

LETTERS

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ogy; and possible sources of tritium, which is needed for the U.S. nuclear arsenal.

Dynamics

The "multiregional" and "out-of-Africa" models of the origin of modern *Homo sapiens* are compared in light of recent studies of variation in key genetic loci. A woodblock created by a mysterious Japanese *ukiyo-e* artist, Toshusai Sharaku, in 1795 is said to be the inspiration for a cartoon created for a special section of *Science* (at left). And several writers revisit topics raised in previous Letters sections: possible consequences of insect resistance to transgenic *Bt* cotton plants; the reputation of the field of sociobiol-

Resistance Management

Last summer's widespread failure of the transgenic *Bt* cotton to control the cotton bollworm (J. Kaiser, News & Comment, 26 July, p. 423) strongly suggests that the cotton is not producing high levels of *Bacillus thuringiensis* (*Bt*) toxin. If so, this means that the cotton does not satisfy the requirements of the experimental high-dose-plus-refugia strategy that the Monsanto Company has said it was relying on to avoid the development of the resistance to *Bt* in pests. Monsanto now says (W. R. Deaton, Letters, 20 Sept., p. 1641) that for the cotton bollworm (one of three pests the cotton is advertised as controlling) the high-dose element of the strategy is unnecessary; refugia (non-*Bt*-containing plants) alone will do the trick. Under the new theory, Monsanto appears to be relying heavily on the multiple wild plant and crop hosts as potential refugia.

In essence, this is a new resistance avoidance strategy—mid-dose-plus-what-ever-refugia-happen-to-be-around. Because it was only recently proposed, it appears not to have been described by Monsanto in submissions to the Environmental Protection Agency (EPA) requesting approvals for its crops, nor evaluated by EPA. Will it work? Perhaps, but there is no such assurance. Not all non-*Bt* plants constitute "refugia" for purposes of resistance avoidance strategies. They must, among other factors, be within a certain distance from and harbor pests at the same time as *Bt* crops.

The bottom line is that both the government and the biotechnology industry appear to be working out resistance management plans as they go. Meanwhile, insects are being exposed to millions of acres of *Bt* crops. If the insects develop resistance before management plans are in place, we will have irrevocably and unnecessarily lost the use of one of our safest natural pesticides.

Margaret Mellon

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The Image of Sociobiology

One must agree with S. B. Hrdy *et al.* (Letters, 11 Oct., p. 162) that a substantial amount of good work is being done in sociobiology. However, with all due respect for good intentions, their attempt to blame the questionable reputation of the field on "detractors" and the public appears misplaced. To be sure, in some quarters there is a knee-jerk rejection to anything that smacks of a "biological explanation" of human behavior; but this is not the main problem. Rather, it is a tendency for promoters of sociobiology, some of whom have been central to its development, to advance extreme and untenable claims (1). The reaction of many "detrac-

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tors" is to an image that sociobiology has created for itself. The field in fact has a good deal of internal housekeeping to do in figuring out what has been solidly established, what are current active research questions, what is speculation, and what is just plain nonsense parading as "science." These questions should be dealt with if the concerns of people who fear resurgence of 19th- and 20th-century "scientific" racism are to be dealt with.

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References

1. P. Kitcher, *Vaulting Ambition: Sociobiology and the Quest for Human Nature* (MIT Press, Cambridge, MA, 1985).



Future Tritium Supply

I hope my editorial of 13 September (p. 1475) and the letters about it (25 Oct., pp. 481-483) will be the beginning of an open discussion of the relative advantages of the options the United States will have in

order to ensure a tritium supply for the future.

An analysis by Richard Garwin (1) shows the following.

According to the Record of Decision in the *Federal Register* 12/12/95, the accelerator production of tritium (APT) approach would have a discounted total life cycle cost of \$5.1 [billion], while the purchase of an existing LWR [light water reactor] would cost \$4.1 [billion] (reduced to \$1.4 [billion] when one includes revenue to the federal government from the sale of electricity), and to "purchase irradiation services" would be \$1.2 [billion] total life cycle cost.

If one assumes that payments for the Russian option would average \$40 [million] per year beginning in the year 2003 (presumably some earlier purchases to exercise the contract, compensated by reduction in later purchases), the program cost discounted to 1996 at 4.9% per year would be about \$0.57 [billion].

These costs are preliminary, but do show that the cost differentials are significant.

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References

1. R. L. Garwin, personal communication (19 September 1996).

Interpretations of Multiregional Evolution

The question of a unique African origin for modern humans, the "Eve" theory, is discussed by S. A. Tishkoff *et al.* in their article "Global patterns of linkage disequilibrium at the CD4 locus and modern human origins" (8 Mar., p. 1380). Tishkoff *et al.* appear to incorrectly interpret the multiregional model, which seems to influence their conclusions.

Multiregional evolution does not predict "roughly equivalent time depth and genetic diversity in all parts of the world," as Tishkoff *et al.* state. For instance, some regions outside of Africa, such as Europe north of the Pyrenees (1), have been inhabited for half the time that others have been inhabited (2). The whole linking of time depth and genetic diversity is wrong because the links are *within* a species composed of internally diversified populations; the pattern of genetic diversity among these populations does not reflect differences in time depth, but rather, differing regional histories of selection, genic exchanges, and demographic variation (3). Multiregional evolution began with the hypothesis that, as the world outside of Africa was first colonized, a pattern of genetic diversity developed that

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