

# A curse to last 10,000 years

A nuclear-waste dump needs a 'keep out' sign with a long half-life

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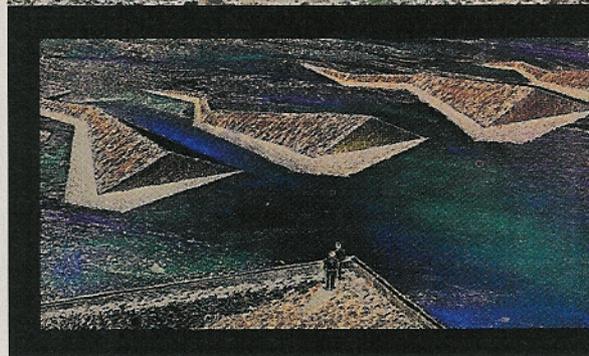
**S**ure, right now Nevada's Yucca Mountain—which President Bush last week designated America's official dump for the deadliest nuclear waste—sits in a desert sparsely populated by English-speaking homo sapiens. But care to make a wager about the year 12,002? Then, Yucca might rise from the suburbs of some post-human society straight from *Stargate SG-1*. So how can we warn Yucca's future neighbors against poking around this nuclear tomb, which will still be radioactive 10,000 years hence?

Not a single spent nuclear-fuel rod will be shipped to the mountain until construction of the repository is finished—perhaps by 2010—and the Nuclear Regulatory Commission and Environmental Protection Agency approve a plan for storing the waste. Environmentalists and Nevada officials are vowing to fight the project in court. But the Department of Energy is already starting to ponder how to comply with a federal requirement to mark the site for the next 100 centuries. It has plenty of ideas to choose from.

Earlier this year, the University of Nevada–Las Vegas hosted an exhibit ([www.desertspace.org](http://www.desertspace.org)) of potential Yucca warning concepts—some sarcastic, some whimsical, such as seeding the mountain with genetically modified, blue-colored yucca shrubs or transforming it into a simulated volcano. But more likely, says DOE spokesman Joe Davis, “We’ll take a look at what they’re doing at WIPP.”

That would be the Waste Isolation Pilot Plant near Carlsbad, N.M., which since 1999 has been storing waste from nuclear weapons production in an old salt mine. WIPP consulted panels of academics—including archaeologists, astrobiologists, and materials experts—about the warning-marker conundrum.

**Scare tactics.** They noted that although it might seem sensible to fashion markers from a durable material like titanium, ancient Egypt teaches a different lesson. The fine limestone that originally cloaked the Great Pyramid of Cheops, for instance, was pried off and reused. And scare tactics like the curses on Egyptian tombs can backfire. “Nothing that says, ‘Touch this rock and die,’” says archaeologist Maureen Kaplan of environmental consultants ERG. Inevitably, someone would touch a rock and



**FEAR AND LOATHING.** A field of 50-to-80-foot-tall concrete thorns and jagged “menacing earthworks” are two designs for warning markers developed for a nuclear-waste dump in New Mexico; they may now be considered for Yucca Mountain.

survive, undermining the warning.

Of course, writing may not get the message across in the distant future. So the teams also considered ways to embed a warning in the marker structure itself. One proposal: “menacing earthworks” resembling the jagged lightning-bolt insignia of Hitler’s SS. “That one would scare the be-jesus out of you,” says Roger Nelson, WIPP’s chief technology officer. But costly, elaborate structures can draw the wrong kind of attention. “The more grandiose you make it, the more likely people will wonder what you’re hiding,” says Jon Lomberg, artist for the PBS series *Cosmos*.

WIPP eventually chose a plan to surround the site with a plain, 33-foot-high, 100-foot-wide berm of rock, soil, and salt. Inside the berm, to be built sometime after the site closes in 2035, will be 16 granite monuments (shades of Stonehenge) and many buried markers. Some

will carry warnings in the six official languages of the United Nations, as well as Navajo; others will feature Edvard Munch-esque distorted faces to represent horror, and changing star positions to illustrate when the waste was buried.

At Yucca, where the buried radioactivity will be fiercer, project managers are leaning toward edgier concepts, according to those familiar with their thinking. Two favorites are the menacing earthworks and a field of giant concrete thorns bursting from the ground near the mountain.

But University of California–Irvine physicist and sci-fi author Gregory Benford favors the opposite extreme: doing nothing. Well, almost nothing. “Build some kind of monument out of government concrete which will be gone in two centuries and forgotten,” he says. He notes that the only major unlooted Egyptian tomb was King Tut’s, which was unmarked. ●