

World Science News In Review

[Archeology]

First Egyptian Lion Mummy Discovered

French archaeologists have found the first mummified lion in the tomb of King Tutankhamen's wet-nurse, Maïa, at Saqqara, located south of Cairo. The tomb dates from 1330 BC, but researchers suggest the lion was mummified during a later Egyptian dynasty.

Alain Zivie, who led the French team of archaeologists, said in a telephone interview from Paris, "We knew from pharaonic inscriptions that lions existed in ancient Egypt and were buried in these tombs, but we had never found one until now." His team has been excavating Saqqara for 20 years, with funding from the French Ministry of Foreign Affairs and guidance from the Supreme Council of Egyptian Antiquities.

They discovered the tomb of Maïa in 1996 and found many funerary apartments with mummies of cats. In November 2001, Zivie and his team found a "big skeleton" in excellent condition, and his colleague, Cécile Callou, immediately confirmed that it was a lion.

Ancient Egyptians worshiped lions because they were thought to have divine abilities and symbolized strength and power. Just as the lion is the king of animals, the pharaohs and gods of Egypt were represented by lions. Bastet, a well-worshiped goddess, was drawn with the head of a lion and the body of a woman.

Some archaeologists suggest that the mummified lion was dedicated to Mahes, the son of the lion goddess Sekhmet. Regardless of such speculation, the discovery confirms the revered and sacred status of lions in ancient Egypt.

—L. Giam

Source: http://news.nationalgeographic.com/news/2004/01/0114_040114_egyptlionmummy.html

[Astronomy]

New Telescope Provides More Detail about Universe

Launched in August 2003, the Spitzer Space Telescope has recorded infrared images that may increase our knowledge of the universe, which was until now gathered mostly by X-ray, optical, or ultraviolet images. Images from the Spitzer Telescope show better resolution and sensitivity than previous infrared telescopes provided. The Spitzer has recorded spectra of organic compounds such as water and hydrocarbons, suggesting that Earth

does not hold a monopoly on the building blocks of organic life. The likelihood of this is increased by the fact that the organic compounds



Image: Stapelfeldt/NASA/JPL – Inner (yellow-green) and outer (orange) parts of a debris disk surround the nearby star Fomalhaut.

were recorded in galaxies more than three billion light years away, meaning the images represent the state of the galaxies more than three billion years ago, at a time when life on Earth was starting to develop.

Also of particular interest has been the star Fomalhaut. With infrared technology, the Spitzer Telescope has now recorded the first full

image of a disk of debris surrounding the star. Interesting features of the disk include some sections radiating more than others (perhaps the result of gravitational pull from an unknown planet) and the possibility of an asteroid belt near the star. In addition to imaging Fomalhaut, the Spitzer Telescope has also imaged the Elephant's Trunk nebula and several young stars that are obstructed by dust in visible light.

—K. Rivoire

Source: <http://www.sciencenews.org/20031220/fob1.asp>



Image: W. Reach/NASA/JPL – False-color, infrared view of a glowing stellar nursery in the Elephant's Trunk nebula.

[Biology]

Human Cloning Now a Reality

South Korean scientists led by Woo Suk Hwang at Seoul National University have made a significant breakthrough in embryonic stem cell research, advancing human stem cell cloning to a stage never before reached. Such advancements could lead to significant development in tissue treatments for Parkinson's and diabetes patients

The scientists first cloned 30 embryos from 16 egg and cell donors. Out of those cloned embryos, researchers were able to harvest embryonic stem cells (ESC) from one sample embryo. The stem cell harvested followed the generic characteristics of ESC. The cells were able to multiply indefinitely, forming several different types of cells, such as bone, muscle, and cartilage cells.

Human cloning has never before achieved a mass larger than 100 cells. The process is difficult due to the fact that key chemicals, especially those belonging to primate embryonic cell nuclei, are very sensitive to cell structure changes; the removal of egg nuclei usually leads to the destruction of the trace chemicals.

It is unclear what led to the successful cloning of human stem cells in this particular research project, though a part of the answer seems to lie in a gentle cell nuclei extraction method.

—T. He

Source: <http://chemistry.about.com/gi/dynamic/offsite.htm?site=http://www.acdlabs.com/webzine>

Coffee Makes the World Go 'Round (and May Keep You Healthy)

In the hustle and bustle of modern times, in the stark distinction between the laborers and the labor attorneys, in the social and economic disparities between the successful yuppies and the cubically-trapped Miltons, a commonality is the cup, or multiple cups, of coffee relied upon throughout the workday. For some, the cup of coffee has become an omnipresent force; a source of life, invigoration, and sustenance. However, we have sometimes been scolded for our addiction to the caffeine-packed companion and warned of the adverse effects of its excessive use. Some data, however, now suggest otherwise: Multiple cups of java can decrease the risks of developing type II diabetes.

