Magnetic nanorods on cruise control
Alexandra Goho
Science News; Jan 22, 2005; 167, 4; Education Module
pg. 62

OF NOTE

Carbon monoxide exposure, however, had no apparent influence on birth weight of exposed women's babies. —B.H.

BIOLOGY

Whalebones show damage from diving

Long-lived sperm whales typically develop bone damage resembling that observed in human divers who surface too quickly or dive too frequently, new research indicates. Marine mammals that dive throughout their lives hadn't been known to be susceptible to such a hazard.

Biologists Michael J. Moore and Greg A. Early of the Woods Hole Oceanographic Institute in Massachusetts made their discovery when they examined the museum-housed skeletal remains of 16 sperm whales.

In people, pitting of bones is often a sign of decompression sickness, which scuba divers can develop after experiencing pressure changes that cause bubbles of gas to form in the body. In mild cases, the condition can cause internal damage without producing symptoms. Extremely abrupt decompression can be fatal.

In their study, Moore and Early found extensive bone pitting in the largest and presumably oldest whales, and only calves were free of the damage. This suggests that the animals accumulate decompression-related bone damage gradually as they live out their lives, the scientists suggest in the Dec. 24, 2004 *Science*.

Because whales appear to be vulnerable to decompression sickness, any influence that causes them to surface suddenly could cause lethal harm, Moore speculates.

Some past research suggests that the U.S. Navy's use of some forms of sonar has caused the deaths of marine mammals by prompting the animals to surface. —B.H.

MATERIALS SCIENCE

Magnetic nanorods on cruise control

Chemists have created miniature engines out of nanoscale metallic rods that propel themselves using chemical energy. The technology might one day yield new kinds of sensors or even tiny machinery for assembling nanodevices.

Each rod, about 1.5 micrometers long and 400 nanometers wide, consists of multiple segments of platinum, nickel, and gold. When the filaments' makers at Pennsylvania State University in State College added them to an aqueous solution of hydrogen peroxide, the platinum segment, located at one end of the rod, broke down the hydrogen peroxide, releasing oxygen. The oxygen, in turn, weakened the attraction between the water molecules at that end of the nanorod. That opened the way for the rod to advance through the water, platinum end first.

For objects this small, water is highly viscous, explains Ayusman Sen of Penn State. Without a break in surface tension, "it would be like swimming through molasses," he says.

The rods move through the water at a rate of 10 μm per second, says Sen. That's about as fast as a bacterium that propels itself forward with a tiny, whiplike tail. "We raced the nanorods against the bacteria," says Sen. It was a tie.

The two nickel segments within each rod are magnetic, and that enabled the researchers to control the rods' direction of movement. When exposed to a magnetic field, the rods moved perpendicular to it.

The next step will be to attach a nanorod to a device, such as a biosensor searching for viruses, to speed up detection. The researchers describe the roving nanorods in an upcoming *Angewandte Chemie*. —A.G.

MEETINGS

American Astronomical Society
San Diego, Calif.
January 9–13

BLACK HOLES

Zooming in on a great void

Using an orbiting satellite tuned to listen in on the X-ray screams from black holes, astronomers have obtained the most detailed view yet of the environment surrounding these cosmic abysses.

With the help of the XMM-Newton satellite, Jane Turner of NASA's Goddard Space Flight Center in Greenbelt, Md., and her team tracked the motion of hot spots in the gas disk swirling around a black hole that sits at the center of the galaxy Markarian 766.

By charting periodic changes in the energy of X rays streaming from the gas disk, Turner's team discerned three hot spots in it. All are within a distance from the black hole roughly 5 times the space between Earth and the sun.

"Each of the hot spots is about the size of our sun, and they're orbiting [the black hole] at an incredible 33,000 kilometers per second," said Turner.

This is the first time that astronomers had detailed the motion of material so close to a black hole. Researchers had observed the motion of individual stars near the black hole at the center of our own galaxy, but these orbit hundreds of times farther out than the hot spots observed around Markarian 766's black hole do.

Probing material this close to a black hole will help astronomers study the effects of general relativity in these extreme gravitational environments, Turner says. —D.S.

DISK FORMATION

Stars in the dust

New observations of one of the sun's brightest neighboring stars show that the debris disk surrounding it contains much fine dust, probably from recent collisions between massive objects near the star.

Using the orbiting Spitzer Infrared Observatory, Kate Y.L. Su of the University of Arizona in Tucson and her colleagues found evidence for huge amounts of microscopic dust around the star, named Vega. Because radiation from any star such as Vega quickly clears away such particles, Su's team concludes that the dust must have been produced by recent collisions. In particular, the researchers propose that two or more Pluto-size objects collided sometime in the past million years and that many subsequent collisions between the resulting fragments led to the disk around Vega.

Two other teams using ground-based telescopes—one group led by Benjamin M. Zuckerman of the University of California, Los Angeles and the other by Charles M. Telesco of the University of Florida in Gainesville—have found signs of similar collisions around other Milky Way stars.

Zuckerman's team reports that a 400-kilometer-wide object appears to have been converted into dust around the star HIP8920 sometime in the past several thousand years. Telesco and his colleagues gathered data from the star Beta Pictoris indicating that 100-km-wide objects collided there within the past 100 years.

Astronomers have long assumed that much of the dust in debris disks around stars comes from ongoing collisions between objects the size of small asteroids, but the new findings are the first to show evidence of recent collisions involving far more-massive objects. —D.S.