

natural history

Ammonia and plants

Because ammonia is present in the atmosphere in relatively small quantities, its interactions with plants have, until recently, been considered of negligible importance. G. L. Hutchinson and D. B. Peters of the U.S. Agricultural Research Service and R. J. Millington of Australia's Commonwealth Scientific and Industrial Research Organization have found that a plant might obtain as much as 10 percent of its total nitrogen requirement by absorbing it, in the form of ammonia, from the air.

By measuring the disappearance of ammonia from a gas mixture flowing through a chamber containing a seedling they demonstrated also that plants absorb ammonia from air even when they are well supplied with nitrogen from other sources. They also found that absorbed ammonia is metabolized and that absorption drops at night.

There is evidence that the ammonia concentration in the atmosphere has been increasing. The researchers say in the Feb. 18 *SCIENCE* that their findings not only have implications for plant nutrition but also suggest that plants may play an important role in decontaminating the atmosphere.

Chemical defense mechanism for plants

Potato tubers contain high concentrations of certain proteins that have been found to be capable of inhibiting the action of the digestive enzymes of insects. In the Feb. 18 *SCIENCE*, T. R. Green and C. A. Ryan of Washington State University report that the protein also occurs in potato and tomato leaves.

They found that when a leaf of a tomato plant was damaged this enzyme inhibitor accumulated rapidly in both damaged and undamaged leaves of the plant. The chemical signal that initiates accumulation is probably a substance produced or released in the plant at or near the wound. Because digestibility of food is an important consideration in the selection of food by leaf-eating insects, the researchers conclude that the enzyme inhibitor is probably a defense mechanism.

Warm-footed animals

If an animal from temperate regions were to find itself transported to Arctic snow, it would rapidly develop an acute case of cold feet. Animals adapted to the cold, however, can stand on ground as cold as minus 50 degrees C. and exhibit no discomfort.

To learn more about how arctic animals are able to do this, three Pennsylvania State University biologists recorded temperature changes in arctic foxes and gray wolves when the animals' feet were placed in a minus-35-degree liquid. Robert E. Henshaw, Larry S. Underwood and Timothy M. Casey report in the March 3 *SCIENCE* that for both species immersion in the cold bath caused the temperature of the foot-pad surface to drop to just above freezing and remain at that level.

Examination of a wolf foot showed four arteries that carry blood directly to a network in the skin of the pad surface. The researchers conclude that foot-pad temperature is regulated by increased blood flow to the foot-pad surface. They believe this is a more efficient mechanism for adaptation to cold. In temperate species, cold produces constriction of vessels and periodic rewarming of cold regions of the body by pulses of blood.

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environment

Less energy, same standard of living

Two researchers at the University of California at Berkeley report that studies they have done show it is possible to reduce per capita energy consumption in the United States to 62 percent of current levels and maintain the same standard of living.

A. B. Makhijani and A. J. Lichtenberg of the UC College of Engineering recommend a five-point program for reducing energy waste and for utilizing now unused available forms of energy: 1) Use of solar energy for household heating and other purposes, a potential which could be realized "if the necessary funding for the R&D were to become available"; 2) Implementation of a "total energy" concept, the use of now-wasted heat from nuclear and fossil-fueled power plants for operating turbines, for preheating, drying, space heating or desalination; 3) Materials reuse and recycling (for instance, instead of using energy-intensive aluminum for throw-away beverage containers, the beverage industry would go back to the use of returnable bottles); 4) Improving transportation efficiency—through rapid transit, through smaller automobiles, through the use of recycled materials in automobile manufacture and through partial replacement of truck hauling with rail hauling, and 5) Improving the thermal efficiency of power plants, through such devices as magnetohydrodynamics (MHD) topping cycles or an increase in maximum operating temperatures of power plants.

Precise pollution predictor

Stanford Research Institute researchers have established the accuracy of a mathematical model that predicts the effects on urban carbon monoxide pollution of a large variety of human activities.

"If a city is planning a greenbelt or an industrial park or a downtown skyscraper or a belt parkway, then the model will compute how each will alter CO concentrations throughout a metropolitan region," says a release from the Coordinating Research Council, for which SRI constructed the model. The SRI researchers have tested the model in St. Louis and in San Jose, Calif.

The model takes into account "street canyons," skyscraper-lined streets with heavy automobile and pedestrian use and thus heavy pedestrian exposure to CO. A possible response to high CO levels in the "canyons" would be to limit the height of new buildings.

Clean air goal may be met

Clean air for the United States (relatively speaking) by 1975 is the goal of the 1970 Clean Air Amendments. An article in the February *ENVIRONMENTAL SCIENCE AND TECHNOLOGY* by Stanton Miller and Carol Lewicke says there is a "reasonable possibility" of meeting the goal.

Although clean air gains vary from each of the nation's 247 air quality control regions to another, generally progress is good, with the state or local jurisdictions taking far more enforcement action than ever before, say the authors.

A predictable difficulty has been in the 60 or so cities with transportation-caused pollution. Four of six pollutants for which ambient air standards are required are automobile-generated. "One strategy may specify restriction of automobile traffic," say the authors.

171