In a study led by Frank B. Hu of the Harvard School of Public Health, adults who drank four to five cups of coffee daily decreased their chance of eventually developing diabetes by 30 percent. Additionally, men who consume six or more cups daily safeguard themselves against the disease by an additional 20 percent. Women, on the other hand, did not benefit dramatically from the increase to at least 6 cups daily.

Last year, a Dutch research team published similar results. A group of 17,000 adult coffee patrons were monitored for 10 years. The data seemed to support an evident drop in the development of diabetes. Hu's study, however, was clearly more extensive, as it involved observing 42,000 men and 84,000 women for a period of 15 to 18 years. The Harvard team first analyzed the risk factors that may have influenced the findings, ranging from family history of the disease to inadequate exercise schedule to obesity. The major source of consumed caffeine was derived from coffee; cola, chocolate, and teas contributed little.

While Hu is confident of his findings, he does not recommend increasing your coffee intake in response to this singular study. Excessive caffeine has been linked with heart risks and rheumatoid arthritis.

It is no surprise that yet again, we are reminded that a well-balanced diet and an active lifestyle is our best defense against heart conditions and diseases such as diabetes.

—E. Slutsky

Source: <http://www.sciencenews.org/20040117/food.asp>

[EECS]

Spacecraft Visits and Samples Comet

While much of the space community was preoccupied with the recent Mars Lander, their fellow spacecraft Stardust was busy studying a comet. Stardust landed on Wild 2 in early January, taking some of the clearest images yet of a comet's core. In two years' time, if all goes well, it will return to Earth with physical samples.

Contrary to the prevailing image of comets as bland slabs of rock and ice, the pictures revealed a remarkably diverse landscape. "Everything is up and down. There are craterlike depressions, cliffs,

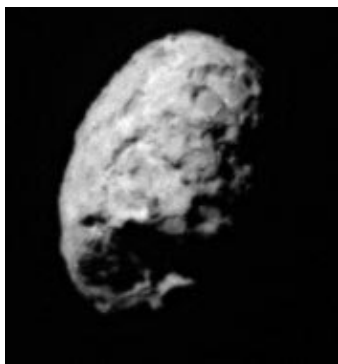


Image: Brownlee, et al./JPL/NASA – Comet Wild 2, as recorded by the Stardust spacecraft on Jan. 2, shows craterlike depressions. One hemisphere is in sunlight, the other in shadow.

and jets," said University of Washington in Seattle scientist Donald Brownlee. "All of this is important in understanding how comets formed." Lucy-Ann McFadden of the University of Maryland at College Park believes that the depressions provide "the first direct evidence" of the presence of craters on comets, which would indicate that they themselves are affected by roaming space objects.

Stardust's pictures also showed that Wild 2 is roughly spherical, unlike previously studied comets such as Halley, which are elongated. This discovery could be related to the comet's varied terrain, as it is fairly young and has not yet had time to wear down, said Michael Belton of Belton Space Exploration Initiatives. Given time, the ongoing sublimation process that gives comets their tails would also smooth their features but Wild 2 has only made five visits to the inner solar system. Perhaps Stardust's samples will provide additional insights.

—D. Barclay

Source: <http://www.sciencenews.org/20040110/fob1.asp>

[EECS/AI]

Robot Eliminates Need for Human Scientists?

A "robot scientist" created by British scientists has been proven to create hypotheses, design experiments, and interpret the results of its experiments at the same level as many human scientists.

"There was no difference between the robot and the best humans on this task," said computer biologist Ross King of the University of Wales in Aberystwyth and Stephen Oliver of the University of Manchester.

The robot consists of a liquid-handling machine connected to computers and is packed with robotics and advanced AI software, as reported in the Jan. 15 issue of *Nature*. With its additional knowledge of biochemistry, the robot was able to determine the function of yeast genes using the scientific process.

Although it is unknown whether robot scientists will become a regular part of every research lab, they may prove to be extremely useful in searching through large amounts of data, especially in gene research. However, all robot data will have to be verified by human scientists before it is accepted. "It is inevitable because it will be required to deal with the challenges of science in the 21st century. It is also desirable because it frees scientists to make the high-level creative leaps at which they excel," the researchers noted in *Nature*.

