cell), Dinman's threshold amounts to less than 1 part per billion, that is, one or two orders of magnitude below levels observed in persons unexposed to any artificial mercury (*1*). Were we ever to attain such levels, I doubt if many environmentalists would quibble as to whether or not the remaining mercury was still causing any harm.

Finally, Dinman implies that the logical conclusion of the no-threshold concept is that any disturbance whatever, or even any sensory stimulus, shortens the life of the organism. He conjures up Faustian images lest we be tempted to seek an immortality at such cost. Yet I failed to note any references to advocates of the other side of this question. Indeed, environmentalists commonly argue against the sterility and blandness of an environment in which we seek to eradicate insect pests, rather than control them, or in which a variety of natural habitats, including some "disturbing" ones, are systematically replaced by the uniformity and drabness of most modern cities (*2*).

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B. D. Dinman presents some useful facts and ideas. I agree that extrapolation of data on dosage response to very low levels of treatment is biologically unsound. However, another concept could have been emphasized more. The hypothesis that all poisons are stimulatory in small quantities was introduced by Schulz in 1888 (*1*) and has since become the basis of the Arndt-Schulz law (*2*). Southam and Ehrlich (*3*) proposed the term hormesis to define a stimulatory effect of subinhibitory concentrations of any toxic substance on any organism.

Hormesis is a common and widespread phenomenon. Insecticides have been shown to stimulate growth of insects as well as plants, and fungicides can stimulate growth of fungi. A wide variety of herbicides can stimulate plant growth when applied at low concentrations (*4*).

Hormesis is often ignored in toxicological considerations. Legislative and regulatory decisions affecting ordinary toxicants should be made with an awareness of this phenomenon. Potential carcinogens present a different problem, which can only be resolved with additional scientific evidence.

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2. T. D. Luckey, in *ibid.*
3. C. M. Southam and J. Ehrlich, *Phytopathology* **33**, 517 (1943).
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I agree with Horne that there are probably several thresholds of response. Indeed, the concerns of the toxicologist and the nutritionist constitute different sides of the same coin. That we can "clean up" the environment to the point where we might precipitate damage by making such traces unavailable is, I believe, a bit overdrawn. This implies extractive activities beyond any possible economic return or technologic capability.

Inherent in Lockeretz's letter are the gut responses of the environmentalists which prompted my article. I refer to his statement that the "no-threshold" concept is a ". . . prudent assumption for establishing pollution standards and policies in the absence of *thorough* [italics mine] information." If conceptually the scientific basis for "no-threshold" is open to serious question, how can the proposition become prudent for *any purpose*? Particularly so, since Lockeretz inserts the reservation that ". . . thorough information" is required before a threshold is permissible. It is well known that for any discrete area of knowledge, characterization of what constitutes "thorough" is always debatable. Therefore only "no-threshold" can be "prudent."

As to the threshold at 10^4 molecules per cell, I left open the nature of the response (see the letters from Appleby and Horne). Lockeretz doubts ". . . if many environmentalists would quibble . . ."; I do not doubt it. Consider the recommendations by some for carbon monoxide air-quality standards approaching 5 to 6 parts per million—or lower—despite the reality that the internal environment is in equilibrium with endogenous carbon monoxide at such concentrations.

Lockeretz's last argument about the problems of our modern cities is interesting. I have been long concerned that the extreme environmentalist position inherent in the "no-threshold" stance has drawn our attention and resources from what I consider to be the prime global environmental problem, that is, the quality of human life in the conurbation (*1*). The fruitless pursuit of "no-threshold" has needlessly siphoned off our finite resources from their application to what should be our common concern.

The problem with the Arndt-Schulz law, mentioned by Appleby, is that there have been at least as many exceptions as supporting instances (*2*). While Carlson and Jackson (*3*) and Sacher and Trucco (*4*) present persuasive evidence in support of that law, I did not lean heavily on the principle in my article since I believe it is presently open to question.

With respect to carcinogens, it is interesting to note that the Millers (*5*) present an argument similar to those in my article regarding interfering substances, that is, that "non-critical nucleophiles" in the cell may trap ultimate carcinogens.

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Virtuous Noun Verbed

Whoever allowed a previously respectable noun to be verbed should be violenced [see 18 Aug., p. 616—"a major part of the ventromedial nucleus of the hypothalmus has been *lesioned*" (italics mine)]. Good nouns are hard to keep virtuous, and their prostitution should be crimed. In his defense, whoever is responsible might claim that he should not be clubbed, axed, or gunned, as usage has justified similar seductions.

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