

DHAKA TUESDAY JUNE 21, 2011, E-MAIL: science&life@thelifestar.net

12

When black hole gobbles up star..

A powerful beam of energy has been spotted blasting out from the center of a massive black hole as it rips apart and devours a star in a rare sight that astronomers say likely happens only once every 100 million years, a new study finds.

When a NASA satellite first detected the intensely bright flash deep in the cosmos, astronomers initially thought it was a powerful burst of gamma rays from a collapsing star, one of the most powerful types of explosions in the universe. But, when the tremendous amount of energy could still be seen months later, they realized something more mysterious was going on.

"This is a really, really unusual event," study co-author Joshua Bloom, assistant professor of Astronomy at University of California, Berkeley, told SPACE.com. "It's now about two-and-a-half months old, and the fact that it just continues on and is only fading very slowly is the one really big piece of evidence that tells us this is not an ordinary gamma-ray burst." [Photos: Black Holes of the Universe]

NASA's Swift Gamma Burst Mission spacecraft first detected the gamma-ray flash, called Sw 1644+57, within the constellation Draco, at the center of a galaxy nearly 4 billion light-years away.

Using Swift observations and others by the Hubble Space Telescope and the Chandra X-ray Observatory, Bloom and his colleagues concluded that the strange activ-



Artist's impression of the formation of two jets of energy at Swift 1644+57

ity they were seeing was likely from a star being ripped apart by a massive black hole, rather than the effects of a gamma-ray burst, which typically can only be observed for about a day.

"This burst produced a tremendous amount of energy over a fairly long period of time," Bloom said. "That's because as the black hole rips the star apart, the mass swirls

around like water going down a drain, and this swirling process releases a lot of energy."

These findings are published online in the June 16 issue of the journal *Science*.

Death of a star

Bloom's research showed that the highly energetic and long-lasting X-rays and gamma-rays were produced as a star about the size of our sun was violently shredded by

a black hole a million times more massive.

But, what makes this a rare event is that this particular black hole has not been eating up matter around it like some other active black holes in the universe, Bloom said. In fact, the researchers sifted through historical records of that region of the cosmos and could not find evidence of previous long-lived X-ray or gamma-ray emissions.

"This event was not the act of gobbling lots of gas, but instead was a sort of impulsive thing," Bloom said. "This sort of thing could happen at the center of any galaxy, but the rate at which this happens is very low. It's sort of a one-off event that really shouldn't happen again." [Top 10 Strangest Things in Space]

Astronomers were even luckier to have been able to witness the event with such detail and clarity, since the jet of X-rays and high-energy gamma rays were punched out along a rotation axis that placed Earth in the eye of the beam.

