P. Christensen, in *High Power Lasers and Applications*, K. L. Kompa and H. Walther, Eds. (Springer-Verlag, New York, 1978), pp. 45–48]. Given a "burst mode" onboard power supply to pump the excimer states there is no apparent reason why 25 megawatts mean output power levels of more than 100 seconds, comparable to those of DF-HF chemical lasers at 2.7 μm assumed by Field and Spergel, could not be obtained at a λ of approximately 0.3 μm in space-based systems. If the power supply were a high-power density fuel cell, the system would in effect be a short-wavelength chemical laser with an intermediate electrical conversion step.

3. *Time*, 11 March 1985, p. 17.
4. F. R. Eldridge, *Wind Machines* (Van Nostrand Reinhold, New York, 1980), p. 144.
5. L. Bekey and J. E. Naugle, *Just Over the Horizon in Space Astronautics and Aeronautics* (National Aeronautics and Space Administration, Washington, DC, 1980). This technical assessment projected substantial cost reductions for post–space shuttle launch vehicle technologies on the basis of energy requirements: "The Shuttle will not do better than $1000 to transport one kilogram to orbit, compared to only $5 to fly one kilogram in an airliner from Los Angeles to New York, although the energy requirements are the same." These authors expected that fully reusable vehicles and other transportation systems would reduce the costs of space transportation "by at least two orders of magnitude." More recently, aerospace planes with airbreathing propulsion systems based on supersonic combustion technology have been seriously proposed for flying directly into orbit with reusable components at far below present launch vehicle costs. A hypersonic transport airliner version, dubbed the Orient Express, has received preliminary development funding by the present Administration.
6. L. F. Richardson, *Arms and Security* (Homewood, Pittsburgh, PA, 1919/1960). Richardson's arms race models are expressed as coupled rate equations for stocks of military goods accumulating in a given nation and that of its rival. The stock flow interaction is such that if the perceived difference is too large or too small, a nation alters its decisions accordingly. For plausible values of parameters a runaway arms race is usually inevitable given an atmosphere of mutual distrust (modeled as perceived tension indices), which is limited ultimately by budgetary constraints from the nonmilitary sector of the economies. Contemporary applications of Richardson modeling to the U.S./Soviet strategic arms situation are discussed by M. D. Ward [*Am. Pol. Sci. Rev.* **78**, 297 (1984); *Confl. Manage. Peace Sci.* 7, 1 (1984)].
7. J. Schell, *The Fate of the Earth* (Knopf, New York, 1982).

Response: Hoffert and Miller state that infrared lasers are not optimum, that ultraviolet lasers will result in the reduced cost-exchange ratios (CER's) in their table 1, and that further reductions in costs will be possible (their table 2), so that "a nonnuclear laser defense begins to look so good . . . that a *prima facie* case against [it] is simply not there."

Infrared lasers indeed may not be optimum. We stated in our article (p. 1389) that shorter wavelength lasers have the potential to decrease the CER. Our analysis was restricted to infrared lasers; as some readers may not have understood this, we regret that the word "infrared" was not included in the title.

We agree that shorter wavelength (0.3 micrometer) lasers in space could result in lower costs. Hoffert and Miller propose a high power, rare gas–halogen excimer laser for this application. Noting that suitable such lasers do not now exist, they suggest that lasers of the "efficiency, mass-to-orbit, and power required" can be developed. This seems doubtful (*1, 2*). Gerold Yonas (*1*), until recently Chief Scientist of the Strategic Defense Initiative Organization, has stated that the "efficiency [of excimer lasers] is so low and generating apparatus is so bulky (even though the optics could be a reasonable size) it is unlikely that they and their fuel supply could be lifted into space in cost effective ways."

Hoffert and Miller scale the cost of infrared laser optics down by a factor of 40 because of the smaller mirror size. However, one cannot simply carry this factor directly over to the CER, because with such a low cost for the optical system alone, other components of a laser platform, which we neglected in order to be conservative in our article, including the generator of the laser beam, the power supply, and systems for pointing, acquisition, and tracking, would probably dominate the cost, particularly in view of Yonas' comments. The CER's in table 1 of Hoffert and Miller are therefore unreliable pending a more detailed analysis of a space-based excimer laser system.

Hoffert and Miller dispute our method of cost analysis. We calculated costs from a model that is based on well-documented space systems (*3*). According to this model, the Hubble Space Telescope (HST) is not "overpriced" as stated by Hoffert and Miller, as it actually cost 20% less than the model predicts. (We took this into account by renormalizing the model to the actual cost of the HST.) Complex space systems are very expensive, and there is no evidence for the supposition of Hoffert and Miller that production costs can be reduced to $2000 per kilogram; so their table 2 has little value.

We remind the reader of the many conservative assumptions listed at the end of our article, the violation of any of which could significantly increase the CER of a space-based laser system. We are not persuaded by Hoffert and Miller that such systems "look so good."

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REFERENCES

1. G. Yonas, *Phys. Today* **38**, 24 (June 1985).
2. *Report to the Congress on the Strategic Defense Initiative* (Department of Defense, Washington, DC, 1985); Office of Technology Assessment, U.S. Congress, *Ballistic Missile Defense Technologies* (OTA-ISC-254, Government Printing Office, Washington, DC, September 1985).
3. W. L. Pritchard, *Acta Astron.* 7, 373 (1980).

ICSU General Assembly

With reference to David Dickson's briefing on the International Council of Scientific Unions (ICSU) (News & Comment, 3 Oct., p. 19), the venue of the 1988 meeting of ICSU's General Assembly was not decided in Berne. Invitations were received from the Science Council of Japan and the China Association for Science and Technology, but the Assembly did not go beyond welcoming the proposal that it should next meet in East Asia. The final decision as to the venue of the 22nd General Assembly, whether it will be Beijing or Tokyo, will be made by the ICSU Executive Board in January 1987.

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Spanking and Rationality

Daniel E. Koshland, Jr., in his editorial on "Spanking, reason, and the environment" (24 Oct., p. 409) says "The reality is that we live in a world that becomes more densely populated each year and that population depends on chemicals for its food and standard of living." Then he suggests research free of headlines, law cases, and politicizing.

But is it not perfectly obvious (and rational) that the basic problem lies in population growth and the basic solution lies in population control? If it is not, then perhaps Koshland should have been spanked when he first believed the world was rational.

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Erratum: In the article "Molecular biology of the H-2 histocompatibility complex" by Richard A. Flavell *et al.* (25 July, p. 437), reference 44 should have been omitted.

Erratum: In the News & Comment article "The Chesapeake Bay's difficult comeback" by Marjorie Sun (15 Aug., p. 715), the size of the Bay was reported incorrectly to be 64,000 square miles. It is the Bay's watershed that spans 64,000 square miles. The Bay itself covers more than 2,500 square miles of surface area, according to Environmental Protection Agency figures.