

Spotting the Milky Way's enigmatic center

Two tiny spots of light may hold the key to unlocking the mystery of the Milky Way's center. These celestial objects, detected by astronomers using the European Southern Observatory's New Technology Telescope (NTT) at La Silla, Chile, lie very near the position of a source of intense radio waves in the southern constellation of Sagittarius, in the direction of the galactic center.

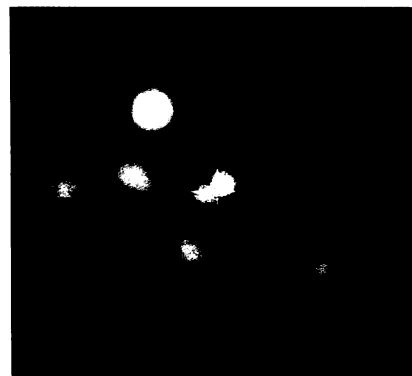
The discovery marks the first identification of visible objects at the radio source's position. Careful study of the light emitted by these objects, provisionally designated GZ-A and GZ-B, may enable astronomers to determine whether a black hole or a compact cluster of hot, young stars lies at the heart of the Milky Way.

To obtain a clear image of the galactic center, Michael R. Rosa of the European Southern Observatory in Garching, Germany, and his collaborators adopted a novel strategy for penetrating the dense interstellar gas and dust clouds that oth-

erwise obscure the view. They decided to make their observations at wavelengths ranging from 850 to 1,100 nanometers. At these wavelengths, about one-millionth of the light emitted by any sources present would penetrate the surrounding clouds — sufficient light for the NTT to obtain an image.

Using a variety of image-processing techniques, the astronomers combined five 40-minute exposures to create one sharp optical image. That allowed them to see that one of two relatively bright stars in the picture appeared elongated, clearly indicating the presence of other, fainter images nearly coincident with that of the bright star. Further processing subtracted the bright star's image, unveiling two closely spaced, previously unknown star-like objects.

GZ-A lies closer to the galactic center's radio source, about 28,000 light-years from Earth. It looks quite blue, suggesting a large energy output, and apparently shines with an intensity a few million



Computer-processed image shows a pair of star-like objects (cross) at the Milky Way's center, known as GZ-A (lower left) and GZ-B (upper right).

times greater than the sun's. It also seems to produce very little infrared radiation, whereas GZ-B appears to coincide with a known source of infrared radiation.

Rosa and his colleagues speculate that GZ-A could be an extremely dense cluster of hot stars. However, it's also possible that one or both of the objects are associated with a black hole at the galactic center. Spectroscopic studies of the light emitted by the two objects may indicate which idea is correct.

— I. Peterson

U.S. stalls on establishing CO₂ limits

The United States resisted calls to make a specific commitment on the issue of global warming at an international meeting last week in Geneva, Switzerland, and now finds itself the only wealthy Western nation that has not agreed to stabilize its emissions of carbon dioxide by the turn of the century.

In the weeks leading up to the Second World Climate Conference, 18 Western European nations, Japan, Australia, New Zealand and other countries announced their intention to stabilize carbon dioxide emissions. But in drafting the conference's final declaration, U.S. negotiators blocked attempts to insert specific timetables for industrialized nations to limit those emissions, the primary cause of global warming.

The action drew criticism from environmentalists and from many countries that had hoped the conference would generate a strong international statement before negotiations on a global climate treaty begin in February. Diplomats aim to have the treaty ready in time for the United Nations Conference on Environment and Development in June 1992.

During the Geneva meeting, which began Oct. 29, scientific experts from around the world gathered to discuss the state of knowledge regarding global warming. Their final declaration concludes that "notwithstanding scientific and economic uncertainties, nations should now take steps toward reducing sources and increasing sinks of greenhouse gases through national and regional actions."

However, according to John Knauss,

head of the National Oceanic and Atmospheric Administration and the lead U.S. delegate to the conference, the United States is not prepared to set specific targets on carbon dioxide emissions, although it is implementing programs that would slow the rising trend in emissions levels.

