

## Nuclear Waste

RICHARD A. MULLER



As PEOPLE recognize the dangers of fossil fuel plants—especially the risk of global warming from carbon dioxide production—nuclear power begins to look more attractive. But what about the waste—all that highly radioactive debris that will endure for thousands of years? Do we have the right to leave such a legacy to our children?

Nuclear waste is one of the biggest technical issues that any future president is likely to face. The problem seems totally intractable. Plutonium—just one of the many highly radioactive waste products—has a half-life of 24,000 years. Even in that unimaginable amount of time, its intense radioactivity will decrease by only half. After 48,000 years it will still emit deadly radiation at a quarter of its original level. Even after 100,000 years the radiation will still be above 10% of the level it had when it left the reactor. What if it leaks into the ground and

**RICHARD A. MULLER** is professor of physics at the University of California at Berkeley. He is a past winner of the MacArthur Fellowship, often referred to as a “genius” award. This piece was given originally as a lecture in his physics course for non-science students and was then published in a collection of his course lectures, *Physics for Future Presidents* (2008).

reaches human water supplies? How can we possibly certify that this material can be kept safe for 100,000 years?

Still, the US government persists in its pursuit of “safe” nuclear waste disposal. It has created a prototype nuclear waste facility buried deep within Yucca Mountain, Nevada (Figure 1). To keep the waste safe, the storage rooms are 1000 feet below the surface. To store even part of the present nuclear waste requires a vast area, nearly 2 square miles. The cost of the facility is expected to reach \$100 billion, with hundreds of billions of dollars more in operating costs.

To make matters worse, the Yucca Mountain region is seismically active. More than 600 earthquakes of magnitude 2.5 and higher have occurred within 50 miles in the last decade



Figure 1. Yucca Mountain, Nevada, the site of the prototype nuclear waste storage facility.