First, Fleeting Glimpse of Antiatoms

Physicists have for the first time created atoms of antimatter in the laboratory. Produced in an accelerator, these antiatoms lasted only 40 billionths of a second before annihilating in collisions with particles of ordinary matter.

An international team of researchers, led by Walter Oelert of the Institute for Nuclear Physics Research in Jülich, Germany, announced the accomplishment last week. The report is scheduled to appear in PHYSICS LETTERS B.

"It's an impressive achievement," says Richard J. Hughes of the Los Alamos (N.M.) National Laboratory.

Every subatomic particle, such as a proton or electron, has a corresponding antiparticle with the same mass and spin but opposite electric charge. Thus, the electron's antimatter counterpart, called a positron, has a positive charge, and the antiproton has a negative charge.

Moreover, when an antiparticle meets its matter counterpart, both entities instantly annihilate, releasing a burst of energy.

Physicists had already developed techniques for generating antiprotons and positrons in the laboratory. To create antihydrogen, they needed to bring these two components together so that a positron ends up orbiting an antiproton nucleus.

Oelert and his collaborators performed the experiment last September at the European Laboratory for Particle Physics (CERN) in Geneva. Using the Low Energy Antiproton Ring (LEAR), they sent antiprotons whirling at nearly the speed of light in the accelerator, periodically passing them through a jet of xenon gas.

Occasionally, an antiproton would interact with a xenon atom, giving up a small portion of its energy to create an electron and a positron. In the even rarer instances in which the newly created positron had a velocity sufficiently close to that of the antiproton beam, it would get captured by an antiproton to create antihydrogen.

Electrically neutral and no longer deflected by the accelerator's magnetic fields, this antiatom would move in a straight line before plowing into a silicon target. This target separates the positron from the antiproton so that each component can be detected independently as it annihilates.

During 3 weeks of observations, Oelert's team identified nine cases in which antiatoms had been created.

"This experiment nicely demonstrates that antihydrogen really does exist," says Gerald Gabrielse of Harvard University. "It's an exciting development."

However, antiatoms created in flight in a particle accelerator don't last long enough to permit any study of their characteristics. "You can't do useful measurements when these things travel at the velocity of light and only a few are produced," Gabrielse says.

Physicists would like to compare antihydrogen with ordinary hydrogen to check whether antimatter behaves in exactly the same way as ordinary matter. For example, researchers would like to know how gravity affects antimatter (SN: 3/2/91, p. 135).

Such data could provide clues as to why the universe appears to contain far more matter than antimatter. Present theory predicts that matter and antimatter would have been created in equal amounts in the early universe.

Researchers have already made considerable progress in developing methods for slowing down and storing large numbers of positrons or antiprotons in special antimatter traps (SN: 10/21/95, p. 268; 7/15/95, p. 38). But the primary source of antiprotons, CERN's LEAR facility, is scheduled to close at the end of this year so that the laboratory can focus on building the Large Hadron Collider (SN: 1/7/95, p. 4).

To beat this deadline, Gabrielse and his coworkers are rushing to complete preparations for an attempt to create antihydrogen by bringing together positrons and antiprotons and storing the resulting antimatter in traps for hours or longer.

"It's an incredibly hard thing to do," Gabrielse says. "If we're lucky, we'll make low-energy antihydrogen. But our chances of doing interesting measurements by the end of the year are not very high."

CERN physicists are looking into the possibility of adapting the antiproton source that feeds LEAR for use specifically in antihydrogen experiments. If this project attracts sufficient funds to pay for the new facility, experiments could begin by late 1998, says CERN's Rolf Landua.

Landua and his collaborators have plans for an antihydrogen experiment similar to the one being put together by Gabrielse and his team. "People from all over the world have become involved in this experiment," Landua says. "There's a huge interest." *—I. Peterson*

Myrrh: An ancient salve dampens pain

Apparently the three wise men displayed true wisdom when they made an offering of myrrh to the newborn Jesus.

Piero Dolara, a chemist at the University of Florence in Italy, and his colleagues find that secretions of the thorny, flowering shrub *Commiphora*—prized by ancient Mediterraneans for medicine, perfume, and embalming—indeed possess long-rumored analgesic properties.

The chemists gave a dose of myrrh to mice, then placed the animals on a hot metal plate, they explain in the Jan. 4 NATURE. Mice without myrrh began licking their paws within 15 seconds, whereas mice dosed with myrrh showed no discomfort for 20 seconds.

Dolara's team proceeded to analyze the holy remedy, subjecting its oils, gums, and resins to chromatography, nuclear magnetic resonance, and mass spectrometry. They isolated three key compounds but found that only two—the sesquiterpenes known as furanoeudesma-1,3-diene and curzarene—produced analgesic effects in mice.

Further tests suggest that myrrh's active ingredients affect the brain's opioid receptors, long known to influence pain perception.

"This could explain the use of myrrh as a painkiller in ancient times," Dolara says. Slightly astringent and antiseptic, the plant extract long ago found favor with the medical luminary Hippocrates, who prescribed it for mouth sores. Roman physicians used it to treat infections, coughs, and worm infestations.

"Its use for analgesia may later have been dropped and replaced by opium derivatives, given the presence in myrrh of other compounds with unknown or unfavorable pharmacological activity," Dolara speculates.

"There appears to be a real effect here," says J. Michael Walker, a neuroscientist at Brown University in Providence, R.I. "But there's still some question about the cause of that effect."

"It's also unclear how the opiate receptors are involved," he says. "It's not likely that these compounds act directly on opiate receptors, so the analgesia probably arises indirectly.

"But it's a very interesting class of compounds," Walker says. "Whenever someone finds new compounds that kill pain, they should be studied, because existing painkillers have limitations, and chronic pain is a huge problem for many people." *—R. Lipkin*