—L. Nambiar

Source: http://news.nationalgeographic.com/news/2004/01/0114_040114_robot.html

[Materials Science]

Novel Magnetic Material

Elie Molins of the Barcelona Science and Materials Institute (ICMAB) and scientists at the Autònoma University of Barcelona (UAB) and the University of Zaragoza developed a novel magnetic material in which fine particles of neodymium, iron, and boron (Nd₂Fe₁₁B) are embedded in silica aerogels, which are light and 95 percent air in composition.

There are a wide variety of applications for this material. These magnets are not only transparent and lightweight but also resistant to

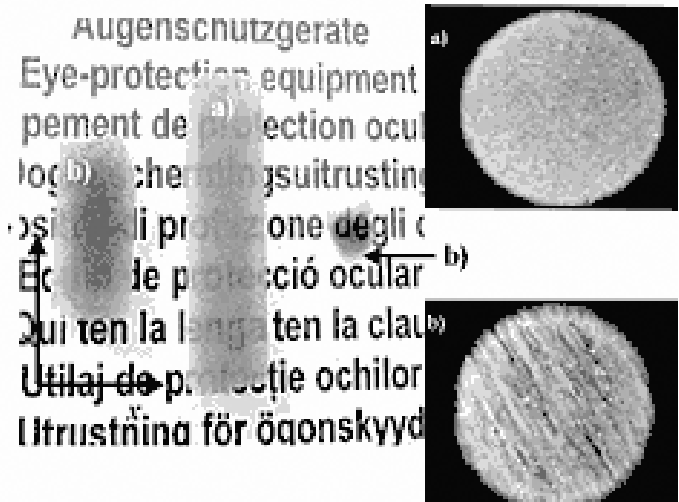


Image: (a) unaligned opaque aerogel; (b) aligned in a magnetic field and transparent.

the effects of weak external magnetic fields, making them useful for information storage. The optical versatility of the aerogel allows it to be used in magneto-optical memory devices with lasers as well as in flat-screen displays, since they are anisotropic.

The structure of the magnetic aerogels gives them the lowest levels of thermal, electrical, and sound conductivity in their class of materials. Many of their immediate applications have yet to be determined, but these materials will revolutionize the current 2-D world of microelectronics and information storage.

-L. Giam

Source: <http://chemistry.about.com/gi/dynamic/offsite.htm?site=http://www.acdlabs.com/webzine>

[Math/EAPS]

What if the Earth were Larger?

Scientists at the University of Arizona are investigating an almost century-old partial differential equation that models planetary tidal effects caused by the gravitational force applied by a planet on its satellite, and vice versa.

Sections of a planet that are located at various distances from a satellite have a different gravitational force. Because of this, the planet develops internal strains and stresses that cause its sections to accelerate together due to the unstable effect of gravity. Tides arise because a planet is a certain size and occupies a specific area.

Oxford mathematician Augustus Edward Hough Love developed partial differential equations in 1911 that describe how the shape of one body can be affected by the gravity of a second. One of his equations found the tidal amplitude for a sphere. He then plugged in values that could describe the Earth for the constants in his equation and produced reasonable results for tidal amplitudes.

The scientists in Arizona observed the effect of size and other variables on tidal amplitude using computers. They repeated Love's results for the Earth but found that for planets larger than the Earth small satellites could cause large tides. The researchers state that "it is conceivable that extreme instabilities might disrupt or limit the growth of forming planets." They speculate that when the size of a growing

planet reaches a certain value, it could stop getting larger due to limiting conditions that place an upper limit on its size. This could lead scientists closer to understanding the evolution of satellites.

-N. Rubinstein

Source: <http://www.sciencenews.org/20040117/mathtrek.asp>

[Physics]

Infrasonic Symphony

Scientists are devising increasingly imaginative ways to work with infrasound, the wavelength of which is too high to be heard by humans. Potential applications include detecting earthquakes, hurricanes, nuclear blasts, the aurora borealis, and the vocalizations of large animals such as elephants.

For example, a Wyoming agency set up microphones in a mountain pass to detect avalanches. Audible sound fades away too soon, but by monitoring the longer-lasting infrasound - in this case the waves emitted by falling rocks - transportation officials can quickly know if an avalanche disables a remote road. According to Ernie Scott of IML Air Science, "Essentially, they can sit there and listen for an avalanche to occur. If it hits a highway, they can send the road crews out."



Photo: Johnson - BIG BANG. The eruption of the Fuego volcano in Guatemala last year generated high-amplitude infrasound, mostly below 10 hertz. The pressure readings show that the strength of these sound waves can reach the equivalent of 120 decibels.



Photo: J. Curtis - PRETTY LIGHTS. Auroras such as this one generate infrasound by pushing the surrounding air outward.



Photo: A. Mack - ODD BIRD. A Cassowary might pick up infrasonic signals with its casque, a mysterious head-top structure that is the subject of much scientific speculation but has no known function.

