uncertainty in the estimates of ΔP, while the increased cost of production can usually be passed on to the consumer.

2) An investment which is justified at current sales levels would not be justified if sales fall, since it would increase the fixed cost of the industry.

3) The high cost of capital discourages energy-saving investment, since it raises both ΔK and the minimum acceptable value of r.

Initial investments are often more effective than alternatives in conserving energy, yet, initially the uncertainties are greatest and hence additional investments less likely.

As Berg points out, small companies are least able to make energy-saving investments. Not only is capital harder and more expensive for them to obtain, but they run a higher risk than the larger corporations which have an established market. The paradox is that those companies for whom price competition makes investments which save energy advisable (and hence price cuts possible) are the least likely to be able to make the investments. Large corporations, such as automobile, steel, and so forth, are much more able to set prices where they receive the highest return and hence have the least incentive to make energy-saving investments.

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1. See, for example, R. G. D. Allen, *Macro-Economic Theory* (Macmillan, London, 1968).
2. *New York Times*, 24 January 1974, p. 1.

Energy and Food

I would like to correct two errors in the article by John S. Steinhart and Carol E. Steinhart (19 Apr., p. 307) on energy and food. They write, "A dramatic suggestion, to abandon chemical farming altogether, has been made by Chapman. His analysis shows. . . ."

First, in the article they cite (*1*), I discussed the economic consequences of regulating or prohibiting various agriculture chemicals. I did not suggest abandoning "chemical farming altogether." Their error, however, is understandable, since my original title was replaced by the inaccurate title "An end to chemical farming?" without my knowledge. Second, I discussed empirical results of other investigators; I undertook no new analysis. The points summarized by Steinhart and Steinhart are, however, worth considering. The consequences of high export demand and high energy prices will be in many respects similar to the effects of chemical regulation, namely, higher net income in farming, more acreage, less chemicals, and a retardation or reversal of emigration from agricultural areas. And, the competitive position of the family farm is improving vis-à-vis the corporate farm (*2*).

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1. D. Chapman, *Environment (St. Louis)* **15** (No. 2), 12 (1973).
2. B. F. Stanton, *Cornell Agricultural Economics Staff Paper No. 74-8* (Dept. of Agricultural Economics, Cornell Univ., Ithaca, N.Y., 1974).

The distinction between "coastal" and "distant" fishing in Steinhart and Steinhart's article should be clarified, as the reader may be left with the impression that coastal fisheries are more susceptible to overfishing than distant fisheries.

The overwhelming preponderance of catches in the world's fisheries is made in coastal waters. For example, the National Marine Fisheries Service estimates that some 77 percent of the 1973 U.S. catch was taken within 12 miles of U.S. shores. Distant fishing is rarely conducted in mid-ocean, as the term might imply. It is most often distant in the sense that it is conducted off someone else's shores. For example, the more than 300 Soviet vessels fishing off the United States in February were, from their point of view, engaged in distant fishing; from our point of view, a good percentage of them were engaged in coastal fishing.

Distant fishing frequently exploits stocks which have been underexploited by the contiguous country. It is energy-intensive for the obvious reason that it takes a lot of fuel to move the fleet a long distance to the fishing grounds and to move the catch back home. But distant fisheries are more prone to overfishing than traditional coastal fisheries.

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We regret any erroneous implication that Chapman was advocating the abandoning of chemical farming.

The point raised by Schoning is an important one. Even the proposed "distant" fishing for Antarctic krill is still coastal fishing (although off an unoccupied coast). Sometimes such fishing is in underexploited areas—as the Antarctic case would be—but, all too frequently, fishing distant shores is the first step in overexploitation and leads to political difficulties (as in Iceland), economic difficulties, and overfishing (as in Peru).

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Geothermal Resources: Prospects for Development

May I offer a footnote to Geoffrey R. Robson's fine review "Geothermal electricity production" (19 Apr., p. 371).

On 12 July 1973, Pacific Energy Corporation (the geothermal operating arm of Hughes Aircraft Company) entered into an agreement with Pacific Gas and Electric Company (PG & E) under which it agreed to sell PG & E its established geothermal steam reserves (149 hectares) and to develop additional reserves (1304 hectares), and PG & E agreed to buy all the steam produced in that area, located within The Geysers geothermal field in Sonoma County, California. An initial 55-megawatt power plant will be installed by PG & E by 1977; additional power plants will be installed as additional geothermal reserves are established. PG & E is presently paying geothermal steam suppliers 3.73 mills per kilowatt-hour for steam supply and effluent disposal services. The Pacific Energy Corporation also holds additional leases within The Geysers (about 6000 hectares) that are uncommitted and has applied for federal geothermal leases in Oregon, Washington, Idaho, and Utah.

Barbier and Fanelli (*1*) report that the installed capacity at Larderello-Travalle in Italy is 405.6 megawatts. The installed capacity at The Geysers will be 516 gigawatts by November 1974 (*2*). The 20-megawatt geothermal power plant at Matsukawa, Japan, is owned and operated by the Japan Metals and Chemicals Company; a 10-megawatt plant has recently been installed there by Mitsubishi Mining Company.

While "dry (superheated) steam" field operation is relatively simple, as Robson notes, the work under way to demonstrate binary cycle systems is thought by several major companies to offer a more economical and efficient conversion process (*3*).

The dry steam produced at The Geysers is not only the result of encountering a vapor dominated reservoir. Superheating may also be a function of the thermodynamic process occurring in the well bore and the pipeline system.

One of the major obstacles to geothermal development in the United States is the fact that the federal tax laws do not refer to "geothermal resources" or provide any explicit tax treatment for exploration and drilling expenses.

Congress is aware of this oversight, but the current political situation regarding the tax treatment of oil and gas companies has apparently prevented any consideration of the plight of the geothermal developer at this time. Until geothermal exploration costs can be confidently treated as current business deductions, it is unlikely that the rate of geothermal exploration will increase dramatically.

Some 100 companies, partnerships, and individuals have applied for federal geothermal leases (about 3.2 million hectares) since 1 January 1974, when the Federal Leasing Program began. It is hoped that the federal government will change the focus of its political attention and enact remedial legislation that will encourage the development of these lands.

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1. E. Barbier and M. Fanelli, *Overview of Geothermal Exploration and Development in the World* (Istituto Internazionale per le Ricerche Geothermica, Pisa, Italy, 1973), p. 3.
2. *PG & E Environmental Data Statement for Geysers Unit 15* (Pacific Gas and Electric Co., San Francisco, 1974).
3. D. H. Cortez, B. Holt, A. J. L. Hutchinson, *Energy Sourc. J.* **1**, 1 (1974); a contrary opinion is held that "theoretically a refrigerant can promise more [electrical] output than does water in the single flash process . . . [but] it appears that double flash can about match anything that refrigerants can hope to attain and is eminently more practical" [B. Wood, in *Geothermal Energy*, N. C. H. Armstead, Ed. (Unesco, Paris, 1973), p. 121].