Deposition and concentration are confused in Hidy's citing of monthly and seasonal analyses. Statistical analysis (*5*) of monthly data supports our original contention of a relation between sulfate concentration and smelter SO_2. The other studies cited (Hidy's references *3* and *4*) deal largely with deposition, the product of VWM concentration, and precipitation amount. The relation between deposition and emissions is obscured by fluctuations in precipitation amount because combined VWM sulfate concentration is independent of precipitation amount in this data set. Seasonal concentration variations further obscure the relation of emissions to deposition in quarterly data.

Newman and Benkovitz incorrectly assert that our regression is "derived from essentially three points." As our Fig. 1 and Table 1 demonstrate, the annual relation over the period from 1980 to 1983 is based on 26 points and has now been extended to include 1979 and 1984, for a total of 34 points. Figure 1 shows that during the period from 1982 to 1984, when annual emissions varied little, annual regional average sulfate concentrations were indistinguishable from year to year, as would be predicted from a cause-and-effect relation between emissions and concentration. The regionally combined VWM's on which the regression is based are subject to less error than station-specific observations. The observations that make up the combined average provide important additional information, however, in that they allow an estimate (independent of that obtained from the standard error of the slope) of within-year concentration variability (*12*).

Hidy observes that from 1982 to 1983, while annual smelter emissions increased by about 5% of total 1982 emissions, concentration fell at five out of eight stations. In view of the large variation from station to station (see Fig. 1) and the fact that emissions do not uniquely determine concentrations, these fluctuations do not, in Hidy's words, "reveal a major contradiction" so much as they underscore the efficacy of using regional means to elucidate source-receptor relations.

Extrapolation of the regression line to high emissions values to predict eastern U.S. concentrations is unwarranted: wet (and probably dry) removal is much faster in the East, so that long-range source-receptor slopes are inherently smaller. However, sulfate and hydrogen ion concentrations in these data resemble eastern values outside the core of high pollution density, so that the linear relation has implications for droplet chemistry in the East.

In summary, the annual analysis not only stands on its own, but geographical, multiple regression, and monthly studies support its conclusion: concentrations of sulfate in precipitation are consistent with a linear relation to smelter sulfur dioxide emissions.

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2. M. Oppenheimer, *Atmos. Environ.* **19**, 1439 (1985).
3. *Modeling Regional Haze in the Southwest: A Preliminary Assessment of Source Contributions* (Systems Applications, San Rafael, CA, 1985).
4. L. R. Dupuis and F. W. Lipfert, "Acid deposition, smelter emissions, and the linearity issue in the western United States" (Draft report, Brookhaven National Laboratory, Upton, NY, 1985). "Multivariate analysis of acid deposition, smelter emissions, and the linearity issue in the western United States" (Draft report, Brookhaven National Laboratory, Upton, NY, 1985). These studies were based on observations from 16 National Acid Deposition Program (NADP) stations in the intermountain region (including eight omitted from our study because of incomplete coverage) suggesting that the source-receptor relation is representative of the region as a whole.
5. C. B. Epstein and M. Oppenheimer, *Nature (London)*, in press.
6. *NADP Data Reports Precipitation Chemistry* (Natural Resource Ecology Laboratory, Colorado State Univ., Ft. Collins, CO, 1985). Manitou, Colorado, is the third station available in 1980, and this point was inadvertently omitted from our original report.
7. The five Colorado NADP stations provide a data set whose geographic composition was constant over the period considered (June 1980 through December 1984). By excluding the non-Colorado stations included in our original report, we can reduce the degree of geographic variability and limit our consideration to stations reporting chemical data from a larger percentage of total weeks possible.
   Sodium and chloride monthly VWM concentrations from the combined Colorado stations from mid-1980 through 1984 have a significant relation to inverse precipitation volume at the same stations (F tests, $P<0.10$, Na^+; $P<0.05$, Cl^-) but not to monthly SO_2 emissions. No other ions (except H^+) are related to inverse precipitation volume. Thus, Na^+ and Cl^- concentrations may be influenced by dilution or soil moisture, with the 1980 to 1981 change in annual combined VWM being a result of pooling stations available for different periods and the 1981 to 1983 changes being related to precipitation changes in the region over the period.
8. The correlations of SO_4^{2-} and Mg^{2+} with emissions cannot result from a coincidental covariation of emissions and the scavenging of soil material containing $MgSO_4$ because Mg^{2+} concentrations in precipitation average one-sixth of SO_4^{2-} on an equivalents basis.
9. G. E. Likens, F. H. Bormann, R. S. Pierce, J. S. Eaton, R. E. Munn, *Atmos. Environ.* **18**, 2641 (1984); F. W. Lipfert, E. Kaplan, M. Daum, paper 84–21.65, presented at the 77th Annual Meeting of the Air Pollution Control Association, San Francisco (1984).
10. W. Stumm, G. Furrer, B. Kunz, *Croat. Chem. Acta* **56**, 585 (1983); W. Stumm, Ed., *Chemical Processes in Lakes* (Wiley, New York, 1985).
11. Analysis of data from a bulk precipitation chemistry network in Colorado in 1982–1983 showed through altitude and geographic concentration gradients that sulfate and calcium are not physically tied to the same source [W. M. Lewis, Jr., M. C. Grant, J. F. Saunders III, *Water Resources Res.* **20**, 1691 (1984)]. In addition, it has been shown (C. J. Popp, D. K. Brandvold, A. Long, in preparation) that sulfur isotope ratios in New Mexico precipitation do not match those in local soils. Hidy also asserts, incorrectly, that hydrogen ion is not related to sulfate. In fact, his reference 5 shows that hydrogen ion concentration is determined by sulfate together with nitrate and calcium.
12. R. R. Sokal and F. J. Rohlf, *Biometry* (Freeman, New York, 1981), p. 484.

Evolution of Color Vision

The stimulating Perspective of David Botstein (11 Apr., p. 142) contains two inaccuracies. Dichromats are not "the most common form of color blindness"; in almost all populations deuteranomalous males are most common (*1*). In addition, the statement that "New World monkeys have only a single pigment encoded on the X chromosome" is incomplete; the X chromosome of any individual male *Saimiri sciureus*—the squirrel monkey—carries one gene encoding a color vision pigment, but several alleles encoding different pigments exist and females of course can be heterozygotes (*2*).

This situation suggests, at least to me (*3*), ideas concerning the evolution of color vision in primates which add to those proposed by Botstein. While human trichromatism is indeed likely to have evolved by duplication and diversification of a single X-borne color vision locus, the *Saimiri* polymorphism probably originated by *mutation*—rather than duplication—at a single locus. Finally as any Perspective—even that of a molecular biologist—must have a historical component, one might mention J. Scott (*4*), whose clear description of a man and his uncle as dichromats (protanopes) anticipated by 20 years that of Dalton. One would also suggest that among the "great names" of those concerned with color vision might be added Goethe (*5*), who in addition to publishing observations in the *Fahrbenlehre*, conducted the first family studies of color vision deficiency (*6*).

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