The U.S. position contrasts with that of other Western industrialized nations, which have agreed to stabilize or reduce their carbon dioxide emissions. Many of these countries maintain they can achieve reductions without substantial costs to society. Other industrialized nations have opposed adopting emissions limits. These include the Soviet Union, beleaguered by a failing economy, and China, with relatively low *per capita* emissions of carbon dioxide.

The debates at the meeting foreshadowed the problems facing those attempting to frame an international agreement in the next two years. "I realize the difficulty of the negotiating process, given the wide variety of views among the different countries of the world," says conference coordinator Howard Ferguson of the Geneva-based World Meteorological Organization, one of six international organizations sponsoring the 138-nation meeting.

Yet the conference and the deadlines recently set by some nations left many hopeful for the prospects of a treaty. "It's not going to happen overnight, but this international process has a lot of momentum right now," says Rafe Pomerance of the World Resources Institute in Washington, D.C.

— R. Monastersky

STM tip builds golden mounds

Physicists have devised a simple and speedy method for creating microscopic images and characters. Their new technique — using a scanning tunneling microscope (STM) to deposit tiny gold mounds onto gold or platinum surfaces — brings scientists one step closer to making near-molecular-scale electronic devices.

In recent years, many groups have sought to manipulate increasingly small clusters of atoms, with the ultimate goal of making tiny circuits and data storage devices. The STM has proved a helpful tool. Invented in 1981, the instrument works by positioning a tiny metal tip within a few atomic diameters of a surface, close enough to allow electrons to leap, or "tunnel," across the air gap to the surface. The resultant current varies with the width of the gap, allowing scientists to chart surface bumps and grooves as small as individual atoms (SN: 4/1/89, p.200).

Dan Rugar, H. Jonathon Mamin and Peter H. Guethner at the IBM Almaden Research Center in San Jose, Calif., wondered whether they could somehow release clusters of atoms from an STM tip and deposit them onto a surface. "I had the idea that if we could apply [an external] voltage to the tip, we could get some atoms to be emitted," says Rugar.

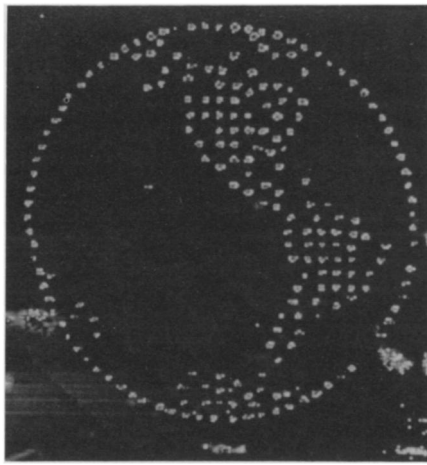
Scientists have long known that a

strong electric field can ionize and eject atoms from a surface, but no one had tried this approach with a solid STM tip. The IBM team chose gold as the tip material because it holds its atoms loosely and does not react in air, disrupting the STM.

Rugar's idea worked. In the Nov. 5 PHYSICAL REVIEW LETTERS, he and his colleagues report that short bursts of voltage applied to the gold tip produced surface mounds typically measuring 100 to 200 angstroms in diameter and 20 to 30 angstroms high, each containing several thousand atoms. The linear dimensions of today's computer-chip features are about 100 times larger.

Other researchers have "written" characters of the same size or smaller using different methods and more complicated setups, Mamin notes. Last April, for instance, another IBM team reported it had written "IBM" by pushing individual xenon atoms into place with an STM, but this required supercold temperatures and a vacuum. "We can operate in room temperature and in air," Mamin says.

The new method works fast, depositing a single mound in a few hundred nanoseconds or less and creating a grid of more than 100 mounds in just a few minutes. The speed is limited only by the time it takes to move the tip between locations, Mamin says.



Arguably the smallest map of the Western Hemisphere, the actual diameter of this image — greatly enlarged here — measures about one-fiftieth that of a human hair. Each dot is a mound of gold containing thousands of atoms.

"We were also surprised how reliably it worked," Rugar adds. "We thought that after a few tries the tip would be blunted so that it wouldn't be able to emit well." Instead, they found that many of the tips could make thousands of dots.