A similar principle is being used to determine if countries are illegally cheating on a nuclear test ban treaty. Twenty-four monitoring stations worldwide continuously collect infrasonic data to send to a central computer, which sorts through the information for anything suspicious. "Ideally, we want to be able to say, 'Here is a signal, and

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we know it wasn't a nuclear test," said Michael Hedlin, the head of one of the stations.

Its low frequency doesn't mean the infrasound isn't powerful. University of Hawaii at Manoa scientist Jeffrey Johnson, who measures infrasonic emissions from an active volcano in Antarctica, reported that some of the signals have a volume of over 130 decibels—"somewhere between a jet airplane and the threshold of pain." Luckily for Johnson, they just can't be heard.

—D. Barclay

Source: <http://www.sciencenews.org/20040110/bob9.asp>

Those Quirky Quarks

Researchers at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia have come across some "disturbing" results relating to quarks, the main components of neutrons and protons. A single quark may briefly steal all of the energy in a neutron, but still spin in a direction opposite to that of the neutron. This means that scientists may have previously miscalculated quark behavior inside neutrons and underestimated the importance of quarks' spins.

Atomic nuclei are made up of (a) nucleons, which are neutrons composed of one "up" and two "down" quarks, and (b) protons, which are composed of one "down" and two "up" quarks. Nucleons also contain gluons, which join quarks together, and temporary quark-anti-quark pairs. Each component of the nucleon carries a part of the nucleon's energy although the energy distribution is always changing.

The spin detecting experiment performed in the Jefferson lab is the first to measure a neutron's state when the majority of its energy is in one quark. Previous experiments and mainstream theory predict that a quark holding most of a nucleon's energy should spin in the same direction as the nucleon. Surprisingly, in this most recent experiment, even when the up quarks held up to 60 percent of a neutron's energy, they rotated in a direction opposite to the neutron. The motions of the orbitals of valence quarks, which are the only quarks that can hold the majority of a nucleon's total energy, may contribute to nucleon spin. This overthrows older theories and forces researchers to formulate a new theory on quark behavior in neutrons.

—N. Rubinstein

Source: <http://www.sciencenews.org/20040103/fob1.asp>

[Psychology]

Worrying Linked to Early Death in Mice

Psychologists at the University of Chicago recently performed a study showing that mice that avoid new settings and live in relative safety might have shorter life spans. The overly cautious mice seemed unable to cope with stressful situations, causing them to age prematurely, thereby cutting their lives shorter. The mice seemed to inherently prefer one behavior to the other, maintaining either a tamer or bolder attitude toward exploring new environments throughout their lifetimes.

Hormone tests revealed that more adventurous mice responded to stressful situations better, with their hormones returning to normal levels much more quickly than their timid counterparts. The adventurous mice lived an average of 700 days, compared to 600 for the inhibited mice. Psychologist Martha McClintock, a leader in the study, analyzes the results as a trade-off between the two lifestyles; the bolder mice are more likely to die due to attack by a predator, but those who survive seem to outlive the mice who avoid risks entirely. As Jerome Kagan of Harvard University points out, however, the results have yet to be verified in human beings, who often die earlier as the result of risky behavior.

—K. Rivoire

Source: <http://www.sciencenews.org/20031213/fob5.asp>

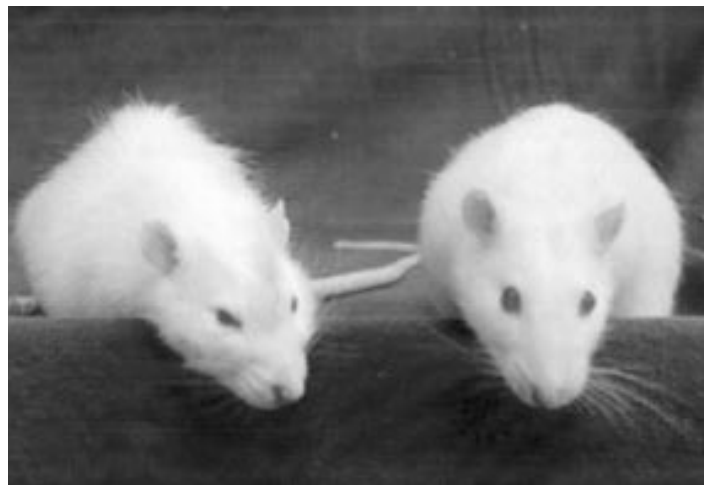


Photo: Cavigelli, McClintock – STRESSED OUT. The rat on the left exhibits fear and caution in a novel environment while its brother (right) displays boldness and curiosity in the same setting.