are misleading. For example, it does not mention the active materials research in the near infrared range at Vanderbilt University, notably with semiconductor interfaces and nonlinear optics, which would be simply impossible without the Vanderbilt FEL's capabilities.

More specifically, the report does not mention the fact that no tunable broadband source exists over the entire near infrared range (1 to 10 micrometers) covered by the Vanderbilt facility. This range includes fundamental material science parameters such as semiconductor band discontinuities, interface energy barriers, and energies of artificial nanostructures (*2*).

As for the x-ray region, the NRC report mentions the importance of x-ray microscopy and holography, but states that "one must compare these techniques with recent advances in tunneling, atomic force, and near field optical microscopy" (*1*, p. 5). However, no such comparison is evident from the report, which is unfortunate because such techniques are complementary: those based on the FEL have capabilities not available in the others (and vice-versa).

Marshall states that "the Levy panel says that none [of the nine active FELs in the United States] has picosecond capability. . . ." Is the panel familiar with the basic performance characteristics of the Stanford, Duke, and Vanderbilt FELs? Did its members even visit such facilities?

Levy is credited with saying that "none of them is truly open to all comers; instead they are controlled by universities or government labs where, the management occasionally allows people to come in." This is not correct, witness the Vanderbilt users' program.

In our view, the most disturbing aspect of the NRC report is its conservatism: rather than presenting a vision of the future in FELs, its main preoccupation appears to be a defense of the status quo. If adopted, its recommendations would condemn the United States to a secondary role in a vital field of scientific research.

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Treating Brain Cancers

Faye Flam's article "Will history repeat for boron capture therapy?" (News & Comment, 22 July, p. 468) presents boron neutron capture therapy (BNCT) as a one-shot gamble aimed at a single tumor—malignant glioma—which uses a single new boronated (and one old) chemical, and a single method to deliver the thermal neutrons to the target region, that is, the nuclear reactor. While the nuclear reactor is often presented as the only way in which the neutrons could be delivered, research has identified new ways to deliver the neutron without damaging the brain or scalp. New, improved boron compounds have been developed that can be better localized in the brain tumor. The concentrations of these compounds remain lower in blood and in normal brain tissue. Other tumors, such as malignant melanoma, have been identified where BNCT may also be useful. There are also other neutron sources.

One new method for delivering neutrons is by using small pellets or "seeds" of the radioactive transplutonium radioisotope californium-252 (Cf). Californium can be produced in a highly radioactive form that can be implanted directly into the brain tumor without traversing the brain or scalp, as is necessary in the case of beam therapy. Neurosurgeons and radiation oncologists perform these treatments routinely in many medical centers using other radioactive isotopes. As Cf-252 neutrons (which are already of low energy) interact with tumor tissue, they lose further energy and become thermalized (*1*). BNCT can thus further enhance the efficiency of Cf therapy.

Experimental studies (*2*) have shown that when a human brain tumor is implanted into the brain of nude rats and treated with Cf-252 alone or Cf and boronophenylalamine, lifespans are much longer than those of untreated, tumorous mice. Earlier human studies (*3*) had already shown that Cf alone can eradicate glioblastoma from the brain.

The Department of Energy has focused on the reactor as the only way to produce neutrons. But if neutrons and boron neutron capture enhancement prove to be effective, alternative low-cost, safe, and practical sources of neutrons need to be made available on a large scale quickly.

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