LETTERS

Acid Precipitation

Richard A. Kerr (Research News, 12 Feb., p. 881) describes Kenneth Rahn's use of noncrustal manganese (Mn)-vanadium (V) ratios in atmospheric aerosols to ascribe source regions of acidic precipitation. On the basis of the ratio technique (*1*), Rahn concludes (*2*) that Midwest sources are responsible for sulfate pollution and acid rain at High Point, New Jersey, while local (Northeast) sources are responsible for acid precipitation at two other sites: Narragansett, Rhode Island, and Watertown, Massachusetts.

In reaching these conclusions, Rahn makes two major assumptions that are questionable. First, he assumes that the Mn/V ratio in particulate matter in Rhode Island and Massachusetts could reflect the emissions ratio from upwind sources, rather than local emission sources. Second, Rahn assumes that the source areas of Mn and V are the same as the sources of acid precipitation.

One must distinguish between primary and secondary pollutants. Primary pollutants are emitted directly from a source and, in the case of Mn and V, undergo no chemical reactions in the atmosphere. Secondary pollutants, such as sulfate (SO_4^{2-}) and nitrate (NO_3^-), which are also the principal causes of acid precipitation, are formed through the atmospheric reactions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x). It takes some time for these secondary pollutants to form, so they are generally deposited downwind of their source area. Therefore, at any site where there are nearby sources, such as in Massachusetts and Rhode Island, the concentration of primary pollutants will be determined largely by local sources, while the secondary species will be determined by upwind sources. This assumes that the air is not stagnant, which it rarely is during precipitation events.

Furthermore, the New York Metropolitan Area is the largest consumer of fuel oil and, hence, the largest source of V in the Northeast. An air parcel that arrives in Watertown or Narragansett from the Midwest will travel through or near the New York Metropolitan Area. This is why the Northeast Mn/V ratio is observed at these sites even though the air traveled from the Midwest. High Point, New Jersey, on the other hand, is 50 miles west (or upwind) of the New York Metropolitan Area, and there are no major fuel-oil combustion sources between it and the Midwest. Consequently, the Midwest signature is observed at High Point.

Data obtained as part of the New York Summer Aerosol Study (*3*, *4*) shows that, on the average, 86 percent of the SO_4^{2-} in New York City was produced from emissions upwind (west) of High Point (*3*). Based on the same computational schemes employed for the SO_4^{2-}, the data (*4*) indicate that at least 78 percent of the Mn and V observed in New York City were of local origin. Therefore, the principal source areas of the sulfate and the tracer species are different, and the technique used by Rahn does not appear to be valid.

Rahn's hypothesis concerning the local contribution of sulfate aerosol is contrary to observations (*3*, *5*, *6*) and modeling results (*6*, *7*) that demonstrate the importance of long-range transport of sulfates. For example, the Brookhaven AIRSOX model (*7*) estimates that 87 percent of the sulfate in New York and New Jersey is due to transport [in excellent agreement with the 86 percent estimate for New York City in (*3*)] and that 92 percent of the sulfate in New England is due to transport. The model further predicts that only 10 percent of New England's sulfate is caused by emissions in New York and New Jersey, with the balance of the sulfate resulting from emissions further upwind.

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Watching the Watchers

Present times can be said to be the Age of Studies. Major sociotechnical reports that have implications for industrial, regulatory, and public policy decisions are turned out at a commendable but nearly overwhelming rate. Rarely are these studies subjected to the broad, serious, constructively critical review they warrant. Most such reports are reviewed by the originating institution before they are released. Directly affected groups discuss the findings. But debate over uncertainties, assumptions, social value judgments, context of controversy, and usefulness to decision-making is not often carried effectively into larger circles. The documents may not even be readily accessible. Regardless of how balanced reports may be, intellectual or political antagonists are more likely to take up the issues they address than middle-ground observers and synthesizers are.

I therefore propose that *Science* solicit in-depth essays on recently released reports that have central relevance to national decisions. These essays would amplify the reports, interpret them for a broader readership, critique their assumptions, methods, and findings, and place them in perspective relative to other studies and to public events. Such review would manifest scientific community in its original sense, provide partial answer to "Who will watch the watchers?," and offer much-needed social stewardship.

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Leprosy Research in India

Thomas H. Maugh II's article "Leprosy vaccine trials to begin soon" (Research News, 26 Feb., p. 1083) covers many facets of research on this important disorder which today afflicts about 12 million people, mostly in the developing countries. The disorder is of great interest to India, which harbors the largest number (about 4 million) of leprosy patients in the world.

Since its inception in 1952, the Cancer Research Institute in Bombay, India, has been deeply interested in leprosy research. In 1958, the late V. R. Khanolkar, who was the founder and director of the institute, cultivated a mycobacterium from human leproma using classical tissue culture techniques. The organism was named ICRC after the then name of the Institute—Indian Cancer Research Centre. The bacillus shares many antigens with *Mycobacterium leprae*, including those involved in cell mediate immunity. Of particular interest is the fact that, ICRCin, a particulate antigen prepared from ICRC, evokes skin reactions (Mitsuda type) comparable to lepromin in both leprosy patients and in normal healthy individuals. We have now pre-