Letters

Risk Assessment

With regard to the article by Bruce Ames *et al.* (17 Apr., p. 271), consider the following parable: I am steaming in my Berkeley hot tub when my neighbor leans over the redwood fence with a long spoon and sprinkles some TCE (trichloroethylene)into the hot tub. "What are you doing," I ask in some consternation. "It's so expensive to dispose of this legally, I thought I'd dispose of it this way," he replies. When I start to protest he points out that the "HERP" [*H*uman *E*xposure dose/*R*odent *P*otency dose] from the TCE is negligible when compared with the chloroform from the hot tub, the aflatoxin from my half-eaten peanut butter sandwich, and the basil in my herb salad. Although this has a reassuring effect on me, it does not prevent me from sloshing off to call my lawyer to obtain an injunction. This parable illustrates the strength and the weakness of the article by Ames *et al.* It *is* reassuring to assess exposures and risks in a larger context. But the decision to choose between action options (stay in the tub or call the lawyer) is governed by more than mere risk considerations. First, one must also consider the tangible and intangible costs of tolerating or replacing an exposure. This means that my neighbor should not count on convincing me to automatically accept risks comparable to those previously accepted on the basis of specific cost-benefit trade-offs made in other settings. Thus the fact that the Environmental Protection Agency, after considering the benefits of water chlorination, accepted a particular risk from trihalomethanes, does not mean that I or the proverbial rational decision-maker, would allow my neighbor to continue spooning TCE into my hot tub until the risk conveyed the same HERP as did the chlorination! Since there are no benefits from bathing in TCE I will predictably tolerate less risk from it than I would tolerate from the chlorination that prevents skin infection and unsightly algal blooms! There is a second class of considerations that is most important. These are societal and ethical considerations that override cost-benefit-risk considerations. Our society tends to be intolerant of situations in which exposures are involuntary or when one party derives the benefit and the other party bears the risk. We fear some illnesses and some ways of dying more than others. Slovic's article in the same issue of *Science* (17 Apr., p. 280) emphasizes the public concern with dread disease and unknown outcomes. Peter Sandman at Rutgers University has been publicly referring to these intangible constraints as the "outrage factor." It is outrageous for my neighbor to dispose of minute amounts of hazardous waste in my hot tub without my permission. Sophisticated decision analysts know this and take it into consideration as a constraint. Ames *et al.* ignore this factor and the decision-analysis literature that has tried to deal with it. Although helpful in overall perspective, the information in the article by Ames *et al.* provides little guidance in helping us to decide if we should initiate a program to *prevent* underground tanks from leaking or how polluted a well needs to be before we shut it down.

It is one thing to say that the degree of ground-water contamination to date does not warrant the kind of sensational treatment it has received in the press. It is another thing to ignore the "outrage factor" and the potential for worsening groundwater pollution and to imply that scientific data suggest that the problem should be passed over until the last smoker lays down his cigarette!

RAYMOND NEUTRA
956 Evelyn Avenue, Albany, CA 94706

Response: Neutra's hot tub parable is not germane to the issues raised by our article. We did not imply that cost-benefit-risk considerations should be the sole basis of public policy. Our intention was not to provide a new regulatory policy but rather to contribute scientific information and perspective.

Neutra's parable leaves out the benefits to everyone (including health) of modern technology. Every industry pollutes to some extent, and reduction of exposure to pollutants usually involves trade-offs, including loss of some benefits. Neutra's car pollutes the air for those of us who walk to work, but modern automotive technology benefits all of us, even those without cars, in many ways. A decision on whether or how much to increase the costs of transportation in order to reduce the pollution of cars and trucks, depends in part on understanding the true health costs of *each* option.

As we pointed out, modern technologies are constantly replacing older, more hazardous technologies. The reason billions of pounds of the solvents TCE and PCE (perchloroethylene—the main dry-cleaning solvent in the United States) are used is because of their low acute toxicity and the dangers of the flammable solvents they replaced. We have also pointed out that consideration of alternative substances and possible preventative measures should be part of the public policy decision-making process.

In the modern context of being able to measure parts-per-billion and parts-per-trillion levels of substances and the realization that there is universal human exposure to rodent carcinogens of natural origin, it is first important to prioritize among the plethora of possible hazards in order to avoid being distracted from working on the more important problems. The enormous uncertainties in the use of animal data to assess human risk and our lack of knowledge about the mechanisms of carcinogenesis make policy-making especially difficult; however, we do not imply that all problems should be passed over until the last smoker lays down his cigarette.

BRUCE N. AMES
RENAE MAGAW
Department of Biochemistry, University of California, Berkeley, CA 94720
LOIS S. GOLD
Biology and Medicine Division, Lawrence Berkeley Laboratory, Berkeley, CA 94720

Public Health Service Revitalization

I would like to comment on Gina Kolata's article about the tempest in a teapot at the National Institutes of Health (NIH) over the plan to revitalize the commissioned corps of the U.S. Public Health Service (News & Comment, 29 May, p. 1055). Surgeon General Koop's prerogatives and initiatives are clearly stated in the Public Health Laws of the United States and are just as he says they are. There is an old saw in Washington that "If it ain't broke, don't fix it." It became clear at the meeting described incompletely by Kolata that the corps *was* "broke" and that Koop is trying to "fix it."

Commissioned officers in the Public Health Service are not paid more than civil servants. Persons with medical degrees (whether they treat patients or not) receive a physician's bonus similar to physicians in other uniformed services. Nonphysicians are paid decidedly less than equivalent ranks in the civil service. The value of perquisites available to commissioned officers has been steadily diminishing in recent years. In addition, the corps promotion lists have been stagnant for a long time.

The commissioned corps has never been other than as described in the law. That people might have joined it for their personal benefit does not change that, and Surgeon General Koop should get some credit for his return to the will of Congress and the people who elected them.

CECIL H. FOX
U.S. Public Health Service, Bethesda, MD 20205