

Courting Reliable Science

Judges seek to improve use of scientific experts in trials

By RICHARD MONASTERSKY

In some of the most complex cases currently crawling through the U.S. courts, upwards of 500,000 women are suing the makers of silicone gel breast implants, claiming a range of medical problems caused by the occasionally leaky packets buried under their skin.

At their core, these cases rely on scientific experts to weigh in on whether the implants can damage the human immune system, trigger connective tissue diseases, or precipitate a host of other disorders, from allergies to vertigo. The litigation pits one team of experts against another. Judges and juries must listen to the scientific arguments and then decide which side bears the preponderance of the evidence.

To many observers, such battles of the experts appear to be straining the judicial system. "This is a circumstance where the information that the courts must consider is so inherently complex that even the best efforts by skilled advocates to educate the court often fall short of the mark," says Joe S. Cecil, a lawyer and psychologist who conducts research for the Federal Judicial Center in Washington, D.C.

"I believe the breast implant cases are the most challenging cases that are in federal courts today," Cecil said in February at a meeting sponsored by the American Association for the Advancement of Science (AAAS) in Philadelphia.

In Alabama, a federal district judge is experimenting with a potential solution to the problem of complex scientific arguments. Judge Sam C. Pointer Jr. has appointed a panel of four independent scientists to examine the available evidence about silicone gel breast implants and disease. These court-appointed experts—an epidemiologist, an immunologist, a rheumatologist, and a toxicologist—have been asked to offer their own assessments of the state of the science and examine the validity of dissenting opinions.

Their conclusions will be particularly influential because Pointer is presiding over a multidistrict litigation—a procedure that has grouped together more than 20,000 individual suits in order to make the pretrial phase more efficient. When these cases go back to their separate federal courts for trial, judges across the

nation will decide how they wish to use the report from this independent panel.

Judges have had the authority to appoint independent experts since 1975, but relatively few have done so, in part because of widespread opposition from lawyers. The practice is now gaining increased attention. In December 1997, Justice Stephen G. Breyer of the U.S. Supreme Court supported the use of court-appointed experts in a concurring opinion he wrote in the case of *General Electric Co. v. Joiner*.

Breyer expanded on the issue of expert witnesses in an address at the AAAS meeting, noting that "as society becomes more dependent for its well-being upon

ception that law and science are like oil and water. They're good things in their own place, but they don't mix together very well."

At the most fundamental level, participants at the AAAS meeting noted that science and the law represent wholly different approaches to seeking solutions. Science represents an unending search for explanations, one in which the questioning process prevails and answers are temporary. Courts, on the other hand, must make decisions on the basis of the information available, without the luxury of putting off a conclusion to await further research.

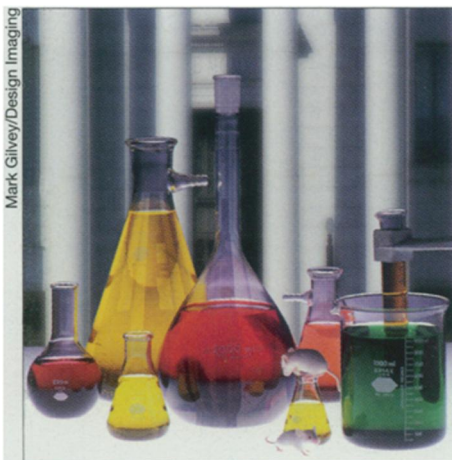
This conflict appears most dramatically in toxic tort cases, in which plaintiffs claim to have suffered injury or disease from toxic substances. Besides the breast implant controversy, these cases have involved asbestos, the Dalkon Shield, toxic shock syndrome, Agent Orange, lead, tobacco, and, recently, fen-phen (SN: 10/18/97, p. 252).

In such tort cases, the plaintiff must prove, among other points, that he or she has suffered damages and that the defendant caused those damages. In an asbestos suit, for example, the plaintiff needs to convince the jury that exposure to asbestos more likely than not caused his or her lung disease. "The causal question is the center of controversy," says Sanders.

