sentenced to life in prison.

Fortunately for Stallings, however, William Sly, chairman of the department of biochemistry and molecular biology, and James Shoemaker, head of a metabolic screening lab, both at St. Louis University, got interested in her case when they heard about it from a television broadcast. Shoemaker performed his own analysis of Ryan's blood and didn't detect ethylene glycol. He and Sly then contacted Piero Rinaldo, a metabolic disease expert at Yale University School of Medicine whose lab is equipped to diagnose MMA from blood samples.

When Rinaldo analyzed Ryan's blood serum, he found high concentrations of methylmalonic acid, a breakdown product of the branched-chain amino acids isoleucine and valine, which accumulates in MMA patients because the enzyme that should convert it to the next product in the metabolic pathway is defective. And particularly telling, he says, the child's blood and urine contained massive amounts of ketones, another metabolic consequence of the disease. Like Shoemaker, he did not find any ethylene glycol in a sample of the baby's bodily fluids. The bottle couldn't be tested, since it had mysteriously disappeared. Rinaldo's analyses convinced him that Ryan had died from MMA, but how to account for the results from two labs, indicating that the boy had ethylene glycol in his blood? Could they both be wrong?

When Rinaldo obtained the lab reports, what he saw was, he says, "scary." One lab said that Ryan Stallings' blood contained ethylene glycol, even though the blood sample analysis did not match the lab's own profile for a known sample containing ethylene glycol. "This was not just a matter of questionable interpretation. The quality of their analysis was unacceptable," Rinaldo says. And the second laboratory? According to Rinaldo, that lab detected an abnormal component in Ryan's blood and just "assumed it was ethylene glycol." Samples from the bottle had produced nothing unusual, says Rinaldo, yet the lab claimed evidence of ethylene glycol in that, too.

This September, Rinaldo presented his findings to the case's prosecutor, George McElroy, who called a press conference the very next day. "I no longer believe the laboratory data," he told reporters. Having concluded that Ryan Stallings had died of MMA after all, McElroy dismissed all charges against Patricia Stallings on September 20, 1991. ■ MICHELLE HOFFMAN