The 1994 paper by Blaustein *et al.* did include the statement that "There is no known single cause for the amphibian declines, but their widespread distribution suggests involvement of global agents—increased UV-B radiation, for example." David Reznick, when interviewed by me, noted several alternatives to the view that a global UV increase was responsible. It was not clear in our discussion that his statement, "These global patterns don't lend themselves to a single easy explanation," was derived from Blaustein's own writings. I regret the error, and apologize for the misunderstanding.—***Wade Roush***

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Dioxin and Advisory Board

We take strong exception to Richard Stone's summary of the U.S. Environmental Protection Agency (EPA) Science Advisory Board (SAB) meeting and the accompanying headline, ("Panel slams EPA's dioxin analysis," 26 May, p. 1124), as members of the panel in question. At the conclusion of the meeting, one of us (D.O.) characterized the panel's recommendations as "in no way a repudiation," but rather a judgment that two of the nine chapters (parts of chapter eight and chapter nine) of the health assessment document needed "clarification and ripening." No one on the 39-member panel disagreed publicly with that judgment, and there were several concurrences on the record.

As noted by Stone, we did commend the agency for considering dioxins and related compounds as a class, and many of us were highly supportive of the work reflected in the first seven chapters of the health assessment document. In particular, we do not agree with Stone's assertion that "Other board members say EPA also ignored data that fail to support its conclusion that dioxin is harmful to human health." The only board member Stone cites in this context is Michael Gough, a microbial geneticist at the Office of Technology Assessment of the U.S. Congress, and we disagree with him and think he is not representative of the full group. Moreover, his long-held views on this subject are well known.

Finally, we point out that the one public comment on the agenda in the 2-day meeting from an organization not representing industry also commended the EPA for its work to date. We think it is likely that when the EPA redrafts the health assessment document for the molecule TCDD, it will maintain the scientific core of the ev-

idence it assembled in its most recent draft. If so, it will be a major step forward in providing the basis for a scientifically based policy to protect the public health.

Richard Clapp
David Ozonoff
Department of Environmental Health, Boston University School of Public Health, Boston, MA 02118, USA
Alan Silverstone
Department of Microbiology and Immunology, State University of New York, Health Science Center, Syracuse, NY 13210, USA
Bernard Weiss
Department of Environmental Medicine, School of Medicine, University of Rochester, Rochester, NY 14642, USA

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Cancer Risk Assessment

Richard Stone's article "A molecular approach to cancer risk" (21 Apr., p. 356) is an excellent discussion of the necessity of using mechanistic information in risk assessment when extrapolating data from animals to humans. Chloroform regulation is a good example of progress in scientific understanding, but not a good illustration of misuse of cancer information in regulatory decision-making. In reference to the 1979 drinking water standard for chloroform (and other trihalomethanes) established by the U.S. Environmental Protection Agency, the article implies that it was determined on the basis of simplistic cancer risk assessment.

Chloroform and other trihalomethanes (THMs) were regulated in drinking water at 0.1 part per million for a host of reasons that were well articulated at the time, including cancer bioassay results. These included, among many others, that THMs are *indicative* of the presence of a host of other halogenated, oxidized, and potentially harmful by-products of drinking water chlorination that are concurrently formed and that have not been fully characterized chemically. In some water samples, THMs accounted for only a few percent of the organically bound chlorinated by-products. More of these other chemicals have since been identified, but many more remain uncharacterized. A few of the known by-products include halogenated acids, alcohols, aldehydes, acetonitriles, and phenols, and many of them show more significant toxicology than chloroform.

The chloroform–by-product indicator concept was an important factor in the rule, and it has an apt analogy in the traditional use of coliform bacteria in drinking water standards. Rather than identifying, measuring, and setting standards for each of the many pathogenic bacteria potentially in drinking water, controlling for easily measured coliforms provides a good indication of the likely absence of significant amounts of pathogenic bacteria. In the same vein, THMs are relatively easily measured, and water treatment processes that lead to reduced THM concentrations will usually provide less of the other gratuitous by-products.

EPA made logical deductions based on all of the available science to arrive at a reasonable technology-based standard. The aim was to reduce exposure to unnecessary chlorination by-products with means that were safe and feasible. The determination that chloroform is not likely to be carcinogenic to humans at low doses does not negate either the overall rationale for regulating chloroform and the other THMs in drinking water, or the original standard.

Joseph A. Cotruvo
Chemical Screening and Risk Assessment Division Office of Prevention, Pesticides and Toxic Substances U.S. Environmental Protection Agency, Washington, DC 20460, USA

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2. J. A. Cotruvo, *Environ. Sci. Technol.* **15** (no. 3) (March 1981), pp. 268–274.

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Sugar-Coated Stress Relief

In her informative news article "Biopreservation: Putting proteins under glass ("Frontiers in Materials Science," 31 March, p. 1922), Karen Celia Fox discusses the superior protective effect of sugars during freeze-drying of engineered human growth hormone. Occurrence of the unusual disaccharide trehalose in nature might be of interest to readers.

In the hemolymph of most insects (possibly also in arthropods), trehalose, not glucose, is the sole "blood" sugar. Also, trehalose protects bacteria against osmotic shock; for example, when vegetative streptomyces turn into spore forms, the cellular trehalose content increases 50-fold and raises the spores' heat stability by two orders of magnitude.

To counter environmental stresses of any kind (heat, cold, or desiccation), nature appears to have chosen the unusual α,α^1-1,1 disaccharide trehalose as the most effective.

Konrad Bloch
Department of Chemistry, Harvard University, 12 Oxford Street, Cambridge, MA 02138, USA