CHERNOBYL EXPLOSION

# Inside Look Confirms More Radiation

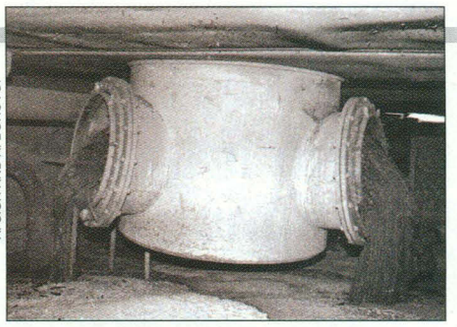
Most graduate engineering theses are quickly consigned to the dusty stacks of a library. Not so Alexander Sich's Ph.D. treatise at the Massachusetts Institute of Technology. Last month, Sich's opus won him a doctorate in nuclear engineering—and promptly became front-page news in *The Boston Globe*. The reason: Sich, after spending 18 months in the Ukraine and working inside the Chernobyl nuclear reactor, provided an unprecedented look at the aftermath of the reactor's explosion on 26 April 1986. "I went there on a whim and a prayer. I had some pretty amazing access to people, places, and data," says Sich.

That access has produced the first extensive onsite analysis of the radioactivity released from Chernobyl. Sich concludes that attempts to douse Chernobyl's burning core with tons of material dumped from helicopters were largely futile, and as a result, the crippled reactor released far more radioactivity than Moscow officials estimated at the time of the accident. That's no big surprise to researchers in the West, who had reached a similar conclusion based on less reliable airborne monitoring and ground deposition studies outside the former Soviet Union. While some of Sich's findings are still being debated, his overall effort is winning high praise. "He's brought some valuable new information to the table," says nuclear safety engineer Edward Warman of Boston's Stone and Webster Engineering Corp., co-author of a 1987 study on Chernobyl's health and environmental affects.

Sich, a fluent speaker of Ukrainian and Russian, gained the trust of local scientists studying the accident on his visit, which began in 1990, and convinced the research director at Chernobyl, Alexander Borovoi, to put him on staff. Working for brief periods inside the concrete sarcophagus that now encases the reactor, Sich helped analyze dozens of samples taken by drilling into the lava-like material that resulted from the core melting through its containment vessel and flowing into lower regions of the plant. There its heat dissipated and it solidified.

Those samples held a wealth of information. Soviet officials had claimed, at a 1986 conference in Vienna, that only 13% of the cesium and 20% of the iodine from the core was released into the atmosphere. But by looking at the remaining cesium-137 and other radioisotopes in the core samples, Sich computed a release of more than 65% and 85% of these elements, respectively. In what he calls a conservative guess, Sich concludes that the accident released more than 185 million curies—four to five times higher than the Soviet estimate. Sich's numbers are in line with current Western thinking about the accident, says Warman. Borovoi, however, still thinks Sich might be overly "pessimistic," suggesting that a lot of the vaporized radioactive particles were reabsorbed by surrounding reactor material and never reached the atmosphere.

The core samples had other news, too. They revealed almost no trace of sand, neutron-absorbing boron, lead, or any other portion of the 5000 tons of helicopter-dropped material that Soviet officials claimed had effectively quenched the fire in the 10 days after the explosion. The pilots, says Sich, were largely ignorant of the reactor design and were merely told to aim for a "red glow" presumed to be the burning core. Yet later analysis of photographs showed that the red glow, which may have been a small ejected core fragment, was more than 50 feet from the reactor; it is now covered with a 4-story mound of dumped material. "I strongly contradict the Soviet claim that the core was covered with the material," says Sich, asserting that an observed large dropoff in radiation release nearly 10 days after the accident was simply because the core had spread itself thin and cooled off.



A. SICH AND A. BOROVOI

**Chernobyl lava.** Portions of the molten core spread through the plant and froze.

Calling it "tricky to believe" that none of the material hit its target, Harvard University's Richard Wilson, who has studied Chernobyl extensively, is still cautious. "I would like to withhold judgment" pending a closer look at the data, he told *Science*. He and other Chernobyl followers will get their chance in May, when portions of Sich's thesis hit the press in the journal *Nuclear Safety*.

**–John Travis**

ASTRONOMY

# Gloomy Picture for Photo Astronomers

On his next trip to Argentina, William van Altena fears he may run out of film—a frustration for any tourist, but for Van Altena, a Yale University astronomer touring the cosmos, the situation is much more serious. Since 1987, he has been taking photographs of the southern sky using his discipline's version of film: glass plates covered with a highly sensitive photographic emulsion. But last fall Eastman Kodak, the primary supplier of almost all astronomical plates, told Van Altena that it had stopped producing the type he needed. "With no warning, they dropped the bomb," recalls Van Altena, who needs 600 more plates to finish his research on the motion of stars.


JON CHASE/HARVARD NEWS OFFICE

**Fading plates.** Harvard astronomer Martha Hazen looks at a photographic plate, a technology that may be on the way out, taking some astronomers with it.

Van Altena is not alone. Kodak's recent move to discontinue more than a half-dozen types of plates, which were bringing in little money, has caused photographic astronomers to wonder if their discipline has any future. And last month at the American Astronomical Society (AAS) meeting in Alexandria, Virginia, these worried scientists confronted a Kodak representative, Gordon Brown, who tried to explain his company's actions and dispel rumors that other plates would be next. From Kodak's perspective, he said, there just isn't a lot of business to be had. "They may be selling only $1,000 a year [of a particular plate]. It's just not cost-effective," says astronomer Eric Craine, who convened the special session at AAS.

In large part, the astronomers' crisis stems from a digital revolution, which has, over the past decade, replaced glass plates with light-sensitive chips known as CCDs. But there is still a small community doing traditional photographic astronomy, and many of them have decades-long, wide-field sky surveys under way and other projects that depend on comparing current plates to those taken many years before.

Moreover, these scientists argue that plates are still superior to CCDs for some projects. "There are things we can do with a