groundwaters in the region have an isotopic signature like the trench 14 carbonates, and he suggests that in the past, when these carbonates were formed, Yucca Mountain may have been gushing with groundwater of a different kind—the kind that is typical of a Szymanski source zone.

Though Archambeau and Price have helped give Szymanski's theory credibility, it has yet to pass muster in formal peer reviews. In fact, it has flunked the two reviews completed so far. The first was conducted by a group of experts retained by the state of Nevada and the second by a panel of federal scientists chaired by William Dudley, Jr., of the USGS. Though only the DOE-USGS review has been made public, *Science* has obtained, among others, a critique performed for the state by University of Nevada seismologist James Brune. In it, Brune comments that Szymanski's thesis seems "unlikely" and appears to be "scientifically unsound." Yet he writes that the possibility that it is correct "cannot be discounted."

Brune judged the discussion of earthquakes to be especially weak because it leaned on a theoretical model developed by a Bureau of Mines geophysicist named Brian Brady. In the early 1970s, Brady proposed his own method for predicting earthquakes and then, in an infamous case, went on to apply it. He forecast that a major quake would hit a town in Peru on a specific day. It caused an international flap and a local panic, and when the day came, there was no quake. Brune says that an analysis performed by Clarence Allen of the California Institute of Technology found Brady's theory to be "completely untenable." The fact that Szymanski relied so much on it, Brune wrote, "casts a great deal of doubt on the validity of this part of the report."

Asked if he had read these comments and written any response, Szymanski told *Science* he had not bothered. He dismissed them as the work of contractors, whom he speaks of as "fleas." However, Brune was pleased to see that Szymanski's final draft—a sprawling 911 pages long—omits the Brady references.

Flap Erupts Over Dioxin Meeting

Everything about dioxin is so politically charged, even the science, that the organizers of a Banbury Center dioxin conference last fall expected their meeting would generate some controversy. But no one anticipated the furor that erupted in early February when participants learned that a public relations firm hired by the Chlorine Institute, which helped pay for the conference, was circulating a "consensus" summary of the meeting. The document, not surprisingly, supports the industry line on dioxin.

"I'm outraged," says Ellen Silbergeld, a toxicologist at the University of Maryland, who insists that the press materials—which none of the participants approved—misrepresent her views. "I agreed to participate based on my previously held high regard for Banbury and Cold Spring Harbor," she wrote in a letter to Banbury Center director Jan Witkowski. "I did not expect to be manipulated by industry or government spokespeople." Silbergeld sent copies of her letter to all the participants and to the press.

"It was basically mishandled," sighs Witkowski, who admits to a degree of naïveté in dealing with such a "highly politicized" issue as dioxin. He has just written a letter to all the meeting participants explaining that the Banbury Center in no way authorized the press materials that were sent out. "I am very sorry that what was intended to help promote the goals of the meeting has gone so awry," he wrote.

The intensity of Silbergeld's reaction may say more about the extreme sensitivities over dioxin than about the culpability of any of the parties involved, all of whom have taken some heat. The flap nevertheless illustrates what can go wrong when the roles and agendas of sponsors and participants aren't clearly spelled out.

What Silbergeld, who was formerly with the Environmental Defense Fund, finds most disturbing about the events is the "violation of process." And she has found an unexpected ally in Vernon Houk, director of the Center for Environmental Health and Injury Control at the Centers for Disease Control. Houk is in almost total disagreement with Silbergeld on the dangers of dioxin—he believes that they have been vastly overrated. Yet Houk told *Science* that he, too, is "disturbed" by the publicity campaign. "I don't think it is fair to represent consensus when none was really sought," says Houk. Silbergeld's view is also supported by a number of the other participants, albeit with somewhat less emotion, who say they feel manipulated and misused.

