LETTERS

PBB Incident

Luther J. Carter's article "Michigan's PBB incident: Chemical mix-up leads to disaster" (News and Comment, 16 Apr., p. 240) drives home the message that we can no longer be so casual with the stream of exotic chemicals flowing into commerce. In the future we must look to better living through responsible chemistry and effective control.

Carter refers to my role and that of George Fries in identifying PBB (polybrominated biphenyl) as the Michigan contaminant. I wish to acknowledge the unselfish and productive efforts of our veterinarian, the late Ted F. Jackson, who worked hand in hand with us on the problem right down to the wire, and of Al Furr, formerly with the National Animal Disease Center, Ames, Iowa, who brought new meaning to the phrase "Rocky Mountain High" by discovering the late emerging peaks characteristic of PBB in gas chromatograph analysis of our feed.

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Energy Conservation and Credibility

Philip H. Abelson's editorial "Energy diplomacy" (30 Apr., p. 429) implies some fault in the public for not being "conservation-minded." We have just completed a survey of public perceptions and attitudes concerning energy-related problems. The survey was conducted by professional interviewers using an open-ended format and involved a statistically valid sample of a metropolitan population of 350,000 persons.

Our findings indicate that the public is behaving with extraordinary internal consistency. If they believe that the United States and the world will run out of effective supplies of oil and natural gas in the next 50 years, or that there is an energy-related problem which goes beyond waste in our society or manipulated (by government or big business) shortages, they respond with a variety of conservation adjustments including plans to buy a smaller car, drive less, turn down heat, use less electricity, and so forth. Indeed, they have been acting on these beliefs for the last 2 years.

The problem is that they do not believe there is or will be a supply problem. When asked whom they trusted for energy information, 21 percent said no one, and 20 percent said they did not know whom to trust. Only 9 percent believe the information put forth by the federal government. If we consider the contradictory statements to which they have been exposed, the public is responding in a realistic manner.

Given the internal consistency of behavior, changing the public's perception of the reality of the problem should have immediate effects on conservation behavior. The fault lies with decision-makers and leadership, not with public unwillingness to make necessary changes. Current references to the public's unwillingness to conserve energy appear to be not unlike the "blaming the victim" syndrome in the literature on poverty.

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Swine Flu: Quantifying the "Possibility"

We need better rules for translating everyday language into quantities and vice versa, especially in the area of probability. Philip M. Boffey (News and Comment, 14 May, p. 636) reports that President Ford, in referring to the campaign against swine flu, spoke of an epidemic as a "very real possibility." Boffey consulted at least four experts and reports their responses concerning the probability of a swine flu epidemic in the 1976–77 season as being, respectively, 2 percent, 10 percent, 35 percent, and "less than even," which I translate as "less than 50 percent." The 2 percent responder regarded his number as plucked out of the air; we were not told how the others regarded theirs.

Boffey then says, "Those probability estimates, though far lower than the official rhetoric of the campaign would lead one to expect, do not necessarily mean that the vaccination campaign is a foolish endeavor." I wish to address the question of whether the estimates are far lower than the official rhetoric should have led us to expect. Since Boffey emphasizes Ford's concern about the " 'very real possibility' of a dangerous epidemic in the United States next fall and winter," I regard the phrase "very real possibility" as the official rhetoric needing quantification. Boffey has done the fieldwork of consulting experts for their guesses. Judith Selvidge (*1*) found, from responses of Harvard Business

School students to a questionnaire, that for the median student the word "possibility" in probability estimation had a value of 20 percent (with quartiles of 10 and 50 percent). Thus about half the students thought "possibility" meant 20 percent or less. Cliff (*2*), in his article "Adverbs as multipliers," found that the multiplying effect of "very" is about 1.25. I have no way of knowing the multiplicative effect of "real," but "decidedly" has a factor of 1.16, "unusually" of 1.28, and "extremely" of 1.45. I personally would consider "decidedly" as similar to "real" in multiplicative effect. This would give as a median estimate $1.16 \times 1.25 \times 20 = 29$ percent (with quartiles of 14 and 73 percent). (A more careful effort would require a transformation that would keep all percentages between 0 and 100.) Is not 29 percent one reasonable summary of the four estimates 2, 10, and 35 percent and "less than even"? If so, the official rhetoric seems to be right in line with the reported probability estimates, at least for the populations studied. I would like to see us much better able to make translations of the sort Boffey tries to make, and to encourage others to inform us of work done in this area of quantifying everyday language.

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References

1. J. Selvidge, "Assigning probabilities to rare events," thesis, Harvard University (1972).
2. N. Cliff, *Psychol. Rev.* **66**, 27 (1959).

Antiviral Agent: Abbott Tests

The article "Chemotherapy: Antiviral agents come of age," by Thomas H. Maugh II (Research News, 9 Apr., p. 128), attributes to some anonymous investigators the suggestion that Abbott Laboratories is not pursuing the investigations of phosphonoacetic acid as actively as it might because "it is not a patented drug, but rather is in the public domain."

We wish Maugh had reviewed these suggestions with us before he reported them in *Science*, particularly in light of the evidence cited below.

The facts are that Abbott Laboratories has been actively investigating phosphonoacetic acid for some time now to establish safety evidence required both by our own scientific standards and by the Food and Drug Administration before clinical testing can be done. Sound animal studies prior to human testing represent a responsible approach to the development of a potential new therapeutic agent and should not be interpreted as "reluctance" on Abbott's part to undertake clinical studies.

The unjustified conclusion by Maugh and his anonymous "investigators" is also based on a false premise—that phosphonoacetic acid is not a patented drug. Abbott Laboratories does have a *method* patent on this agent covering its use in herpes simplex infections—U.S. Patent No. 3,767,795 (1973). This, too, is a fact which Maugh could—and should—have checked before his article was published.

We believe that Abbott Laboratories has made many significant contributions to virus research and is deserving of more accurate representation.

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Moral Periodic Table

It is very encouraging to see the interest recently directed to the moral qualities of the element plutonium (News and Comment, 23 Apr., p. 356; Letters, 21 May, p. 738). There is little doubt that the singular properties of this metal as a poison, together with its origin in the nuclear caldron and its unique explosive qualities, justify some moral questions or at least some moralization. But why limit ourselves to the baneful transuranics? We should be grateful to the National Council of Churches for originating the concept of a moral periodic table, to which some further additions suggest themselves. Gold is clearly connected with the most known immoral tendencies and has been accused of being the root of all evil. Sulfur, while good when compounded in sulfa drugs, is clearly evil as a component of pollutants and such obnoxious compounds as mercaptans, and historical tradition gives good reason for supposing elemental sulfur to be the main constituent of Hell. Oxygen, however, is more difficult to rank; it is at once the supporter of Life and the element of Fire. The difficulty is even greater when one considers its allotropic modification, ozone, which is simultaneously a main component of smog and also our sole protection from the carcinogenic effects of solar ultraviolet. Perhaps the Council will issue a ruling on this question.

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