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.

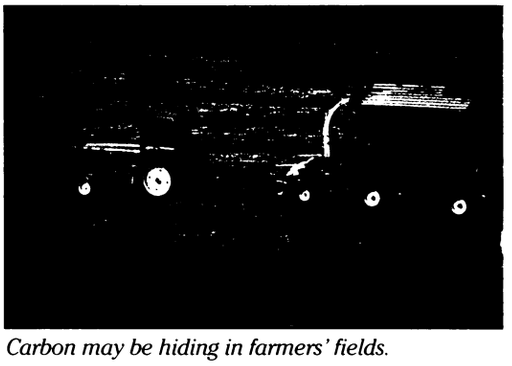
"If they were right, it would mean that the U.S. could be pretty relaxed in terms of reducing emissions," says Richard A. Houghton of the Woods Hole (Mass.) Research Center.

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*

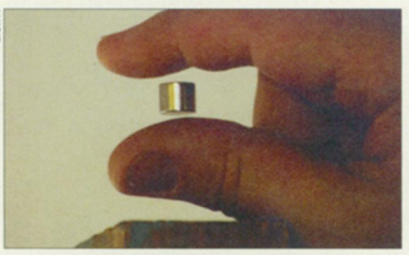
Abracadabra! Magnets float in midair

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 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.



Geim

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.

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