

## Acid rain network planned

In Pasadena, Calif., rainfall measured during 1976 and 1977 showed a mean pH of 3.9, compared with a pH of 5.7 for pure rainwater. A recent survey of lakes in the Adirondack Mountains of New York showed that 51 percent have pH values below 5.0; in the period from 1927 to 1937, only 4 percent of the lakes had a pH below 5.0. Average rainfall acidity over most of western Europe is between 4.0 and 4.5.

So, what does it mean?

Considering that on the logarithmic pH scale a change from pH 6.0 to 4.5 means a 32-fold increase in acidity, it means that those raindrops falling on your head are becoming significantly more corrosive as the years go by. And while you might not have noticed any acid burns from playing in the rain, fish kills, overgrowth of freshwater forms of algae and fungi, foliage injury and inhibited plant reproduction and development have been attributed to increasingly acidic precipitation.

The phenomenon called acid rain, or more specifically acidic atmospheric deposition, has been noted and studied for several years (SN: 6/15/74, p. 383; 7/10/76, p. 25). It happens because natural and human-produced particles, aerosols and gases, composed primarily of sulfur dioxide and nitrogen oxides, sift down from the atmosphere or combine with precipitation. Though most sources are natural — from volcanoes, photosynthetic products or cycling of inorganic elements — a recent study suggests that humans contribute at least half as much potential corrosives as do natural sources. Primary human sources include fertilizers and combustion products from industry, transportation and agriculture. Though it was thought that the problem was confined to the eastern United States, data show that the average acidity of rainfall is steadily increasing in all parts of the country. And because of increased emphasis on fossil fuels by the U.S. energy plan, it will only get worse, said Leon S. Dochinger, the principal plant pathologist with the U.S. Department of Agriculture in Delaware, Ohio, at a recent Environmental Protection Agency interagency research meeting. Even the best available emission control and use of tall stacks may not help, he said. The problem is that acidic substances do not always fall near the site of emission as previously thought. The acidic leftovers of coal burned in Pennsylvania may be carried to and deposited in Leningrad.

"It is perhaps the most severe environmental problem of the century," says Dochinger. "It is an international problem; indigenous wherever the world exists."

Because it is a global problem, the USDA, EPA, U.S. Geological Survey, Tennessee Valley Authority and other agencies are gear-

ing up to create a nationwide network to study the extent and effects of dry and wet acid deposition. It will be the first U.S. network to sample the chemistry of rainfall. The project was first proposed by Ellis B. Cowling of North Carolina State University at a 1975 international conference on acid deposition. Since then, the North Central Agricultural Experiment Station has provided most of the funding to get the show on the road. Representatives of the various agencies met in St. Louis last week to make their final plans for the project, called NC141. Dochinger said 40 stations should be working by July 1 and they plan to have a total of 100 throughout the United States by 1982. The stations will be in both rural and urban areas primarily in the eastern, north central and southwestern states. The Illinois State Water Survey will serve as the central laboratory where weekly and monthly dry and wet samples will be tested for  $\text{SO}_4$ ,  $\text{NO}_3$ ,  $\text{NH}_4$ , Cl, total P, F, Br, B, K, Na, Ca, Mn,  $\text{Al}_2\text{O}_3$ , FeMn,  $\text{SiO}_4$  as well as pH. A filter system provided to selected stations by the EPA will measure the size of finer particles to determine their sources and how far they may travel. By coordinating their data with existing stations in Canada and Europe, researchers hope to determine the consequences of increased fossil fuel use and the immediate and long-term effects of deposition on plants and soil. □

## Study casts doubt on Rand report

Can a reformed alcoholic take an occasional drink without tumbling off the wagon and back on the road to heavy drinking? Until two years ago, most people, including clinicians, believed that with few exceptions the answer was "no." However, results of a Rand Corp. study set forth the revolutionary notion that many recovered alcoholics could indeed resume moderate drinking without relapse.

Now the first large-scale attempt to replicate the Rand findings yields still a third answer: a very cautious "maybe." The study — an 18-month follow up of nearly 300 recovering and reformed alcoholics from 26 treatment centers in Oklahoma — suggests that a return to even light drinking is considerably riskier than the Rand results indicate.

University of Oklahoma researchers found that those who reverted to occasional drinking were three times as likely to relapse as abstainers and twice as likely to do so as those surveyed by Rand. The Oklahoma relapse rate for controlled drinkers is 32 percent, compared with a 16 percent rate in the Rand population. Among those who cut out drinking altogether, 10 percent relapsed in Oklahoma, and 16 percent in the Rand study — the same rate as for Rand's controlled drinkers. □

"What our project does is inject some caution [into] advocating controlled drinking for alcoholics as a form of dealing with their problems," says Alfonso Paredes, director of the Oklahoma Center for Alcohol-related Studies. "Rand injected false optimism," he adds.

Paredes says a number of studies have shown that from five percent to 15 percent of alcoholics are able to decrease their drinking after recovery. "We think there is enough evidence to show that a number of them are able to go back," he said in an interview. "But right now we have no way of identifying *who* is able to do this. Some who look the worst — who have been drinking many years and have had a lot of problems — do very well [in terms of being able to resume moderate drinking]. Other[s] ... do not do so well," says Paredes, also director of the division on alcoholism of the Oklahoma Department of Mental Health.

"It is critical as far as research and understanding are concerned to continue ... giving alcohol to alcoholics," Paredes says, "but under controlled circumstances. Otherwise, it would be like playing Russian roulette."

Because it is still so difficult to identify what type of individual might safely return to social drinking, Paredes is wary of overhauling any alcohol treatment approaches just yet. "Perhaps at the beginning of treatment, when it is difficult for the person to confront the prospect of not drinking again at all," he says, it may be feasible for the recovering alcoholic to drink minimal amounts. But beyond that, "at the present state of knowledge, I would recommend total sobriety," Paredes says. The Oklahoma data, still not formally published, were presented recently at the National Council on Alcoholism's annual medical-scientific forum in St. Louis.

## Millimeter wave antenna

The region of the electromagnetic spectrum between light and radio has been a difficult one for astronomers to develop. Optics had been traditional for millennia and radio had developed into an important technology before it became astronomical, but the gap between remained.

Part of the gap is being filled with new infrared technology, and now from the other direction comes a new, high-resolution telescope for millimeter waves that was recently put into operation at the California Institute of Technology's Owens Valley Radio Observatory. The 34-foot reflector has achieved a resolution of 27 seconds of arc with a wavelength of 1.3 millimeters. Two other such telescopes are being added to make an interferometer that will greatly enhance astronomers' ability to study celestial bodies that emit these wavelengths, such things as the gas and dust in interstellar space. □