appreciate the amount of time involved: Ten thousand years ago humans had just discovered agriculture. Writing wouldn't be invented for another 5000 years. Can we really plan 10,000 years into the future? Of course we can't. We have no idea what the world will be like then. There is no way we can claim that we will be able to store nuclear waste for 10,000 years. Any plan to do that is clearly unacceptable.

Of course, calling storage unacceptable is itself an unacceptable answer. We have the waste, and we have to do something with it. But the problem isn't really as hard as I just portrayed it. We don't need absolute security for 10,000 years. A more reasonable goal is to reduce the risk of leakage to 0.1%—that is, to one chance in a thousand. Because the radioactivity is only 1000 times worse than that of the uranium we removed from the ground, the net risk (probability multiplied by danger) is $1000 \times 0.001 = 1$—that is, basically the same as the risk if we hadn't mined the uranium in the first place. (I am assuming the linear hypothesis—that total cancer risk is independent of individual doses or dose rate—but my argument won't depend strongly on its validity.)

Moreover, we don't need this 0.1% level of security for the full 10,000 years. After 300 years, the fission fragment radioactivity will have decreased by a factor of 10; it will be only 100 times as great as the mined uranium. So by then, we no longer need the risk to be at the 0.1% level, but could allow a 1% chance that all of the waste leaks out. That's a lot easier than guaranteeing absolute containment for 10,000 years. Moreover, this calculation assumes that 100% of the waste escapes. For leakage of 1% of the waste, we can accept a 100% probability after 300 years. When you think about it this way, the storage problem begins to seem tractable.

However, the public discussion doesn't take into account these numbers, or the fact that the initial mining actually removed radioactivity from the ground. Instead, the public insists on absolute security. The Department of Energy continues to search Yucca Mountain for unknown earthquake faults, and many people assume that the acceptability of the facility depends on the absence of any such faults. They believe that the discovery of a new fault will rule Yucca Mountain out. The issue, though, should not be whether there will be any earthquakes in the next 10,000 years, but whether after 300 years there will be a 1% chance of a sufficiently large earthquake that 100% of the waste will escape its glass capsules and reach groundwater. Or, we could accept a 100% chance that 1% of the waste will leak, or a 10% chance that 10% will leak. Any of these options leads to a lower risk than if the original uranium had been left in the ground, mixing its natural radioactivity with groundwater. Absolute security is an unnecessarily extreme goal, since even the original uranium in the ground didn't provide it.

The problem is even easier to solve when we ask why we are comparing the danger of waste storage only to the danger of the uranium originally mined. Why not compare it to the larger danger of the natural uranium left in the soil? Colorado, where much of the uranium is obtained, is a geologically active region, full of faults and fissures and mountains rising out of the prairie, and its surface rock contains about a billion tons of uranium. The radioactivity in this uranium is 20 times greater than the legal limit for Yucca Mountain, and it will take more than 13 billion years—not just a few hundred—for the radioactivity to drop by a factor of 10. Yet water that runs through, around, and over this radioactive rock is the source of the Colorado River, which is used for drinking water in much of the West, including Los Angeles and San Diego. And unlike the