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costly proposals to cut sulfur emissions. "For every lake that will die in the Northeast if acid rain is not controlled," says Krohe, "there is a Midwestern coal town which may die if it is." Already, one-quarter of Illinois's 16,000 coal miners are out of work. If Washington forces Midwestern utilities and factories to shift to low-sulfur coal (mined in the West and in Kentucky and West Virginia), Midwestern coal sales would drop by another 44 to 67 percent. An alternative is to require industrial smokestack "scrubbers" to remove sulfur oxides in existing plants (federal law already mandates them for big new ones). But a single scrubber can cost \$200 million. A reduction of eight million tons in annual sulfur oxide emissions would cost \$40 billion by 1995.

Krohe doubts that scientists or politicians will be able to agree on what to do about acid rain any time soon. In the meantime, low-cost reductions of acid rain and its effects are possible—coal "washing" to remove sulfur, energy conservation, applying acid-neutralizing lime to lakes. Writes Krohe, "It's hard to imagine an acid-rain program that won't cost anyone anything, [but] it isn't hard at all to imagine one that costs more than it needs to."

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What Monuments Are For

"A Meaning for Monuments" by William Hubbard, in *The Public Interest* (Winter 1984), 20th & Northampton Sts., Easton, Pa. 18042.

Before it opened on Veterans Day 1982, the modernistic Vietnam Veterans Memorial in Washington, D.C., was scorned by some critics as a "black ditch of shame." The controversy soon faded. Even so conservative an observer as newspaper columnist James J. Kilpatrick wrote upon seeing the monument, "I could not speak. I wept."

Hubbard, a UCLA architect, shared that reaction. What is so moving about the monument—a V-shaped wall of polished black granite, its top level with the ground behind it, sloping down 10 feet into the earth at its vertex—is the roster of 58,000 dead and missing U.S. servicemen carved row after row in the stone. But Hubbard says that tears are not enough. The Vietnam Memorial (like other recently erected monuments) may intensify viewers' emotions, but it does not *clarify* them. The memorial neither gives a symbolic explanation of why the soldiers died nor helps viewers gain perspective on their feelings about the Vietnam War.

Traditionally, Hubbard says, "by asking us to contemplate imaginatively the ideas they embody, monuments prod us to think through the implications of our social ideals." But since World War II, architects have increasingly followed the path blazed by modern artists, creating monuments, buildings, and other structures that are abstract and de-

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tached from the real world. Viewers are not supposed to be reminded of (or to reflect on) shared experiences, they are meant to contemplate the unique qualities of the works themselves.

A case in point is the 1970 monument in Dallas commemorating President John F. Kennedy's assassination. Hubbard describes it as a "large hollow cube lifted off the ground and open to the sky, with a vertical slit cut out of the center of two opposite sides." The monument does not seem to focus attention on the tragedy of 21 years ago, he protests, but on "the feeling of enclosed space and the play of light on hard surfaces."

Hubbard does not contend that the Vietnam Memorial should have exalted the war itself. Such a monument, he says, "would have been a sham." Rather, the memorial should have led viewers to ask such questions as: "Is the defense of this land the only justification we will accept for sending young men and women to death in faraway places?"

Art, Hubbard asserts, must help people think about *human* experience. The alternative is "to leave the field in the sole possession of words," which do not always alone suffice. A monument that spoke in the symbolic language of the imagination, he believes, might have helped Americans get closer to agreeing on the meaning of Vietnam.

The Secret of Stradivarius

"The Stradivarius Formula" by Joseph Alper, in *Science* 84 (Mar. 1984), P.O. Box 10790, Des Moines, Iowa 50340.

For nearly 200 years, no one has been able to duplicate the sound of the stringed musical instruments made during the Renaissance by Antonio Stradivari and by later Italian masters. But the work of a chemist in Texas could change all that, says Alper, a freelance writer.

From the mid-1500s to the late 1700s, a colony of uniquely skilled musical craftsmen flourished in the northern Italian town of Cremona. The violins of Stradivari, Nicolo Amati, and Giuseppi Guarneri were hailed throughout Europe for their rich sound. Today, these Cremonese instruments remain highly prized by musicians: One of the 700 extant Stradivari sold recently for \$1.2 million.

Succeeding generations of violin makers have examined the wood, the construction, and the acoustics of Cremonese instruments, but the secrets have eluded them. Now Joseph Nagyvary, a biochemist at Texas A & M University, thinks that he has unlocked the mystery.

He believes that modern craftsmen are the victims of a cruel trick played by Joannes Baptista Guadagnini, one of the last Cremonese masters. The secretive Guadagnini told his patron, Count Cozio di Salabue, that violins must be made from wood untreated by any chemicals. Eager to pass the secret on to posterity, the Count included it in a treatise on the violin. Ever since, craftsmen have used untreated wood.

But after extensive research, Nagyvary is convinced that the great Cremonese instruments were made from wood treated with a variety of mineral solutions that altered the wood's cellular structure and affected the instruments' sound quality. Nagyvary's investigation also re-