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LETTERS

Conservation Research and the Legal Status of PCR Products

The challenge of obtaining biological material for conservation genetic research has always been daunting. There was some justification for tight regulatory control when genetic analysis required that a few organisms be killed to provide samples for the study of threatened or endangered populations. Polymerase chain reaction (PCR)–based genetic assays, however, can be performed with a single drop of blood, a scrap of skin, or a dried fragment of muscle. The forensic identification of whale products in commercial Japanese markets (C. S. Baker and S. R. Palumbi, Policy Forum, 9 Sept., p. 1538) is an example of molecular genetic analysis used in the service of conservation. But even as this new era in conservation biology unfolds, developments of a bureaucratic nature have cast a troubling shadow across the field.

Ironically, the first development stems from the 1993 Convention on Biological Diversity. One of its more controversial passages endorses financial compensation to developing nations for genetic resources. This initiative was aimed primarily at pharmaceutical companies prospecting for biological resources on foreign territory, but unfortunately it also has been applied to nonprofit conservation efforts. For example, two developing nations recently rejected our requests to export scientific samples (typically a few drops of blood) for genetic analysis, citing the compensation principle of the biodiversity convention.

The second development involves a mid-1994 decision by the Office of Management Authority (OMA, a branch of the U.S. Fish and Wildlife Service) to include PCR products within its jurisdiction over material from endangered species. If enforced, this new policy would place synthetic DNA under the same restrictions as apply to rhinoceros horns and elephant tusks, but the tiny synthetic pieces of DNA produced by the PCR themselves do not have monetary or aesthetic value that might invite commercial abuse. Furthermore, because PCR methodology requires preexisting knowledge of portions of the target sequence, there is little possibility that the technique could be improperly used to somehow purloin genetic resources. Instead, synthetic copies of DNA may be likened to a biological microfilm. The OMA might just as reasonably seek control over photographs or other likenesses of endangered species. To regulate this form of biological data serves only to further extend the reach of OMA into scientific arenas, at draconian cost to conservation efforts (*1*). If DNA products for scientific research were allowed to cross political boundaries freely, without cumbersome regulations being imposed by the Convention on International Trade in Endangered Species or the U.S. Endangered Species Act, the resulting genetic information highway would undoubtedly increase the pace of critically important conservation genetic research.

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Notes

1. The Society for the Study of Amphibians and Reptiles and the Herpetologists' League issued a joint resolution in August 1994 calling on the OMA to (i) provide scientific access to endangered species in a timely and efficient manner and (ii) rescind the policy of regulating synthetic DNA.

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Free Electron Lasers Fettered?

As managers of two leading research programs that use free electron lasers (FELs), we are disturbed by the factual inaccuracies and conservative philosophy of the recently released National Research Council (NRC) report on FELs (Eliot Marshall, News & Comment, 16 Sept., p. 1651). The NRC report (*1*) reflects a political agenda rather than an evaluation of the real situation. It is disturbing for one of us (G.M.) to be listed as a contributor to a report that states, for example, that "valence transitions of chemical bonds fall in the visible and ultraviolet, and band gaps of solids fall in the visible or near infrared" (*1*, p. 3). We suggest that Donald Levy and his co-authors act consistently with this opinion by renouncing forever the use of kitchen salt, windows, and eyeglasses.

On a more serious note; the NRC report mixes the analysis of three different energy ranges—visible, ultraviolet, and near infrared. Not surprisingly, its corresponding findings and recommendations

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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