In the past, science and the courts enjoyed a better relationship because toxic tort cases usually arose only after a body of solid scientific evidence had accumulated, Sanders notes. Asbestos lawsuits in the 1970s relied on scientific evidence, collected in the 1960s, that linked lung disease to asbestos fibers. Dalkon Shield suits followed after scientific studies established the hazards of this intrauterine birth-control device.

The sequence of events has reversed in the last 2 decades, making toxic tort cases much more difficult to adjudicate, says Sanders.

In part, money has motivated this trend. Plaintiffs' lawyers stand to make much more if they file suit before hundreds or thousands of similar cases



scientifically complex technology, we find that this technology increasingly underlies legal issues of importance to us all."

The legal system, he says, "has begun to look for ways to improve the quality of the science upon which scientifically related judicial determinations will rest."

Legal professionals and scientists are quick to point out that they face what appear to be irreconcilable differences. Recognizing the problem-plagued relationship, the AAAS called its session on scientific litigation "Disorder in the Courts."

Joseph Sanders, a law professor at the University of Houston, explained. "What the title reflects is a widespread belief that the law is basically doing a poor job with scientific evidence and perhaps even a more fundamental per-

develop. When substantial numbers of similar suits are brought against the same defendant, the cases get bundled together under the direction of an executive committee of plaintiffs' lawyers.

"It's the plaintiff's lawyer who gets in the door first that's going to have a good argument for being one of the members of this committee and will cash in on all of this money. If you wait for the science to develop, someone else will have been there first," says Bert Black, a Dallas defense attorney who has represented pharmaceutical and chemical companies. Black cochairs the National Conference of Lawyers and Scientists, a joint committee of the AAAS and the American Bar Association.

The statute of limitations also forces plaintiffs' lawyers to bring cases forward quickly, sometimes in advance of the science, says Sanders.

Some of the problems surrounding the use of expert witnesses may have been precipitated by changes in the law. When the federal rules of evidence were amended in 1975, they removed some of the procedural hurdles facing lawyers who wanted to introduce testimony from their own experts.

By making it easier to use such witnesses, however, the rule change also led to the misconception that the standards for allowing testimony had loosened. According to this thinking, judges were bound to admit expert testimony and juries would decide its merit.

"The rules do not express any more preference for admitting unreliable evidence than was traditionally the case

under the law," says Black. Nonetheless, the perception of looser standards led to the proliferation of so-called junk science in trials.

The Supreme Court clarified the admissibility standards in its 1993 decision regarding *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (see sidebar). That decision called on judges to serve as gatekeepers who "must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." As part of this process, the Court instructed judges to assess the reasoning and methodology of proposed expert testimony before a trial starts.

A federal district court judge in Oregon made headlines recently when, on the recommendation of four independent experts, he disallowed all testimony that silicone gel breast implants cause immune system disorders. In a pretrial decision, Judge Robert E. Jones said that the opinions of the plaintiffs' experts contained major flaws.

Jones ruled, for example, that a key witness had not submitted her results for peer review, that one type of diagnosis was untested, and that the experts had extrapolated so far from experimental data that their conclusions amounted to a "leap of faith." Jones' decision effectively ended all claims except those relating to tissue damage near the implant, although he has deferred his ruling until the scientific report from the Alabama district court emerges.

For those who support the use of independent experts in trials, the Oregon and Alabama cases provide examples of how to improve the quality of science in court. "Our advocacy system of justice in Ameri-

ca has served us very well because it ensures that each side has a vigorous representation by a loyal advocate, namely, an attorney. But it's not necessarily a good way to present a scientific story and to present scientific material to a trier of fact, whether it's a judge or a jury," says Deborah Runkle of AAAS. "In most cases, judges and juries have little or no scientific training or background, so you're presenting them with very complicated matters in a style that is not conducive to learning scientific matters."

The two cases also illustrate the difficulty of identifying appropriate neutral experts. In Oregon, the presiding judge relied on a cousin, who happened to be a noted scientist, to help select four specialists. The judge in Alabama enlisted the aid of six so-called special masters, legal and scientific scholars who performed the task of identifying and interviewing potential independent experts.

The special masters spent over 300 hours trying to find appropriate people who had no conflict of interest. "It was difficult and time-consuming," says Margaret A. Berger, a professor at the Brooklyn Law School in New York, who served as one of the special masters. "We were looking for people who did not work directly in that field, but people who worked close enough to that field that they didn't have to start at square one in terms of the necessary information."

