RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Fire Damages Gamma-Ray Observatory

Nearly one-third of a brand-new gamma-ray observatory in the Canary Islands was destroyed by a fire on 16 October. Because of the damage, the sensitivity of the observatory will be reduced by about half for at least the next several months.

The High-Energy Gamma-Ray Astronomy, or HEGRA, a German-Spanish-Armenian facility constructed over the last 8 years at the Roque de los Muchachos observatory on La Palma, consists of 239 sheds housing particle detectors and six special-purpose telescopes. Some 70 sheds were destroyed and one telescope severely damaged by the fire, the cause of which remains under investigation. "It took the fire brigade many hours to extinguish the flames with helicopters," says Dutch engineer and eyewitness Rob Hammerschlag.

The detector complex became fully operational only last summer. Its main task is to study gamma-rays (high-energy electromagnetic radiation) and cosmic rays (fast-moving electrically charged particles) from space. When both types of rays collide with Earth's atmosphere, they create showers of secondary particles that are caught by the detectors.

HEGRA astronomers are resigned to a period of impaired vision. "Our [detection] sensitivity will be reduced for some time by a factor of 2," says Eckart Lorenz of the Max Planck Institute for Physics in Munich, Germany, which is participating in the HEGRA collaboration. Nonetheless, he's optimistic that the observatory's detection capabilities can soon be brought back to almost full strength. "We estimate that we will be able to repair the telescope and 25 of the most important detector stations ... in about 3 months," he says.

Indians Look At Their Big Cats' Genes

A team of DNA sleuths came up with some good news and bad news for India's big game last month. The good news is that India's dwindling lions may have more genetic variability than had been thought, suggesting an adaptability that would boost their changes for long-term survival. The bad news is some of India's wild tigers may be losing their genetic identity. Both sets of findings, however, are controversial.

Many experts have assumed that the wild lions in Gir National Park in Gujarat—part of the last of the Asiatic lion population, now down to about 350—have a depleted gene supply after their near-extermination early this century. As part of a larger conservation effort, molecular biologist Lalji Singh and colleagues at the Centre for Cellular and Molecular Biology in Hyderabad analyzed random bits of DNA from 38 lions of known wild origin. They found much more genetic diversity than expected: Fully 26% of the DNA stretches examined varied, on average, among individual lions, they reported in the September issue of *Electrophoresis*. That's about normal for big cats, says Singh. But it contradicts a 1987 study by Stephen J. O'Brien of the U.S. National Cancer Institute, which revealed "almost no [genetic] variability" in a sample of 28 Asiatic lions. O'Brien, who looked for variations in certain gene products, says the method used by the Hyderabad group—random amplified polymorphic DNA—is "notoriously unreliable" for population genetics. Singh defends it as "extremely sensitive."

PHOTOS: PALLAVA BAGLA

The right stuff? Asian lions and Indian tigers get their DNA analyzed.

Singh's team also reports that two wild Indian tigers in northern India's Dudhwa Tiger Reserve have some Siberian tiger genes, probably as a result of the introduction of a mixed-parentage female into the reserve 2 decades ago. While the Dudhwa tigers are only about 1% of India's wild tiger population of 3500, the presence of hybrids is "very disturbing," Singh says, because hybrids could spread their genes to nearby tiger populations and jeopardize the Indian tiger as a discrete species. Singh says all the Dudhwa tigers should be examined so this can be prevented. Backing the idea is India's Project Tiger, which is looking for funds for a major research project.

Not everybody is ready to sign on, though. Biologist Ullas Karanth of the Wildlife Conservation Society in New York City says, "Money would be better spent on improved habitat protection than on DNA profiling."

Easing the Pain of Repetitive Strain

More and more computer users—from occasional word processors to round-the-clock gaming geeks—are succumbing to repetitive strain injury (RSI), a grab bag of maladies that make banging a keyboard a nightmare. But help may be on the way: Scientists are about to test some non-keyboard technologies that could head off disability.

RSI—which includes carpal tunnel syndrome, rotator cuff syndrome, tendonitis, and tenosynovitis, to name a few—is growing ever more visible these days. Informal surveys at Harvard have revealed that about one-quarter of grad students in the astronomy, physics, and computer science departments have problems ranging from mild wrist ache to acute pain that makes typing impossible. And at the Massachusetts Institute of Technology, physician David Diamond says that some 250 RSI patients sought help last year—a 20% increase over 1995.

Hoping to reverse this disturbing trend, Stanford engineer Neil Scott and his colleagues will launch a study in January to test more wrist-friendly technologies in 80 employees from Stanford and the Bay Area offices of Boeing and Hewlett-Packard who are showing early signs of RSI. Half of the participants will have the option of using voice-recognition technology instead of a keyboard, as well as a device that allows the mouse to be operated by head movements—a mouse is even harder on the body than a keyboard, Scott says. If the modified work station prevents full-blown RSI, the savings could be tremendous: It costs less than $10,000 to set up a workstation and train a user in voice recognition, while RSI treatment costs and lost wages for an individual can run up to $100,000.

But RSI does not promise to be

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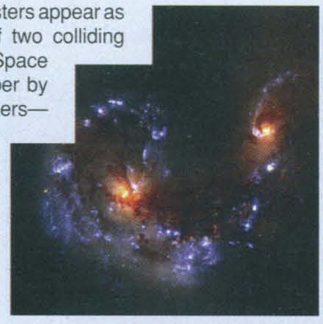

B. WHITMORE/NASA

Galactic fireworks. Young star clusters appear as bright blue spots in this scene of two colliding galaxies captured by the Hubble Space Telescope. Released on 21 October by NASA, the image shows that clusters—each containing up to a million stars—can be spawned by the shock waves of a galactic collision. The image supports a long-standing theory that the Antennae, a cosmic object 60 million light-years away, is actually a pair of galaxies in the early stages of a merger. Because the color and brightness of star clusters reveal their ages, astronomers hope to assemble snapshots of the entire collision process from many merging galaxies, using the clusters as "clocks." "It's like watching a car wreck as it happens," says Yale astronomer Steve Zepf.