When the Chlorine Institute, an industry trade group, approached Banbury director Jan Witkowski early last year about holding a dioxin meeting, he had no inkling it would turn out differently from the 15 or so other meetings the center runs each year, some of which are also sponsored by industry. And to the Chlorine Institute, the time was ripe for another look at dioxin's risks, given shifting sentiments among at least some scientists that dioxin may be less dangerous than previously believed. Chlorine Institute officials thus believed that a scientific meeting could be "beneficial to our interests, particularly our interest in the paper industry," explains Joe Walker, the institute's head of communications. Walker is referring to the enormous pressure the paper industry is now under to reduce the amount of dioxin that arises as a by-product in the bleaching process.

The Chlorine Institute lined up Robert Scheuplein of the Food and Drug Administration to run the meeting. He then asked Michael Gallo, a toxicologist at the Robert Wood Johnson Medical School in New Jersey, and Cornelius A. van der Heijden, a regulatory official in the Netherlands, to chair the meeting with him. From then on, the Chlorine Institute studiously kept itself out of the picture, say both Witkowski and the meeting organizers. The three organizers picked all participants, with one exception: George Carlo, who was invited as an observer for the institute at its request. Carlo, an epidemiologist and lawyer who heads the Health and Environmental Sciences Group in Washington, D.C., is a regular consultant to the institute.

> ***"I am very sorry that what was intended to help promote the goals of the meeting has gone so awry."***
>
> —JAN WITKOWSKI

The meeting itself went surprisingly well; indeed, some agreement was reached by people from opposite sides of the dioxin debate on a number of issues. For example, there was nearly unanimous agreement that, in light of a new understanding of dioxin's molecular actions, the Environmental Protection Agency should take another look at how it assesses the risk of this chemical. Several people, most notably the meeting organizers, speculated

The Dudley report, issued by DOE in July 1989, was just as harsh as Brune's analysis. The summary said that while some reviewers found Szymanski's ideas "constructive" and "stimulating," "most doubt that there is sufficient technical basis to warrant pursuing the author's hypotheses further." The authors singled out one problem in particular that others have complained about since—namely, that the thesis provides no numerical model that can be used to estimate the magnitude, frequency, or duration of the events Szymanski postulates.

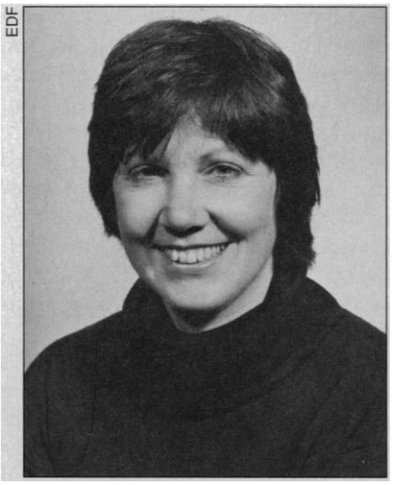
Szymanski did not respond in detail to these criticisms, either, but said they are typical of the kind that come from people who have been trained to think about geology and hydrology in static terms and are hostile to new ideas. "I do not want to be presumptuous," he said, "but prior to Charles Darwin, people had the idea that species remain unchanged; Darwin showed that they evolve. The situation is similar with hydrology."

Although Szymanski has taken a couple of heavy blows in the first rounds of peer review, the debate has not yet run its full course. Judging by the kind of arguments Price and Archambeau are using now—comparing the veins in trench 14 with even thicker (and relatively young) deposits elsewhere on Yucca Mountain—DOE and the USGS may have to collect a lot more information on the quality, size, and location of carbonate deposits in the area before they will be able to present a complete case on the origin of the material in trench 14.

Meanwhile, the DOE staff continues to plug away at the massive "site characterization" effort at Yucca Mountain, costing about $1 million a day. Gertz says the government is prepared to continue in this investigative mode, spending up to $4 billion, until it is satisfied that it has laid to rest all reasonable concerns about safety. That is a huge financial investment. But at least it is paying for some intriguing geological research. ■ ELIOT MARSHALL

that such a reexamination would reveal that EPA overestimates how risky dioxin is—though others, like Silbergeld, rejected that idea (*Science,* 8 February, p. 624).