The AAAS hopes to streamline the process of finding neutral experts. It has proposed a 5-year demonstration project to help courts identify appropriate scientists and engineers to serve as court-appointed experts. The AAAS and the American Bar Association developed this plan several years ago but have thus far failed to secure suitable funding. However, Breyer's opinion in the *Joiner* decision and his support for the demonstration project have raised the profile of this issue.

Judges have wide latitude in using such independent experts. In the pretrial phase, the independent expert can help the judge assess the testimony offered by the opposing parties' expert witnesses and decide what elements can be presented to the jury. During the trial, the independent expert can testify, answering questions from the judge and from the lawyers.

The idea of court-appointed experts does not get a warm welcome from many lawyers. At the AAAS meeting, Thomas W. Henderson, a plaintiff's attorney from Pittsburgh, rose to say, "I want to weigh in on the side of extreme reservation regarding the appointment of experts by the court." Even independent experts have biases, he notes, and they have tremendous power over juries.

A study by the Federal Judicial Center backs Henderson up. When Cecil and a colleague investigated a set of cases involving court-appointed experts, the verdicts

How courts screen scientific evidence

Until recently, judges often used a seemingly simple test for determining whether or not to allow expert scientific testimony into a trial. According to this rule of thumb, known as the Frye test, the scientific techniques at issue had to be "generally accepted" as reliable by the scientific community.

In 1993, the U.S. Supreme Court ruled that the Frye test was not the correct standard. In the case of *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, the Court held that judges must assess whether the reasoning or methodology underlying any proposed testimony is scientifically reliable and relevant.

The general acceptance test is only one of several questions that could help in this evaluation, the Court said. The *Daubert* decision offered a partial checklist of other factors to consider:

- Whether a theory or technique can be, and has been, tested. The Court noted that the issue of testability relates to the most basic definition of science. Various philosophers have held that scientific explanations differ from other ideas principally because scientific ones can be tested, or falsified.
- Whether a theory or technique has been subject to peer review and publication.
- Whether there are standards or error rates that apply to a particular technique.

The *Daubert* decision included potentially confusing language, stating that "the focus, of course, must be solely on principles and methodology, not on the conclusions that they generate." For some people, this meant that judges could not evaluate conclusions, only the information on which conclusions are based.

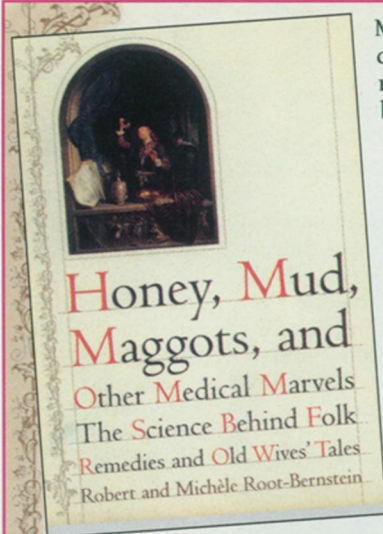
Last year, in *General Electric Co. v. Joiner*, the Court addressed this issue by stating that "conclusions and methodology are not entirely distinct from one another." It went on to say that "a court may conclude that there is simply too great an analytical gap between the data and the opinion proffered."

—R. Monastersky

matched the guidance offered by the expert 56 out of 58 times. In the other two cases, judges reached decisions based on legal grounds unrelated to the scientific and technical issues.

Some lawyers view this as evidence that independent experts can exert undue influence, in essence replacing judge and jury in a trial. Cecil counters that court-appointed experts filled a void in these trials. "Experts are frequently appointed where the adversarial process has failed to provide information that's necessary for a reasoned and principled resolution of the dispute. In that case, when there's not adequate information for a thoughtful resolution of the issue, if a court appoints an expert, it's not surprising that the expert would, in fact, be influential in that decision."

Cecil and other proponents of independent experts acknowledge that they need to be used only rarely, when it has grown clear that the traditional adversarial system is not working. "In my opinion," says Cecil, "appointment of an expert will always be an extraordinary event that will nonetheless be an important tool for resolving some of the most difficult issues of science that come before the courts." □



Many modern medical practices—the use of clay in medications for diarrhea and components of urine in fertility drugs, to name two—began as old wives' tales or folk remedies.

