whether it achieves ignition, as a way of attracting bright young scientists to LLNL. Actually, over the past year, the LLNL laser fusion program has lost some of its best laser and target scientists. But if we assume that NIF is eventually completed, at some performance level, then we need to ask a fundamental question: What kind of scientist is needed to maintain an existing set of nuclear weapons, as compared to designing or improving these weapons? Maintenance requires different skills and attitudes than design. Is an entrepreneurial and risky undertaking like the laser fusion program[2] the appropriate vehicle to attract these scientists? Will laser fusion scientists be sufficiently cautious about making changes in the weapons stockpile, or will they be risk-takers? Will they make unnecessary changes in the nuclear weapons to justify, to themselves and to their sponsors, the high capital and operating costs of NIF?

References

1. Lawrence Livermore National Laboratory, *Laser Program Annual Reports*, rep. no. UCRL-50021-80 LLNL, Livermore, Calif. (1980; see figure 2-114) and rep. no. UCRL-50021-81 (1981); available from the National Technical Information Service.
2. S. Bodner, C. Paine, *Nature* **407**, 29 (2000).

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Edward Moses replies: We must respectfully disagree with the opinions of Stephen Bodner. His views of the National Ignition Facility, Nova, and the US nuclear weapons Stockpile Stewardship Program are well known. During the many reviews that preceded the authorization of the NIF Project, Bodner expressed his concerns to the committees. These committees, and those that succeeded them, have continued to support NIF.

Bodner's representation of Nova neglects to mention that, in addition to meeting its 30-terawatt performance goal, it completed 14 000 shots over its 14 years of operation. Nova was the world's premier high-energy density physics experimental facility, where the highest quality data in hydrodynamics, plasma physics, materials science, and inertial confinement fusion were generated and the first x-ray laser was demonstrated. Over 1000 journal articles were produced and a generation of laser and laser-plasma physicists was trained.

Bodner states that NIF's specifications have been "watered down" and the NIF prototype laser, Beamlet, never met its performance requirements. In fact, Beamlet demonstrated full energy, full power, temporally shaped ultraviolet laser pulses. All aspects of Beamlet design and operation were reported in 31 journal articles. Our Beamlet experience gives us high confidence that NIF will meet its full performance goals.

Bodner raises the question of whether NIF scientists will show good judgment as future stewards of the nation's nuclear stockpile. History speaks for itself. During the past 25 years, the very same people who developed and used similar facilities are now an integral part of the nation's Stockpile Stewardship Program, committed to maintaining its safety and reliability without weapons testing. State-of-the-art facilities like NIF are needed to draw and challenge the best-qualified scientists. NIF will play a vital role in our national security while pushing the boundaries of experimental and theoretical science.

Numerous reviews conducted by the NAS, DOE, and the University of California uniformly support the view that NIF can meet its technical and scientific goals. The NIF team is working to ensure this will happen.

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Accelerator Test Facility Hosts User-Oriented Research

Maury Tigner strikes a chord with accelerator scientists in his outstanding description of the science, technology, and culture of particle accelerator R&D (Physics Today, January 2001, page 36).

Tigner refers to his recommendation in the report of the high-energy physics advisory panel's subpanel on accelerator research and development to devote intellectual and monetary resources to high-energy accelerator R&D. That report was instrumental in establishing, in 1982, the Advanced Accelerator Concepts R&D Program in the Department of Energy, Office of High Energy Physics. The program has, for several years, been supporting university, industrial, and national laboratory R&D projects on advanced accelerators. For the past decade, DOE funded, among other things, the Accelerator Test Facility (ATF) at Brookhaven National Laboratory (see http://www.atf.bnl.gov).

The ATF hosts exactly the user-oriented research that Tigner praises in the article section "Hope for the future." Fifteen graduate students have done their thesis research at the ATF since 1992, and the facility currently has 11 university users and 2 small business users. Another indication of the ATF's importance is the number of times it appears in the pages of high-impact journals such as *Physical Review, Physical Review Special Topics—Accelerators and Beams*, and *Science*. ATF users come from all parts of the US and from Russia, Japan, and Taiwan. The research covers advanced accelerator subjects, light-source science, diagnostics, lasers, and high-brightness electron sources. For nearly a decade, the facility has been a leader in accelerator-based particle and light-source research. I would like to think that the Orion project at SLAC, due to come on line in a few years, was inspired at least in part by the ATF.

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Radio Observatory at Maipú Completes Mission, Closes Doors

After 40 years of operation, the Radio Observatory of the University of Chile (ROM), located at Maipú, has closed down. The ROM came to life in 1959, 27 years after Karl Jansky's momentous discovery of cosmic radio waves. The facility was the result of two cooperative programs of the University of Chile, one with the department of terrestrial magnetism (DTM) of the Carnegie Institution of Washington and the other with the University of Florida in Gainesville. These efforts were initiated and encouraged by the late Federico Rutllant, director of the National Astronomical Observatory of the University of Chile, who wanted to have the university involved in radio astronomy. Rutllant's more ambitious interests led to the installation of large international observatories in northern Chile. At the DTM he met Merle A. Tuve, who was enthusiastic about developing radio astronomy in South America.

continued on page 82