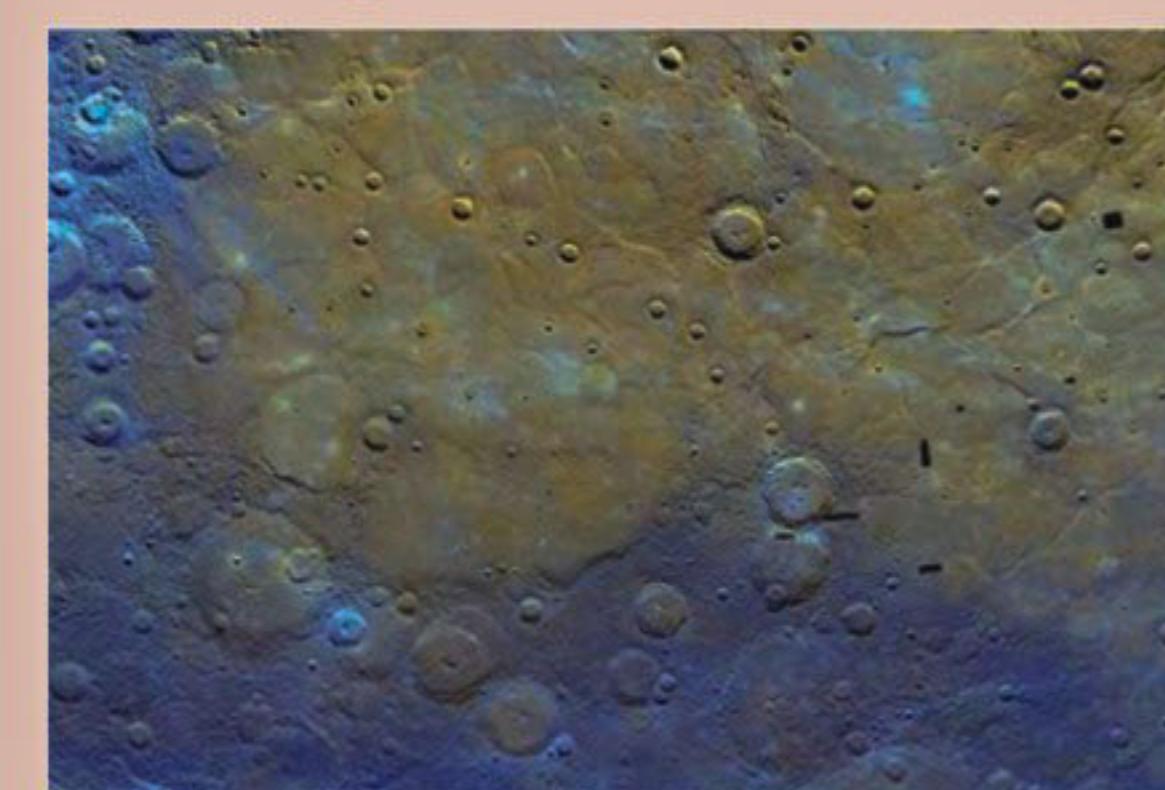
"The best explanation that so far fits the size, intensity, time scale, and level of fluctuation of the observed event, is that a massive black hole at the very center of that galaxy has pulled in a star and ripped it apart by tidal disruption," said Andrew Levan of the University of Warwick in the U.K., lead author of a companion piece that was also published in *Science*. "The spinning black hole then created the two jets, one of which pointed straight to Earth."

Source: Live Science



GHOST CRATERS

Messages from Mercury



"Ghost craters" shown on the planet's northern plains are buried by lava several kilometers thick. NASA, JHU APL, Carnegie Institution for Science

MERCURY'S composition makes it unique among the solar system's rocky planets, new images and data from NASA's MESSENGER spacecraft reveal. The spacecraft's first three months in Mercury orbit also show that some craters on the sun-baked innermost planet are chilly enough to hold frozen water. Researchers announced these and other findings at a June 16 press briefing.

"Mercury is turning out to be unlike any place we've seen before," said lead scientist Sean Solomon of the Carnegie Institution for Science in Washington, D.C.

The craft's sharp images of the northern plains suggest that massive volcanic eruptions sculpted the region some 3.7 billion years ago, burying craters under several kilometers of lava.

By combining MESSENGER's measurements of the depths of north polar craters with other data, scientists have confirmed that some of the craters' floors never receive sunlight. These chilly regions happen to coincide with highly reflective zones, first observed by Earth-based radar 20 years ago, that have been interpreted as deposits of water ice.

MESSENGER, which will record data through next March, has also detected surprisingly high abundances of sulfur and potassium on Mercury's surface. Both elements evaporate easily and were thought to have escaped Mercury during its hot formation or soon thereafter.