But the harmony was to prove short-lived. In retrospect, most participants with whom *Science* spoke say they failed to realize that the meeting was sponsored by industry, along with the EPA, even though the invitation clearly said so. And none of the participants *Science* spoke with, nor even meeting co-organizer Gallo, knew Carlo was there as the institute's observer. Silbergeld, Houk, and others say they have no problem with industry sponsorship of scientific meetings—as long as everyone's role is clear.



No consensus. *Ellen Silbergeld's objection to the press release won support from other participants.*

At the meeting Carlo heard the message the Chlorine Institute hoped he would. The institute's intention, from the outset, was that "if the conference outcome was favorable we would take advantage of it and bring it to the attention of key people in the media," says Walker. They hired Edelman Medical Communications to do just that.

Witkowski saw no problem with the institute publicizing the results of the meeting—after all, they paid for half of it—as long as it was well done. But what he thought would be a straightforward press release turned into a fiasco of crossed signals and miscommunication. For example, Gallo, Scheuplein, and van der Heijden were delighted to cooperate—and indeed, each wrote his own one-page summary of the meeting for the public relations firm. But Gallo and Scheuplein now complain that they had assumed that Edelman was representing the Banbury Center, not the Chlorine Institute.

In addition, Witkowski's only condition in agreeing to the press release was that he have final approval. As agreed, the Edelman staff sent him the cover letter to the press, which he edited to remove any references to the Cold Spring Harbor Laboratory. But in December, Edelman sent out a press packet that included, along with the statements from the three chairmen alluded to in the letter, a background paper purportedly written by Carlo that none of the organizers or participants had seen. The paper asserted, among other things, that the Banbury meeting "reinforced the notion that dioxin is much less toxic to humans than originally believed."

The cover letter also differed from the version Witkowski had approved in two important respects. First, it referred to the meeting as a "consensus conference." Says Witkowski: "Just those two words set the whole framework. It was not a consensus conference. That is what is causing all the trouble." What's more, the draft he approved carried a disclaimer, which was missing from the final version, saying that the three statements were the views of the chairmen and not the conference as a whole. Meeting organizers Gallo and Scheuplein also object to the letter—essentially to the two offending words—and insist that they never saw it.

When Silbergeld got hold of the press packet from a reporter at the end of January, she exploded, writing a letter to Witkowski that took all of the parties to task. Events then took a bizarre twist when Carlo, who received a copy of Silbergeld's letter, called Witkowski to say he had not written the paper after all and had no idea how his name ended up on it. Carlo has since launched a massive telephone campaign—calling the participants and this reporter repeatedly—to clear his name. Carlo concedes that he did work with Edelman and the Chlorine Institute in developing the paper but asserts, nonetheless, that, "No one has the right to put someone's name on a document."

Nancy Turett, senior vice president at Edelman, admits to putting Carlo's name on the paper—she says because he was so extensively involved in drafting it. "The end product is very much a reflection of what Dr. Carlo thought should be in it," says Turett, who says she assumed that the Chlorine Institute had cleared the final document with Carlo. Institute officials say, meanwhile, that they thought Edelman had gotten Carlo's permission.

Turett also takes the blame for the revised letter, calling it a simple editorial mistake. "I thought there was a consensus. There is no big agenda. It is just a cover letter." She called *Science* back to add, however, that Edelman never distributes a single word without the client's approval.

All of which leaves Witkowski at the Banbury Center shaking his head in disbelief. He realizes, much to his dismay, that this flap threatens to "poison" the entire meeting and undermine the fragile—and unexpected—agreement the group forged on the molecular action of dioxin. "That is the kind of thing you would hope would happen at a scientific meeting," says one participant who asked to remain unnamed. "It was like a little flower just starting to bloom, then along came this mess. I feel very sad." ■ LESLIE ROBERTS