

Carbon dioxide shakes off its pursuers

Climate scientists last year reported that forests and fields in the United States are acting like sponges, sopping up most of the nation's carbon dioxide pollution. A new study, however, puts the squeeze on the idea of a U.S. carbon sponge.

The research is important, say scientists, because it plays into debates about how much the United States must reduce its emissions of carbon dioxide to combat global warming.

Atmospheric and oceanic scientists have spent the past decade searching the Northern Hemisphere for a hiding place that calculations suggest is absorbing more than a billion tons of carbon dioxide out of the air each year. In late 1998, a team led by Princeton researchers announced that it had located such a carbon "sink" in the United States and southern Canada (SN: 11/21/98, p. 332). This area, they said, takes up between 1.2 and 2.2 billion tons of carbon annually. For comparison, the United States emits 1.6 billion tons a year.

"If they were right, it would mean that the U.S. could be pretty relaxed in terms of reducing emissions," says Richard A. Houghton of the Woods Hole (Mass.) Research Center.

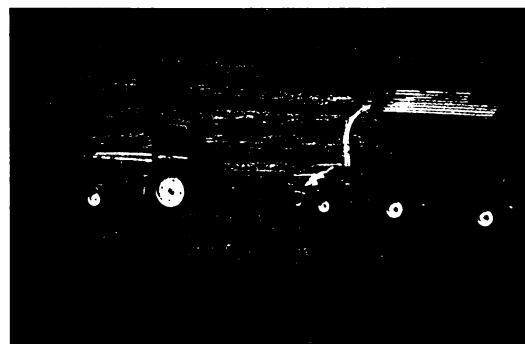
Houghton and his colleagues decided to test the Princeton group's findings.

Working like ecological bookkeepers, they tallied changes in forest and agricultural acreage between 1700 and 1990 and then determined how these alterations affected carbon supplies.

Early on, for instance, clearing of forests added carbon dioxide to the atmosphere. This process reversed after 1945, as forests started to regrow in formerly cleared fields. Suppression of forest fires has contributed to the sink by allowing carbon to build up in thickening stands of trees. Also, modern agricultural practices, with their higher crop yields, have stored extra carbon in soil.

Adding these factors and several others together, Houghton and colleagues pull the plug on the idea of a large U.S. carbon sink. They conclude that land in the United States during the 1980s absorbed between 0.15 and 0.35 billion tons of carbon dioxide each year—offsetting only 10 to 30 percent of the country's emissions during that period. They report their conclusions in the July 23 *SCIENCE*.

The new study corroborates what many researchers had suspected. "The sink is not as large as the Princeton group implies it to be. It cannot be," comments Inez Y. Fung, an atmospheric scientist at the University of California, Berkeley.



Carbon may be hiding in farmers' fields.

The biggest problem with the previous study, she says, is an unrealistic inequality: North America appeared to absorb billions of tons of carbon dioxide, but Europe and Asia, next to nothing. Such a disparity, she says, makes little ecological sense. The actual Northern Hemisphere sink is probably distributed across the continents and perhaps the Atlantic Ocean, says Fung.

Song-Miao Fan of Princeton says that the new study may not refute what his group reported last year. Its analysis of carbon dioxide measurements covered the period 1988 through 1992—a time when sinks were quite large, judging from other evidence. Houghton's study, however, included a period when sinks absorbed less carbon dioxide.

All the scientists agree that resolution to this debate will require better global gas measurements. —R. Monastersky

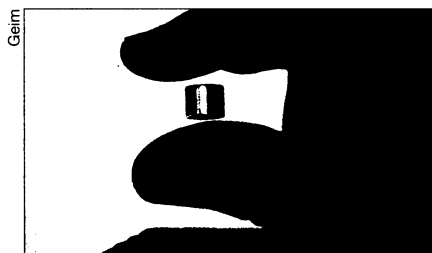
Abracadabra! Magnets float in midair

With smoke, mirrors, and sleight of hand, magicians fashion illusions of levitation, but with magnets, physicists can create the real thing. Scientists have now shown that the forces from everyday materials—wood, plants, even a person's fingers—can help levitate small magnets placed in a magnetic field, causing them to hover motionless in space.