The researchers now plan to try different materials, including a silicon surface, and will attempt to increase the technique's speed. — R.N. Langreth

Fossil find creates ancient ape puzzle

The first discovery of substantial limb remains from an ancient ape known as *Sivapithecus*, unearthed from 9- to 11-million-year-old sediments in Pakistan, raises perplexing questions about the creature's evolutionary standing.

Although previously excavated skull fragments indicated *Sivapithecus* was an early cousin of the orangutan, two new upper-arm bones more closely resemble those of chimpanzees, gorillas and many monkeys, assert anthropologist David Pilbeam of Harvard University and his colleagues. The shape of these nearly complete bones suggests *Sivapithecus* principally walked on all fours rather than spending much of its time climbing in trees and hanging from branches, the scientists report in the Nov. 15 NATURE.

Two possible evolutionary scenarios now exist for *Sivapithecus*, they point out. One argument supports an ancestral link between the ancient Asian ape and modern orangutans based on shared features of the face, nose and palate, while maintaining that limb similarities between *Sivapithecus* and African apes represent independent developments. The other proposes that *Sivapithecus* was not clearly related to any living ape and that its facial resemblance to orangutans fails to indicate a common ancestry.

Individual variation in the shape and size of bones among ancient and modern apes belonging to the same species creates serious problems for anthropologists attempting to reconstruct evolutionary relationships (SN: 8/18/90, p.106). Thus, Pilbeam and his co-workers maintain, further fossil discoveries of *Sivapithecus* probably will not reveal its definitive ancestral standing.

The two arm bones possess curved shafts similar to those of two groups of ancient African apes as well as most modern, knuckle-walking monkeys, the researchers note, whereas tree-dwelling apes such as the modern orangutan have straight upper-arm bones. The elbow joints resemble those of modern apes, suggesting that specialized anatomical features for climbing and suspension also developed in animals that spent most of their time on the ground, the anthropologists contend.

They add that previous fossil finds indicate *Sivapithecus* also shared with living African apes some important hand and foot features that aid in four-legged walking.

Sivapithecus dates to between approximately 13 million and 7 million years ago. Its remains have turned up in Greece, Turkey, India and Pakistan. Once considered a precursor of humans, it was first aligned with orangutans about 10 years ago. — B. Bower

Malaria drugs may boost viral virility

Mouse studies suggest that five of the most commonly used antimalaria drugs may make individuals especially susceptible to viral diseases, including AIDS. If confirmed in humans, this could portend a no-win predicament for the millions of Africans who live virtually surrounded by both the AIDS virus and the deadly malaria-causing protozoan *Plasmodium falciparum*.

Radha K. Maheshwari and his colleagues at the Uniformed Services University of Health Sciences in Bethesda, Md., gave healthy mice one of five different antimalaria drugs and then injected the animals with either of two tropical viruses — Semliki Forest virus or encephalomyocarditis virus. At blood concentrations equivalent to therapeutic levels in humans, the antimalaria drugs significantly enhanced viral replication, leading to more rapid onset of disease and higher death rates in the treated mice compared with untreated mice challenged with the same viruses.

The researchers say their data are consistent with *in vitro* experiments by others suggesting that antimalaria drugs may enhance the activity of the AIDS virus and Epstein-Barr virus, which has been associated with a cancer called Burkitt's lymphoma. They say

their experiments — the first to test the phenomenon *in vivo* — "suggest that the widespread use of antimalarials in malaria-endemic areas may predispose the population to significant viral infections, including AIDS." The team presented its data in New Orleans last week at the annual meeting of the American Society of Tropical Medicine and Hygiene.

Scientists know that chloroquine, the most commonly prescribed antimalaria drug, suppresses the immune system, says William K. Milhous of the Walter Reed Army Institute of Research in Washington, D.C. However, he adds, it's not obvious why other, chemically unrelated antimalarials would also do so.

In the mouse experiments, all five drugs suppressed the disease-fighting "natural killer cells" and apparently blocked the action of interferon, an immune-enhancing chemical secreted by several types of white blood cells. Noting that physicians in Africa often prescribe synthetic interferon to help ward off infections, the researchers warn that antimalaria drugs might render that treatment useless.

Milhous says scientists will have to perform similar studies in primates to help determine whether the new findings apply to humans. — R. Weiss