superinsulation, in more than 90% of eligible homes in 1 to 2 years.

2. A. P. Fickett, C. W. Gellings, A. B. Lovins, *Sci. Am.* **262**, 64 (September 1990).
3. COMPETITEK Hardware Reports (Rocky Mountain Institute, Snowmass, CO, 1988–1991).
4. EPRI's curve is for potential savings achievable by the year 2000, while Rocky Mountain Institute's (RMI's) is long-term asymptotic. EPRI's excludes, but RMI's includes, a further 9 to 15% savings that EPRI believes will occur spontaneously by 2000. EPRI's curve is near the lower end of a 20-percentage-point range of uncertainty [E. Hirst, *Possible Effects of Electric-Utility DSM, 1990 to 2010* (ORNL/CON-312, Oak Ridge National Laboratory, Oak Ridge, TN, 1991), p. 21, figure 12]. EPRI's excludes, but RMI's includes, credit for maintenance costs saved by customers. And EPRI's drive-power savings are about three times smaller and about five times costlier than is agreed in (*2*, p. 68).
5. Information on this "ACT^2" project is available from Pacific Gas & Electric's Research and Development Department, 3400 Crow Canyon Road, San Ramon CA 94583, 415-866-5330. The cost-effectiveness limit used a utility perspective—9¢ per kilowatt-hour, levelized over 30 years at a 6½% per year real discount rate. Several designs were projected to cost far less.
6. A. B. Lovins and L. H. Lovins, *New York Times*, 3 December 1990, p. A15; documented in _____, *The World Petroleum Market in the 1990s*, R. Reed and F. Fesharaki, Eds. (Westview, Boulder, CO, 1989); supply curve in (*8*).
7. The California Legislature passed such a "Drive+" measure by a 7 to 1 margin in August 1990. It was vetoed, but the new governor is expected to sign a repassed version later this year. "Feebates" could also be applied to heavy transport, buildings, appliances, and so forth and could encourage early scrappage of inefficient stocks.
8. A. B. Lovins and L. H. Lovins, "Least-cost climatic stabilization" (Rocky Mountain Institute, Snowmass, CO, 15 October 1990).

Ribozyme Technology Patents

Ann Gibbons, in her article "Molecular scissors: RNA enzymes go commercial" (Research News, 1 Feb., p. 521), refers to Innovir Laboratories having purchased "licensing rights" to a ribozyme technology from Sidney Altman. I would like to clarify that it is Yale University that has filed applications for patents on ribozyme technology on behalf of Altman and his colleagues. This technology is not dominated by Thomas Cech's patent. Yale, in turn, has licensed rights to Altman's technology to Innovir, a company whose purpose is to develop ribozymes as antiviral therapeutics and which has applications for patents pending on its own distinct ribozyme technology.

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Venus Lightning

In his Research News article "Catching Venus in the act" (17 Aug., p. 742), Richard A. Kerr commented on the connection between Venus lightning and active volcanoes. Kerr further clarified the credibility of this connection in his response to the letter "Venus phenomena" by Paul A. Cloutier (12 Oct., p. 191). The physics of lightning in Earth's atmosphere is a complex phenomenon and is not well understood. However, it is established that terrestrial lightning is a global phenomenon, and the frequency of lightning occurrence is known to increase with the injection of volcano plumes in the terrestrial atmosphere. These facts led Fred Scarf and Chris Russell, who analyzed the electric field detectors data aboard the Pioneer Venus Orbiter (PVO), to suggest topographical clustering of orbiter electric field detector (OEFD) signals over volcanic highlands on Venus (*1*).

Cloutier, in his letter, makes the statement (without justification) that, "In 1986 Russell working with R. N. Singh changed the definition of Venus lightning" (*2*). Lightning is produced by electrical discharges from clouds to a planet's surface or between clouds; it has a broadband frequency distribution, with a well-defined amplitude peaking at a certain frequency and falling amplitudes at lower and higher frequencies. Signals not conforming to such an amplitude distribution are generally not attributed to lightning. Harry Taylor and Cloutier attributed these signals to telemetry interfer-

ence spikes (*3*). Cloutier makes special mention that "our comment (*3*) was published without a reply from Singh and Russell." One should not interpret absence of a simultaneous reply to mean that no reply was published. In fact, we did publish our comments in a subsequent issue of the same journal (*4*). A careful reexamination of OEFD signals aboard the PVO showed a temporal clustering of signals in the late afternoon and evening hours. In view of the tenfold decrease of sulfur dioxide concentration in the Venus atmosphere from late 1978 to 1986, the observed clustering of signals was attributed to local dynamical processes (*4*). The telemetric interference and spacecraft discharge hypotheses remain to be substantiated.

The question of whether Venus is dead or alive can likely be settled by observations from the Magellan orbiter. Electrical discharges in Venus clouds are only an indicator of dynamical processes in the dense Venusian cloud system, and their enhancement and correlation with active volcanoes can be established, if Magellan catches Venus in the act. While I have stated that "lightning is not a verdict on Venus's life" (*5*), it may help us find answers to some of our questions about Venus.

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2. R. N. Singh and C. T. Russell, *ibid.* **13**, 1051 (1986).
3. H. A. Taylor and P. A. Cloutier, *ibid.* **14**, 1586 (1987).
4. C. T. Russell and R. N. Singh, *ibid.* **16**, 1481 (1989).
5. R. N. Singh, *Eos* **67**, 641 (26 August 1986).

Ulysses' Wobble

In the News briefing "Ulysses: All shook up" (21 Dec., p. 1663), there is no mention of the part played by European experts in assessing and solving the space probe's "wobble" problem. Today Ulysses is fully commissioned and operational. It is more than 120 million kilometers from Earth, and the "wobble" or precession of its spin axis has now been eliminated. Experts at the European Space Agency have developed techniques to control it in the event of any recurrence later in the mission.

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