SCIENCE



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# LETTERS

## Synchrotron X-rays from a B Factory

Faye Flam provides an insightful perspective (News, 27 Aug., p. 1111) into the competition between Cornell and Stanford universities for a B factory, an accelerator that promises to yield answers to such fundamental questions as why the universe contains more matter than antimatter.

The review committee, commissioned by the Department of Energy and the National Science Foundation and headed by Stanley Kowalski of the Massachusetts Institute of Technology, was asked to evaluate the relative merits of the Cornell and the Stanford B factory proposals. To help ensure a level playing field, a set of conditions was laid down, one of which was to limit the evaluation to only those factors that contributed to B-quark production. The possibility of using these machines as synchrotron radiation sources was explicitly excluded from the evaluation process. However, the Cornell proposal as initially submitted to the National Science Foundation explicitly included a synchrotron radiation facility, CHESS (Cornell High Energy Synchrotron Source) B, as an integral part of the larger accelerator project.

In contrast with the SLAC (Stanford Linear Accelerator Center) B factory design and the implications of SLAC director Burton Richter's remarks, the synchrotron radiation produced by the Cornell storage rings would not all go to waste: it has been, and would continue to be, put to good use providing extremely intense x-ray beams for relatively little additional cost and in a manner that does not compromise the design for particle physics purposes.

The novelty of the B factory as a synchrotron x-ray source results from circulating currents of up to 1 or 2 amperes of electrons and positrons at energies of 8 and 3.5 gigaelectron volts, respectively, which could be used as a high-flux x-ray source after the installation of passive, permanent magnet assemblies called undulators and wigglers into the storage rings. Having more than 10 times the design current of present third-generation high energy x-ray sources such as the Advanced Photon Source and the European Synchrotron Radiation Facility, this new facility would deliver at least an order of magnitude more photons to flux-limited experiments. In the high energy photon regime it would deliver about 100 times more x-rays than the present CHESS laboratory, which has, for the past 13 years, successfully served a community of about 500 scientists each year from diverse university, corporate, and governmental laboratories that are involved in research with x-rays (and not high energy particle physics). The incremental cost to upgrade CHESS for the B factory project would be close to $15 million. Operating costs would be roughly the same as the present CHESS facility ($2.5 million a year).

In today's lean times, it makes good sense to consider funding a B factory project that could make available to the scientific communities an extraordinary x-ray source at a modest scale and which would greatly advance the quality of x-ray experimentation by tapping the power of a new world-class accelerator.

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In his letter of 17 September (p. 1505), Burton Richter, director of the Stanford Linear Accelerator Center (SLAC), lists some of the technical risks involved in the Cornell design for a B factory. In fact, there are technical risks inherent in both designs. The B factory review panel concluded in its report that both proposals were workable and that in each case the engineering challenges would be met and overcome. It also concluded that the cost of the Cornell proposal—including the cost of the collider, the detector, commissioning, and operation—would be significantly lower than that of the SLAC proposal.

It is to be hoped that the decision of where to build the B factory will be based on this unbiased report rather than on the statements of laboratory directors like Richter and me.

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## Biodiversity Entreaty

D. L. Burk *et al.* paint a grim picture of the future of the U.S. biotechnology industry if the United States complies with the Biodiversity Convention (Policy Forum, 25 June, p. 1900). We believe this picture is unjustified and neglects the importance of preserving irreplaceable biological resources. Genetic diversity, the raw material of biotechnology and pharmacology, will be greatly reduced over the next several decades unless financial incentives are established for developing countries to preserve genetic resources. The Biodiversity Convention represents a first attempt to develop a framework within which developed and developing nations share in protecting genetic resources as well as in the profits that may result from their exploitation. The purpose of the treaty is not to destroy incentives for biotechnological research, but to create new financial incentives for conservation.

Burk *et al.* point to language in the treaty (*1*), such as articles 16 and 19, that could appear to threaten the intellectual property rights of corporations. However, there are equally strong sections on access to genetic resources. Article 15, which is devoted to this subject, states in part that (p. 828)

> [e]ach Contracting Party shall endeavour to facilitate access to genetic resources . . . by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention.

Traditionally, collectors representing foreign corporations and governments have enjoyed essentially unrestricted access to the genetic resources of developing nations, but in recent years this has become less acceptable to those nations and to the public in industrialized societies. Whether or not the United States ratifies the Biodiversity Convention, "the era of free scientific access to biological resources is over" (*2*). Venezuela, for one, has already denied access to its forests to U.S. botanists in response to the refusal of President Bush to sign the Biodiversity Convention in Rio in 1992.

As Burk *et al.* correctly point out, much of the language of the treaty is vague and lends itself to various interpretations. Much of it will be more explicitly defined by the Conference of the Parties over the coming years. The United States and other industrialized nations are unlikely to accept any interpretation that is at odds with the long-term interests of the biotechnology industry and with their systems of intellectual property rights. The Biodiversity Convention embodies the belief that the developed and developing nations will have to work together if we are to save any significant portion of our dwindling biological heritage (*3*).

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**References**

1. *Int. Leg. Mater.* **31**, 818 (1992).
2. J. H. Barton, *BioScience* **42**, 773 (1992).
3. A. Gore Jr., *J. NIH Res.* **4**, 18 (1992).

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## Science and Restoration

In the special section "Environment and the Economy," the article by Leslie Roberts "Bringing vanished ecosystems to life" (25 June, p. 1891) raises some provocative questions about the style of restoration being promoted by Stephen Packard, scientific director of The Nature Conservancy in Illinois. Packard's efforts are not scientific studies in the same way that farming is not agricultural research. Even if he is able to establish something resembling a savanna, there will be scant objective information to tell us how to proceed with the next restoration.

In contrast, data from labor-intensive restoration of the Greene Prairie (and also the Curtis Prairie) at the University of Wisconsin, Madison, Arboretum provide valuable information about how restoration efforts could proceed (*1*). The important difference between these two approaches to restoration is not how tedious one might be, but rather how well each is documented and whether we can learn from each about restoration.

During the restoration of the Madison Arboretum prairies, efforts were made to document how plantings were done, and sites were sampled at regular intervals to record changes in the restored vegetation. Detailed studies of remnant prairie vegetation by John Curtis and his students provided end points for the restoration. Management procedures that are widely accepted today (for example, occasional burning) were documented over many years, beginning in the 1940s, before they gained wide acceptance. Even so, at the first Midwest Prairie Conference held at Knox College in 1968, many persons questioned whether it was good management to occasionally burn prairies.

As a result of the early efforts of Curtis and others, today we can restore prairies with relative ease. Rather than diminish the approach taken by science, it would behoove practitioners of restoration to