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A case of dubious rationales

The real question about plutonium pits is not how fast they're aging, but why we need them at all.

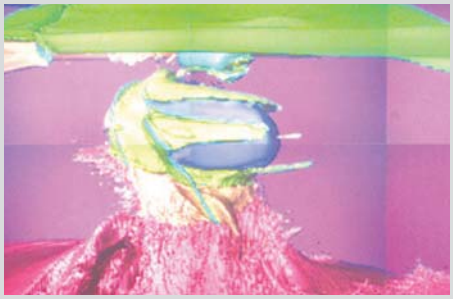
By Lawrence M. Krauss
Ambrose Swasey Professor of Physics and Astronomy and director of the Center for Education and Research in Cosmology and Astrophysics at Case Western Reserve University, and author of *Hiding in the Mirror* (2005)

The Bush administration has listed myriad reasons for funding a Reliable Replacement Warhead (RRW) Program, with the number of rationales increasing with time as critics attack many of the fundamental tenets on which the program is based.

One of the initial issues that prompted the National Nuclear Security Administration (NNSA), a division of the Energy Department, to scrutinize the nuclear arsenal was a concern over the health of the "plutonium pits" that fuel the primary fission explosion that triggers and helps sustain the more powerful fusion explosion. Because the plutonium disintegrates into uranium and alpha particles, there was a concern that these could disrupt the bulk crystal structure of the plutonium, causing possible cracks or faults that could compromise the effectiveness of the pits and reduce the destructive yield of nuclear weapons.

A review of NNSA statements over the years on plutonium aging reveals a slowly evolving change in its position. In 2002, NNSA spokesman Bryan Wilkes warned, "We know that plutonium pits have a limited lifetime . . . we could wake up and find out half our stockpile is gone to waste." In 2005, then-NNSA Administrator Linton Brooks softened this somewhat, saying, "Sooner or later the effects of plutonium aging will require all our current pits to be remanufactured." Then, less than one year later, Brooks told the *San Francisco Chronicle*, "I don't know everything I need to know about plutonium aging." (His suggested remedy for this uncertainty: Build heavier warheads, perhaps using more than the minimum amount of plutonium.) As late as May 2006, Energy officials stated that the lifetime of plutonium pits was 45 to 60 years, while news had already leaked that forthcoming scientific studies would likely extend that estimate. Still, the rumors prompted Wilkes to state, "Any further comment on plutonium aging would be purely speculative." And Brooks acknowledged that the life span of plutonium pits could be "60-plus" years.

Actually, the figure turned out to be 60 plus 40. In late 2006, a comprehensive study by the Los Alamos and Lawrence Livermore national laboratories, validated by a report by the independent Jason scientific advisory group, firmly established that plutonium pits will remain stable for at least a century. Since the oldest



LAWRENCE LIVERMORE NATIONAL LABORATORY

Power viewing: The Terascale Simulation Facility at Lawrence Livermore National Laboratory allows scientists to scrutinize complex nuclear simulations (see left).

COMPUTER MODELING:
Using the most advanced computer systems available, such as the BlueGene/L machine, scientists at the national labs study the behavior of nuclear materials and model nuclear weapon performance in three dimensions.

LIFE EXTENSION PROGRAMS:
By upgrading existing parts of certain warheads, such as fuzing systems, the United States hopes to ensure their reliability for an additional 20–30 years and to add capabilities without building new weapons.

STOCKPILE SURVEILLANCE:
By dissembling random nuclear weapons in the stockpile and closely inspecting and testing their parts, such as high explosives, scientists can identify issues that arise as weapons age.

