Ozone depletion

Pamela Zurer's article (C&EN, May 24, page 6) refers to me as a "persistent scoffer at the seriousness of ozone depletion," but nowhere does she explain my position. Here is some of the missing information.

The validation of the (otherwise quite plausible) theory that stratospheric ozone is being depleted globally by chlorofluorocarbons (CFCs) requires three separate stages of proof—with the burden on those who advocate hasty actions that will cost consumers tens of billions of dollars in the coming decade.

First of all, are the data sound? The Ozone Trends Panel (OTP) used data from the ground-based network of Dobson ozone spectrometers to assert—in a March 1988 press conference—that Northern Hemisphere ozone was being depleted by CFCs. In the April 20, 1992, issue of the Journal of Geophysical Research, however, D. DeMuer and H. DeBacker, label the depletion as "fictitious." Their claim—no refuted, so far—is that the ozone data are contaminated by UV absorption from tropospheric sulfur dioxide.

Even if the data were sound, there is the problem of extracting a small trend from a short ozone record that has a natural variability up to some hundreds of times greater. Even with much averaging, one is left with a natural variation of a few percent, related to the 11-year sunspot cycle—while the claimed trend is only about 2% per decade. The correlation between sunspot number and ozone content is by no means perfect; besides, each sunspot cycle is unique and each ozone cycle is different.

Any claim that a statistical analysis of a time-limited data set can remove such natural variations must be viewed with great skepticism. OTP quotes a trend from 1969 (a sunspot maximum) to 1986 (a sunspot minimum), but has the solar-cycle variation really been eliminated? Apparently not: The depletion trend is found to depend on the time interval selected for analysis (S. F. Singer, "What Could Be Causing Global Ozone Depletion?" in "Climate Impact of Solar Variability," K. H. Schatten and A. Arking, editors, NASA Publication 3066, 1990).

Finally, even if a long-term trend can be established, its cause cannot be ascribed unless the mechanisms are understood and unless "fingerprints" support such a mechanism. For example, in view of known long-term trends in sunspot numbers, one would expect corresponding ozone variations of natural origin.

Granted that stratospheric ozone can be depleted by CFCs or by natural factors, are such depictions "serious"? It is generally agreed that the intensity of solar UV-B increases by 5000% in going from the poles to the equator, primarily because of the change in average zenith angle of the Sun. Thus, a 10% increase in UV-B, as a result of a 3% depletion of ozone, would also be experienced just by moving 60 miles toward the equator (at midlatitudes). While nonmelanoma skin cancers increase toward lower latitudes (at least partly because of longer exposures and other changes in lifestyle), I am not aware of increases in cataracts, damaged immune systems, ecological problems, etc., at lower latitudes (or higher altitudes).

Zurer also claims that I have "retreated" from my assertion in 1989 that "volcanoes ... contribute substantially to stratospheric chlorine and thus dilute the effects of CFCs." Any such statement about the relative effects of natural and human sources of chlorine must, of course, be based on data. Two studies by R. Zander et al., published in the prestigious Journal of Atmospheric Chemistry in 1987, claimed that the total columns of HCl and HF increased from 1977 to 1986 at rates of 0.7%/±0.2%/ and 8.5%/±1%/ per year, respectively. Since HF is adsorbed entirely to CFCs, the much lower rate for HCl led many scientists—including me—to conclude that constant (that is, natural) sources of stratospheric chlorine overwhelm the contribution from human sources of chlorine.

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CFCs. The situation—and my own view—changed after 1991 when Curtis Rinsland and colleagues repeated Zander’s measurements and reported increases for HCl and HF of 5.1±0.7% and 10.9±1.1% per year, respectively, for the period 1977–90, suggesting CFCs as a major source. Rinsland et al. conclude, however—and I tend to agree with them: “In contrast to HF, there are significant natural as well as anthropogenic sources of HCl.” [C. P. Rinsland, J. S. Levine, A. Goldman, N. D. Sze, M. K. Ko, and D. W. Johnson, “Infrared Measurements of HF and HCl Total Column Abundances Above Kitt Peak 1977–1990,” Journal of Geophysical Research, 96, D8, 15523 (1991). See also for details on quoted references.]

I note in passing that the Montreal protocol was signed in November 1987, and that production limits on CFCs were tightened in the years 1987–91—during a period when published scientific data indicated that CFCs were not an important source of stratospheric chlorine.

S. Fred Singer
Director
Science & Environmental Policy Project
Arlington, Va.

Congratulations to Pamela S. Zurer for the most even-handed article on ozone depletion I have seen in a scientific publication. However, the article raises a serious question to which Zurer did not allude. Her final paragraph begins: “Knowing they are missing so much information prevents atmospheric scientists from believing they are anywhere near fully understanding the complexities of the ozone layer.” So why, pray tell, are we still trying to accelerate an already pell-mell program to ban chlorofluorocarbons, halons, and so forth, with hardly a thought as to whether viable and economical replacements are available or as to the economic and social repercussions if they are not?

Hugh W. Ellsaesser
Livermore, Calif.

Bionic boffins

With reference to the article entitled “U.K.’s ICI To Divide R&D as Part of Zeneca Split-Off” (C&EN, May 24, page 21), we would like to clarify the total number of scientists and technologists involved in research and technology in the two companies.

Although ICI has a tradition of cost-effective innovation, the article credits pre-demerged ICI and Zeneca with a race of superhuman research scientists! The suggestion that pre-demerged ICI employed only 7000 scientists and that Zeneca has merely 2000 R&T staff is flattering but inaccurate.

In fact, before it demerged, ICI employed about 12,000 scientists in research, development, and technology. Now that demerger is complete, new ICI employs about 5000 scientists and technologists, while Zeneca employs about 7000.

Peter Doyle
R&T Director
Zeneca
Robert Margetts
R&T Director
ICI, London

Caveat emptor

In response to the ongoing dialogue of whether academe is a business or not, should universities and colleges adhere to the basic business tenant of “the customer is always right”? If so, then students would graduate with a 4.0 grade point average. And if the “customers” (students) were really interested in our “product” (an education) instead of a four- (or five- or six-) year re-parentally supervised party, then perhaps the true goal of academe—teaching the human mind to think, to question, to explore—would be realized.

Bill Church
East Carolina University
Greenville, N.C.

If Michael G. Kinnaid (C&EN, June 14, page 4) thinks of colleges and universities as sellers of education to students, he will be surprised at the behavior of the presumed buyers. Most of them gladly accept less for their tuition money, as when a lecture is canceled. Many of them complain when more is offered to them for the same price—as when a course is enriched with additional lectures or experiments. This is understandable behavior, and all of us act that way as students. But no one acts that way when having one’s car fixed by a mechanic. Academe is not a marketplace.

Nenad M. Kostić
Iowa State University
Ames

Registration, housing deadline for Chicago

The deadline for advance registration for the Chicago national meeting next month is Aug. 2, and the housing deadline is July 30. The forms were published in the June 21 issue of C&EN. They will be published again in the July 19 issue, which also will contain the technical program and exposition information.