Physicists had never before achieved stationary levitation of a magnet without using superconductors (SN: 8/6/88, p. 86). A 157-year-old principle known as Earnshaw's theorem stipulates that no arrangement of magnets can make them stay in a stable equilibrium, says André K. Geim of the University of Nijmegen in the Netherlands. The slightest disturbance would cause one magnet to leap toward another or fall away.

Geim and his colleagues, however, learned that certain materials can stabilize a magnet that is being levitated by another. These so-called diamagnetic materials have no permanent magnetic character but generate magnetism that opposes an applied magnetic field. Superconductors are the strongest diamagnets, and many ordinary materials are weakly diamagnetic (SN: 12/6/97, p. 362).

A pair of well-placed fingers—made up of diamagnetic water, proteins, and



Magic fingers: A strong magnet made of neodymium, iron, and boron floats in a touchless pinch. The fingers stabilize the levitation, which comes from a powerful electromagnet located 2.5 meters above.

organic molecules—is enough to do the trick. "The real surprise is that such weak repulsive forces are still enough to stabilize the magnet, preventing it from falling down or moving upward," says Geim. He and his colleagues report their finding in the July 22 *NATURE*.

This type of levitation could be used to make frictionless bearings for trains or energy-storage devices such as flywheels, says Geim. To illustrate the principle, his collaborator Martin D. Simon of the University of California, Los Angeles has assembled a handheld version of the levitator using permanent magnets and graphite plates. —C. Wu

Kids adopted late reap IQ increases

Children adopted between ages 4 and 6 have more than a new family to celebrate. Those who at first score poorly on standard intelligence tests can expect dramatic IQ gains by the early teen years, especially if they live in affluent families, a new study finds.

As in the general population, genes influence the IQ ranking of these late-adopted kids, say psychologist Michel Duyme of the University of Paris VII and his colleagues. For preschoolers scoring below the normal range on intelligence tests, however, adoptive-family environments foster IQ surges that, on average, put the child near or squarely within the normal range, the researchers report.

"Our results show that the adoptive environment for children adopted after 4 years of age is effective in boosting low IQs," Duyme's group concludes in the July 20 *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*.

Much current research examines genetic influences on intelligence (SN: 5/9/98, p. 292; 6/7/97, p. 349). In contrast, Duyme and his coworkers examine the extent to which children's surroundings influence their intellect. In a prior study, they found that children adopted before age 1 into high-income

families displayed particularly large IQ gains by adolescence.

The new study expanded on that work. Using data from seven French public adoption agencies, the researchers identified 65 children who had been adopted between ages 4 and 6 and had received institutional or foster care because they had been abused or neglected as infants.

Just before adoption, the youngsters had an average IQ of 77, with no scores above 86. The IQ range classified as normal runs from 90 to 110.

When tested in early adolescence—mostly ages 13 and 14—the average IQ score of all the adoptees was 91. Average IQ reached 86 for those in low-income homes, 94 for those in mid-income homes, and 98 for those in high-income homes. The researchers say they don't know whether these IQ gains will last into adulthood.

"They've done a nice job of showing that IQ is malleable and that it responds to the kind of environments adopted children go into," says psychologist Robert J. Sternberg of Yale University. Sternberg

views IQ as a measure of analytic intelligence, distinct from what he calls practical and creative intelligence.

Psychologist John C. Loehlin of the University of Texas at Austin also sees the new study as evidence for environmental influences on IQ. But other data suggest that such gains decline at later ages, says Loehlin, who views IQ, especially a statistical component known as *g*, as the core sign of a person's intelligence.

Linda S. Gottfredson, a sociologist at the University of Delaware in Newark and also a *g* advocate, says that abusive care during infancy may have deflated IQ scores of the French children, who then recovered their true IQs after adoption. Thus, the findings don't show whether the environment would affect the IQs of kids receiving at least adequate care, she argues.

While seeing value in studying environmental effects on intelligence, psychologist Peter H. Schönemann of Purdue University in West Lafayette, Ind., argues that neither IQ nor *g* provide insight into mechanisms of intelligence. —B. Bower

Women's heart attacks kill more often

Heart attacks typically hit men at an earlier age than they do women, but women may not hold the ultimate advantage. Among people stricken during middle age, women are much more likely than men to die in the hospital, new findings indicate.