Understanding these cataclysms might help shed insight on the early universe, when galaxies were closer together and such events were common. And with the Andromeda galaxy bearing down on the Milky Way at 500,000 km per hour, studies on the Antennae might predict the aftermath of our own cosmic car crash some 5 billion years from now.

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an easy enemy to vanquish. At times the cure is as bad as the disease—some people "bark" at their computers, Scott says, straining their vocal cords. And the repetitive movements of head tracking can cause neck strain. Still, the time is ripe for attacking RSI before the problem gets worse. "I suspect we're going to see the problem at earlier stages in people's academic careers," says Joan Bisagno, director of Stanford University's Disability Resource Center. "People are living in front of their computers now."

FBI Crime Lab Gets Physicist Director

The Federal Bureau of Investigation's (FBI's) troubled forensics laboratory has a new director: physicist Donald M. Kerr, former director of Los Alamos National Lab (LANL).

With more than 700 employees and a budget of some $130 million, the nation's largest crime lab prides itself on being on the cutting edge of new technologies such as DNA fingerprinting. However, an April report by the Justice Department's inspector-general chewed it out for improper and scientifically flawed procedures, and "unscientific" court testimony in high-profile cases such as the bombing of the World Trade Center. The lab is now working on standardizing protocols and on getting accreditation from an independent body.

While Kerr has no forensics training, FBI director Louis Freeh lauded Kerr's "remarkable" background as both a scientist and a manager, which, he said, "will be invaluable" for FBI efforts to prevent terrorism involving nuclear, biological, or chemical weapons. Kerr headed LANL from 1979 to 1985, and was most recently an officer of Information Systems Laboratories Inc. in San Diego. This new job "has a unique combination of science, operational responsibility, management challenge, and public interest," he says.

Kerr's appointment provoked a complaint from Senator Charles E. Grassley (R–IA), chair of a subcommittee that oversees the FBI, that the bureau "fell miserably short" of its promise to find someone with a background in forensic science. Kerr responds that "the FBI lab includes essentially the same set of disciplines" as LANL—it's just applied to forensics, not defense.

Kerr hopes to expand training in and dissemination of new knowledge at the lab, which will move from Washington, D.C., to new $130 million quarters in Quantico, Virginia, in 2000.

Ice Show

New York's American Museum of Natural History bills it as "the most comprehensive exhibition ever mounted on the subject of diamonds." It's a 6-month exhibit opening on 1 November, which includes a simulation of a mine tunnel, a hands-on model of a diamond crystal, and a workshop where gem cutters demonstrate their craft. The diamond has a legitimate "hold on our imaginations," says George E. Harlow, curator in the museum's Department of Earth and Planetary Sciences—being highly refractive, extraordinarily thermally conductive, and orders of magnitude harder than its nearest neighbor, corundum. Harlow says about 3 billion carats have been mined so far, and there are still lots left. Canada, which has lots of kimberlite—the volcanic rock where diamonds are found—"has not been touched," he says.

AMERICAN MUSEUM OF NATURAL HISTORY

Hard rock. Six-carat stone in kimberlite matrix from De Beers.

Tuning In to Rat Whiskers

The brain may learn about the world in much the same way a radio translates radio waves into sounds. Rat whiskers trigger nerve signals that the brain decodes using a feedback loop like that of an FM radio, according to a report in the 14 October *Proceedings of the National Academy of Sciences.*

When an animal touches an object, sensory neurons send electrical signals to the thalamus, which relays them to the cortex for analysis. It's been a mystery, though, how these brain regions decode the signals.

Neuroscientist Ehud Ahissar and his colleagues at the Weizmann Institute for Science in Rehovot, Israel, set out to crack this code by studying rats, which are among a handful of rodent species that sense things with the aid of vibrating whiskers, sweeping them back and forth at about 10 cycles a second (10 Hertz). Ahissar and his colleagues believe that changes in the timing of the whisker signals as they strike objects are a way of coding an object's location.

SEBASTIAN HAIDARLIU/WEIZMANN INSTITUTE

Sensors. Rats locate objects with vibrating whiskers.

The scientists knew that certain neurons in the rat cortex, called oscillatory single units (OSCs), pulse at precise frequencies, near 10 Hz. According to their model, these pulses are sent continuously to the thalamus, which compares them with incoming whisker signals. In a kind of feedback loop, the cortical cells' oscillations are modified in response to those signals. This process, Ahissar says, decodes the whisker signals into an intelligible form.

To test their theory, Ahissar's team used a vibrator to jiggle a rat's whiskers at varying rates. Sure enough, electrodes in the rat's brain revealed that the OSC frequencies changed with the whiskers' vibrations. Such a feedback loop is similar to the circuits of an FM receiver, which generates an intelligible signal (sound) by comparing electrical patterns from an oscillator to those from incoming radio waves. "We fully understand how this works in radios, so if the brain utilizes similar principles, it could be a very good starting point to understand how the brain does it," says Ahissar.

"I think it's an important and provocative paper," says neuroscientist Michael Merzenich of the University of California, San Francisco. "People have talked about corticothalamic feedback forever, but they haven't talked about it in specific dynamical terms."