In *Honey, Mud, Maggots, and Other Medical Marvels*, Robert and Michele Root-Bernstein unearth stories that range widely across time and place, from ancient Egypt to the rain forests of contemporary Latin America.

The authors find that current research verifies the biochemical bases of the efficacy of such supposedly outdated practices as "taking the waters," allowing the formation of "laudable pus," and bloodletting. Most important, an increasing number of physicians, pharmaceutical researchers, and scientists are recognizing the wealth of knowledge that can be retrieved from abandoned practices of earlier eras and from non-Western civilizations. While warning against panaceas and crackpot cures, the authors argue vigorously that conventional medicine ignores, at great cost, the world of folk medicine. They propose that we establish rigorous protocols for the systematic exploration of folk remedies that range from using maggots to clean gangrenous sores to using honey as an antibiotic.

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Earth Science

Shifting ground at nuclear waste site

Yucca Mountain in Nevada—the nation's top candidate for a high-level radioactive waste repository—is on the move. This windswept ridge and its environs are shifting at least 10 times faster than geologists had expected, according to precise surveying measurements made with the Global Positioning System (GPS) satellites.

For nearly 2 decades, federal scientists have been studying Yucca Mountain to determine whether it would make a suitable underground burial site for radioactive waste from nuclear power plants and weapons facilities. Once tucked away inside the mountain, the waste must remain isolated for 10,000 years while its radioactive isotopes decay (SN: 11/1/97, p. 277).

To study ground movement around the proposed location, geologist Brian Wernicke and his colleagues took GPS readings at five sites situated along a 34-kilometer line that cuts across Yucca Mountain. Given the relatively short time frame of their study and the history of faults, the researchers expected to find no movement. Yet from 1991 to 1997, the two farthest stations moved apart roughly 1.7 millimeters per year, with smaller shifts between the middle stations, the researchers report in the March 27 *SCIENCE*.

"That is 10 to 100 times [the value] that you would derive from what's known about the seismic history of faults across Yucca Mountain," says Wernicke of the California Institute of Technology in Pasadena.

Researchers are puzzled about why the region is stretching so much faster now than it has over the last million years. One possibility is that the crust is undergoing temporary readjustments following a magnitude 5.4 earthquake that struck 20 km southeast of Yucca Mountain in 1992. Wernicke and his colleagues argue that this explanation is unlikely because the quake was relatively small and far away from many of the GPS sites.

Instead, they propose that magma movement deep in the

crust could be driving the ground motion at Yucca Mountain. If so, the region could be passing through a geologically short period of activity, lasting roughly 100,000 years, when the rates of earthquakes and volcanic eruptions exceed the long-term average over millions of years.

Eruptions are of particular concern because a direct hit would blast radioactive material into the atmosphere. Yet past studies have concluded that the volcanic threat is minimal. Researchers have estimated a 1 in 10,000 chance that a volcanic eruption will disrupt the site of the proposed nuclear waste repository over the next 10,000 years, says Bruce M. Crowe, a geologist with Los Alamos (N.M.) National Laboratory.

Wernicke and his coworkers suggest that the true probability could be 10 times higher. Crowe says the impact of the new study remains uncertain. "I think [Wernicke] has jumped a little too quickly to the volcanism model to explain his interpretations." Both agree that a prudent plan would be to set up a network of GPS stations around Yucca Mountain to resolve how much the ground is shifting.

—R.M.

Ancient quake sliced crusader castle

Around dawn on May 20, 1202, a powerful earthquake cut through a crusader castle overlooking the Jordan River in what is now Israel, according to a team of geologists and archaeologists. The researchers gleaned such a precise description of the damage by studying historical accounts and the disturbed sediments near the castle, called Vadum Jacob.

The walls of Vadum Jacob sit directly atop a major fault in Earth's crust, making them ideal recorders of ground movement, according to Ronnie Ellenblum of Hebrew University in Jerusalem and his colleagues. The earthquake, with an estimated magnitude of 7.6, shifted the walls by 1.6 meters, the researchers report in the April *GEOLOGY*.

—R.M.