

on balloon-borne batteries, she says: "That's unreasonable and nobody is going to be unreasonable." Marks suggests that the nations that have signed the protocol will address such issues in upcoming meetings.

For U.S. scientists, the protocol's practical impact on research depends largely on the legislation Congress enacts to enforce the new treaty. The Clinton administration has yet to decide on the law it desires, and it will not fashion a position until late spring at the earliest, says Lawrence Rudolph, the acting general counsel for NSF. Rudolph testified in late February before the House Subcommittee on Science, chaired by Rep. Rick Boucher (D-Va.).

One of the key undecided issues is which federal agency will regulate U.S. activity in Antarctica. Boucher has introduced a bill that would give NSF principal responsibility for enforcing the protocol provisions, with some oversight provided by a presidential commission. This approach drew praise from scientists at the congressional subcommittee hearing and at the meeting of the National Academy of Sciences committee. They believe NSF will limit the red tape and regulations faced by scientists because it has an express interest in seeing results from the projects it funds.

Yet environmental groups and some legislators argue strongly that regulatory

authority should rest with another agency, such as the Environmental Protection Agency or the National Oceanic and Atmospheric Administration. That arrangement, they say, would allow better oversight of NSF's actions on the ice, ensuring that NSF does not repeat problems of the past, when it regulated its own activities.

"We cannot ignore that years of environmental neglect and self-regulation have caused the very environmental problems that NSF is tackling today," Susan Sabella of Greenpeace USA, Inc., in Washington D.C., told the subcommittee.

Sabella and others question whether NSF has the expertise or motivation to issue the environmental regulations needed to enforce the protocol. She points out that although Congress called on NSF back in 1979 to issue environmental regulations concerning its Antarctic activities, the foundation is only now doing so.

As evidence that NSF should not regulate itself, Bruce S. Manheim of the Environmental Defense Fund in Washington, D.C., argues that NSF failed to perform an environmental impact assessment before it blew up some 70 pounds of aging toxic chemicals using 4,000 pounds of chemical explosives in December 1991. Manheim grants that blasting may indeed have been the best method for disposing of the unstable chemicals. But he criticizes NSF

for not having produced an impact assessment before taking the action.

Erick Chiang, manager of polar operations for NSF, says NSF had started an assessment before the blast, but a mistake led workers to set off the explosion on the ice several miles from McMurdo before the study was completed.

Whatever legislation eventually emerges, NSF's Antarctic activities will undoubtedly face increased scrutiny. At the same time, the cost of doing research in Antarctica will climb as nations enforce the provisions of the protocol. During the February hearing, NSF Deputy Director Frederick M. Bernthal announced that the foundation would require an additional \$66 million to improve U.S. operations to a point where they produce minimal effect on the environment.

While science is still king in Antarctica, it now must get used to sharing the throne with environmental concerns. Peter E. Wilkniss, past director of NSF's Office of Polar Programs, summed up the challenges last September at an orientation for scientists preparing to head south.

"Antarctica will never be the same," he warned. "The old freewheeling days are over. There are more regulations in Antarctica. You will be held more responsible." □

Letters continued from p.227

Composting: A costly cure?

"Cleaning Up Compost" (SN: 1/23/93, p.56) reminded me of my very earliest memory. I was barely able to reach the top of the kitchen trash can. As I threw something in, my mother said, "That's not garbage, that's trash." Many years later when I asked her what it meant, she said that my father, an officer stationed at Hickham Air Force Base from 1946 to 1948, sold the post's garbage to local pig farmers. Everyone on the post was required to separate garbage (food waste) from other trash. I don't know anything else about the practice except that it was profitable.

It does prove, however, that, under certain circumstances, Americans will separate their trash, recyclables, and edible or compostable garbage.

Rosemary M. Killen
College Park, Md.

Your article clearly testifies to the incredible lack of economic viability of almost all of the recycling schemes thus far presented. For example, you state that the Connecticut Agricultural Experiment Station employed the output of the Procter and Gamble research program to increase crop yield.

Did anybody, anywhere consider the magnitude of the problem that would result from actually using that stuff? The New Haven group used the composted material at the rate of 50 tons per acre. For a normal Midwest 640-acre farm, that comes to 32,000 tons. If a farmer living within five miles of the railroad used a 4-ton truck to haul the stuff to his farm, he

might make a round trip, including loading and unloading, in two hours. Since he must make 8,000 round trips (80,000 miles), he could achieve the hauling task in 16,000 hours, or slightly under two years.

Of course, he would have to work day and night all 365 days of the year, without letup, and would use about \$12,000 worth of gasoline. He would also have to pay for the material, its railroad charges, and the job of spreading it over the fields.

John P. Kelly
Albuquerque, N.M.

Memories of circulating sound pulses

While it was interesting to hear that a working general-purpose optical computer has been built ("Juggling at the speed of light," SN: 1/23/93, p.63), the statement that its "most striking feature is that no data are ever stored—even temporarily—in particular locations . . . as they would be in an electronic computer. Instead, information circulates as light pulses through optical fiber loops," seems to imply that memories using circulating pulses are new and unique to optical computers.

The second general-purpose electronic computer (EDVAC, designed in 1946 though not working until 1952) used exactly this kind of data-storage approach, except that it used mercury acoustic-wave delay lines storing data as circulating sound pulses instead of optical fibers storing data as circulating light pulses. Many other early electronic computers also used circulating pulse memories (EDSAC in 1949, SEAC in 1950, the first UNIVAC in 1951, and others).

Circulating pulse memories have long been

obsolete in electronic computers because they limit the speed at which the machine can get the data it needs.

It seems to me that optical computers are closer to the electronic computers of the early 1950s than the mid-1960s.

R. Tim Coslet
Sunnyvale, Calif.

More animals recognize rotation

In "Baboons offer glimpses of left-brain brawn" (SN: 1/23/93, p.54), you summarize research by Hopkins and colleagues on baboon image perception and claim that their work provides the first demonstration that a non-human animal can recognize images that have been rotated.

There is no question that the work reported is important. However, other studies have also reported evidence of recognition of rotated images. For example, Richard Herrnstein has demonstrated that in pigeons, reaction time for image recognition (that is, categorization) is unaffected by rotation. And Perrett and colleagues have shown that in rhesus macaques, as in humans, upright faces are processed more rapidly than inverted faces.

In general, therefore, there appear to be a number of commonalities between humans and nonhumans with regard to image perception. This work is exciting because it provides us with a better understanding of the evolutionary precursors of human cognition.

Marc Hauser
Assistant Professor of
Biological Anthropology and Psychology
Harvard University
Cambridge, Mass.