SUBCRITICAL TESTING:
Scientists routinely detonate high explosives and nuclear materials at the Nevada Test Site to gather diagnostic information about weapons components. The amount of nuclear material used in these experiments is too small to initiate a chain reaction. Other weapons test facilities include the Dual-Axis Radiographic Hydrodynamic Test Facility at Los Alamos National Laboratory, and the Joint Actinide Shock Physics Experimental Research Facility and the Atlas pulsed power machine, both at the Nevada Test Site.

weapon in the stockpile—the W67 warhead carried by U.S. submarines—is about 30 years old, there is no immediate concern about this particular facet of the reliability of our current weapons stockpile.

In retrospect, there is little doubt that RRW proponents used concerns over plutonium aging to motivate Congress to fund their program. An aide to Republican Cong. David Hobson of Ohio—former chair of the House subcommittee that funds the nuclear weapons complex—told *Science* magazine that Energy officials used the shelf life of plutonium as a key measure of the arsenal's health. "That chain of logic makes plutonium aging central to the RRW rationale," the aide said.

Despite this, plans for the RRW Program, as part of a more comprehensive Complex 2030 restructuring of our entire nuclear weapons complex, are apparently continuing unabated. The key argument the NNSA now advances is that whether or not plutonium pits are stable, the RRW Program is required to ensure confidence in our nuclear weapons stockpile into the future, forever.

The problem with these arguments is that they beg the very important question of why we want to maintain a stockpile of 10,000 nuclear weapons into the indeterminate future. An observation made to me by Ivan Oelrich, vice president for strategic security programs at the Federation of American Scientists, exemplifies this deficit in long-term thinking: Why do we need thermonuclear weapons at all? If the primary purpose of our arsenal is deterrence against attack, a far smaller, uranium-based arsenal should be sufficient.

Indeed, this last argument underscores the key point. Our nuclear strategy should be based on logic and strategic thinking, not upon momentum alone. With the longevity of plutonium pits now far more assured, it is hard to think of a logical reason, other than maintaining the present bureaucratic status quo, to proceed with RRW. And that is a very dubious rationale on which to base our peace and security. ⚛

Taking RRW personally

The RRW Program will not close the growing generation gap among weapons designers.

By Hugh Gusterson
Professor of cultural studies at George Mason University and author of *People of the Bomb* and *Nuclear Rites*. He studies the political culture of nuclear weapons scientists and antinuclear activists in the United States and the former Soviet Union.

For most of us, the Energy Department's reliable replacement warhead (RRW) is just a thing. Some see it as a good thing—a way of assuring that the United States cuts its nuclear stockpile and avoids nuclear testing—while others see it as a bad thing—a sign that the United States is reinvesting in nuclear weapons. I see it in more human terms. That is because as an anthropologist who studies Lawrence Livermore National Laboratory, I know the people who designed it.

The RRW design that Energy picked in March is a variant on a Livermore device, tested in the 1980s but never deployed. The lead designer for that device was Seymour Sack, a mythically brilliant and gruff designer, now retired, who spent his days at work chain-smoking and drinking the strongest coffee the human constitution can withstand. His impatience for fools and refusal to negotiate his technical judgments was a source of legendary vexation to the administrators who tried to manage him. The female scientist who took the lead in reworking Sack's primary design for the RRW—that is, the fission component—was mentored by a Sack student, a designer I knew in the 1980s for his love of medieval European cathedrals.

The group leader is another Sack student whom I met soon after I arrived in Livermore in 1987. I was a graduate student in my late twenties trying to find thesis material in conversations with weapons designers; she was a young physics PhD, fresh out of MIT, beginning to learn her craft as a weapons designer. We became friends of sorts. I think of her not as a Strangelove, but as a person who had a large and boisterous golden retriever, a woman who gave her free time to help local schoolgirls go into science careers, a Japanese-American struggling to live amid the historical fallout from World War II.

Weapons designers learn their craft through apprenticeship, and they often have very close relationships with their mentors. I sometimes hear weapons scientists refer to Livermore's RRW design as having a good "pedigree." By this they mean it stays close to a well-tested and understood design. But I think "pedigree" also refers to a line of exceptional weapons designers whose expertise stands

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