

bounce back along the magnetic field lines.

After 3,000 nanoseconds, before the antiprotons can get back to the other end, the entrance-end cap is dropped to -3,000 volts, and the antiprotons are caught in the trap, bouncing back and forth. After some trapping period, which has ranged from 1 millisecond to 10 minutes, the exit-end cap is grounded, and the trapped antiprotons exit to an instrument that counts them. The whole thing is done at a temperature of 11°K for the ultrahigh vacuum the low temperature helps provide.

Antimatter is supposed to be the exact mirror image of matter, except that for properties that have polarity, the polarity is reversed. Thus an antiproton should be just like a proton except for having negative electric charge. Particularly the mass of one should exactly equal that of the other, or, to put it another way, the ratio of the mass of the proton to that of the antiproton should be 1.0000 . . . to an infinity of zeroes.

The experiment Gabrielse and his co-workers are now preparing is intended to measure that ratio by alternately trapping protons and antiprotons in the same trap with the same fields and the same ambient conditions. The size of the helix that a particle makes in the magnetic field depends on its mass, so a comparison of the paths of protons and antiprotons

should get the mass ratio directly.

In the past, measurements of the mass ratio have been done by introducing antiprotons into atoms in place of electrons and measuring how the substitution changes the energy-level structure of the atoms. Gabrielse expects that the new method will increase the accuracy of the measurement by a factor of 100 or so. Up to now, nobody has found anything that could be called a deviation of the mass ratio from unity, but who knows what further refinement might turn up?

Other experiments that might now be possible with trapped antiprotons, and that have been suggested from time to time by a number of physicists, include the making of antihydrogen by mixing positrons with trapped antiprotons. Is the structure of antihydrogen the precise mirror image of that of hydrogen?

Another possibility is the making of protonium, a system in which a proton and an antiproton are bound together and orbit each other. The force that holds them is mainly electric, but the strong interaction, the force that holds atomic nuclei together, should contribute a part of it. The strong interaction exerts a powerful attraction between protons and protons, between protons and neutrons, and between neutrons and neutrons. Is it equally strong between proton and antiproton, and is it still attractive?

—D. E. Thomsen

Ecological energy: Bigger is better

A large bird like the wild turkey takes in more food than, say, a sparrow. Moreover, despite their typically smaller numbers, large birds as a group may use a disproportionately large share of the resources available within an ecological community, two ecologists now report. Although small birds tend to be much more numerous, this doesn't compensate for their lower food needs per individual.

The finding that larger animals seem to dominate an ecosystem may help answer some evolutionary questions and appears to contradict earlier studies concluding that species of small body size use at least as large a proportion of the resources within ecosystems as their larger relatives. "Our evidence suggests that this is not the case," says James H. Brown of the University of Arizona in Tucson. "On the average, the energy flow through the larger species outweighs that through the smaller species." He and Brian A. Maurer of Brigham Young University in Provo, Utah, report on their work in the Nov. 20 NATURE.

Brown and Maurer analyzed data covering the population density and individual body mass of related species within an ecosystem. They looked at birds in a variety of habitats across North America, rodents in a desert environment, marine fish in tidal pools and pe-

renial plants in five different desert habitats. In all of these groups, the researchers say, species made up of large individuals account for most of the energy flow and resource use within local ecosystems.

What isn't clear is whether the results apply over the whole range of animals or plants within large areas. "I'm quite willing," says John Damuth of the Smithsonian Institution in Washington, D.C., "to accept the idea that within [groups of related species] in local communities, there might very well be an advantage to large size." Nevertheless, he says, according to his analyses, that advantage may disappear on larger scales across broader groups of animals.

Brown and Maurer say their results may help explain evolutionary patterns in which small organisms eventually give rise to gigantic forms that often become extinct. "There are certain roles in communities that can be filled efficiently only by these large species," says Brown, but population densities and sizes also go down. The evolutionary process pits the advantages of being an individual of large size (greater likelihood of survival, more mobility, etc.) against the greater probability of species-wide extinction because of smaller populations and slower growth.

—I. Peterson

Lasers advancing on heart problems

Lasers are making a rapid advance on heart disease. They have already reamed out clogged heart arteries during coronary bypass operations (SN: 11/23/85, p.327), and at the recent American Heart Association meeting in Dallas, researchers detailed initial human trials of lasers to treat erratically beating hearts as well as a simpler approach to atherosclerotic arteries.

While showing promise on two of the major problems of cardiology, lasers have their limitations. Using them to bust the clots involved in heart attacks, for instance, "would be like trying to burn Jell-O," one researcher says.

Several groups have used lasers to treat ventricular tachycardia, a condition in which part of the heart does not properly conduct the electrical signals that trigger beating. The heart contracts erratically, and death can result.

The condition is conventionally treated by drugs; for people who don't respond, operations to freeze or surgically remove the problem area are sometimes done. The laser treatment, say its developers, can benefit people whose arrhythmic areas are difficult to reach with scalpels or freezing devices, and once it is developed it may prove simpler and safer than either cutting or freezing.

Laser destruction of arrhythmias was first done a couple of years ago in France. At the Dallas meeting, Robert H. Svenson and his colleagues at the Sanger Clinic in Charlotte, N.C., described their use of the procedure in 21 patients, and Sanjeev Saksena of Newark (N.J.) Beth Israel Medical Center described its use in 12 patients. In both trials the patients had not responded to drug therapy.

In the Beth Israel procedure, worked out after years of animal trials, surgeons put patients on a bypass machine. With the hearts still beating but not pumping blood, the surgeons cut into the hearts with scalpels or lasers. They checked the heart's conduction patterns by applying electrical current and vaporized problem spots on the inner wall with lasers.

Eleven of the 12 people treated had no more tachycardia; the twelfth responded to drug therapy, says Saksena. About half of them would have been dead within a year, he estimates.

The Charlotte group used a laser tuned to kill but not vaporize the erratically firing cells. One patient died during the procedure and one shortly after; of the remaining 15, all but one appeared to be free of tachycardia, Svenson reported at the meeting.

Lasers have also been used on a more common problem, clogging of the arteries that feed the heart muscle itself. While lasers have been used point-blank