Using data from 1,658 hospitals around the United States, researchers led by Viola Vaccarino of Yale University studied almost 400,000 men and women between the ages of 30 and 89 who were hospitalized for heart attacks.

The team found that the male patients were on average almost 7 years younger than the female patients. However, 16.7 percent of women but only 11.5 percent of men died in the hospital, although about the same number of men and women died. For patients under age 50, women were more than twice as likely as men to die in the hospital, the group reports in the July 22 *NEW ENGLAND JOURNAL OF MEDICINE*. That gap steadily narrowed as patients got older, closing at age 74.

Seeking an explanation for this striking pattern, Vaccarino's group uncovered several notable sex differences among younger patients, none of which emerged in elderly patients.

Women under age 70 were more likely than their male counterparts to have diabetes, congestive heart failure, or stroke, lessening their odds of surviving a heart attack. Younger women also tended to wait longer than men before going to the emergency room and were more often misdiagnosed. The researchers report that the crushing chest pain and other warning signs that typify men's heart attacks are less com-

mon for women, making their symptoms tougher to evaluate.

Finally, younger women tended to have heart attacks that were more severe and were accompanied by more complications than their male peers did. Even so, physicians were slightly less likely to give these women aspirin, beta-blockers, clot-busting drugs, and other crucial early remedies for heart attacks.

Together, sex differences in all these risk factors explain only about one-third of the difference in death rate between women and men, the researchers calculate.

"The bottom line is that women who have a heart attack may not all be the same," says Vaccarino. "There may be some subgroups that are susceptible to a particularly aggressive disease for reasons we don't yet understand."

In an editorial accompanying the report, Laura F. Wexler of the University of Cincinnati Medical Center underscores the apparent severity of heart attacks in younger women. Noting that many sex differences in coronary artery disease lessen after menopause, she speculates that genetic variations in the regulation of estrogen may make some younger women more vulnerable to heart disease.

Charles Maynard of the University of Washington in Seattle says the new study is important because it highlights the danger of heart attacks in women, a threat that has long been underappreciated. Further research, he suggests, should scrutinize habits and treatments that might promote women's long-term health after heart attacks. —S. Carpenter

Vitamin A thwarts malaria in children

Regular doses of vitamin A hold off many cases of malaria in children, particularly those ages 1 to 3, new research shows. These findings suggest that the vitamin bolsters the immune system's fight against the mosquito-borne disease.

Vitamin A is known to boost production of macrophages, T cells, and antibodies—all immune system stalwarts. To gauge its effects against the parasite that causes malaria, U.S. scientists teamed with researchers at the Papua New Guinea Institute of Medical Research in Goroka to track 480 children in that country.

Every 3 months for 13 months, half the children received an inert substance; the rest got a capsule containing 200,000 international units of vitamin A, which the liver stores and parcels out as needed.

Subsequent medical examinations and blood tests of the children, ages 6 months to 5 years, revealed that those getting the placebo experienced 249 episodes of fever that were accompanied by a substantial presence of malarial parasites in the blood. In contrast, the children getting vitamin A supplements suffered only 178 such episodes. The study appears in the July 17 *LANCET*.

Children less than a year old gained little benefit from the vitamin A, but such babies don't usually become as ill with malaria as do children 1 to 3 years old. Vitamin A imparted significant resistance to the disease to these toddlers, says study coauthor Anuraj H. Shankar of Johns Hopkins Medical Institutions in Baltimore.

Of 90 such children getting the placebo, 67 (74 percent) had enlarged spleens, a frequent complication of malaria. Only 46 (58 percent) of 79 children this age getting vitamin A had the condition.

By age 5 or 6, many children in the tropics have built partial resistance to malaria. The children ages 1 to 3 getting vitamin A exhibited an immune response against the disease resembling the response normally seen in their older siblings. "This appears to accelerate the acquisition of [some] immunity by a few years," Shankar says.

The vitamin helped deter mild and moderate disease rather than the most severe illness. Equal numbers of children in the two groups had harsh cases of malaria. Vitamin A may not affect the mechanism in the body that controls susceptibility to high concentrations of parasites, and hence, severe disease, says James W. Kazura of Case Western Reserve University in Cleveland.

Nevertheless, at pennies per capsule, vitamin A may prove to be a useful weapon against the most common malarial infections, he says. —N. Seppa