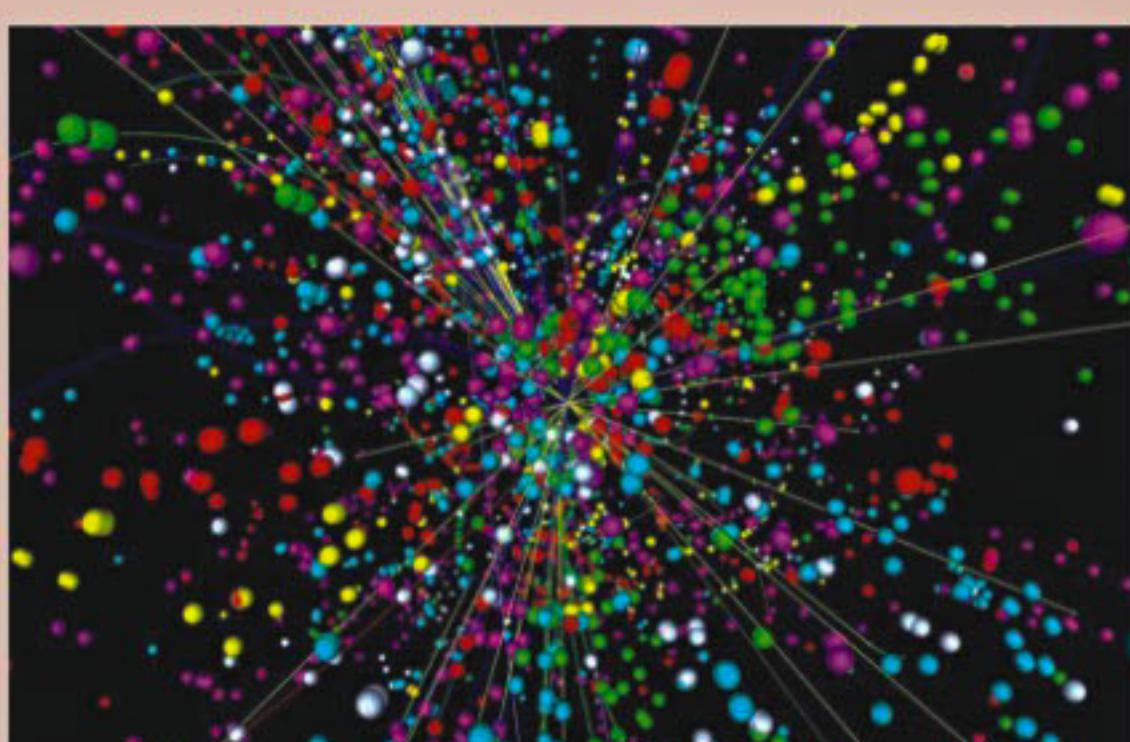
Source: Science News

LHC EXOTICA



LOST HEIGHT & HEALTH

LHC hits data milestone



As two protons collide inside LHC, they create an energetic explosion that gives rise to new and exotic particles

WE'LL have to take physicists' word for it that "one inverse femtobarn" is a lot. That's the milestone recently reached by the world's largest atom smasher, the Large Hadron Collider.

Inside the circular machine, which is buried 574 feet (175 meters) underground near Geneva, Switzerland, scientists accelerate protons to speeds approaching that of light, and then crash them into each other to produce energetic wrecks that can give rise to new and exotic particles.

The Large Hadron Collider (LHC) at the CERN physics lab began operating in 2008, and has been ramping up its power levels and the intensity of its particle beams. Today (June 17) at 4:50 a.m. ET (10:50 a.m. local time), the amount of data accumulated by two LHC experiments called ATLAS and CMS clicked over from 0.999 to 1 inverse femtobarn.

A "barn" is a unit of area, approximately equal to the cross-sectional area of the nucleus of a uranium atom. The prefix "femto" means 10-15 or 0.0000000000000001, and an inverse femtobarn is a measurement of particle collisions per area in other words, how many atoms actually smash together inside the machine.

The more particle collisions that LHC creates, the better its chances of discovering new physics.

"This is a superb achievement, which demonstrates the outstanding performance of the accelerator and of the operation team," Fabiola Gianotti, spokeswoman for the ATLAS experiment, said in a statement.

Source: Live Science

Dawn of agriculture took its toll

WHEN populations around the globe started turning to agriculture around 10,000 years ago, regardless of their locations and type of crops, a similar trend occurred: The height and health of the people declined.

"This broad and consistent pattern holds up when you look at standardized studies of whole skeletons in populations," says Amanda Mummert, an Emory graduate student in anthropology.

Mummert led the first comprehensive, global review of the literature regarding stature and health during the agriculture transition.

"Many people have this image of the rise of agriculture and the dawn of modern civilization, and they just assume that a more stable food source makes you healthier," Mummert says. "But early agriculturalists experienced nutritional deficiencies and had a harder time adapting to stress, probably because they became dependent on particular food crops, rather than having a more significantly diverse diet."

She adds that growth in population density spurred by agriculture settlements led to an increase in infectious diseases, likely exacerbated by problems of sanitation and the proximity to domesticated animals and other novel disease vectors.

Eventually, the trend toward shorter stature reversed, and average heights for most populations began increasing. The trend is especially notable in the developed world during the past 75 years, following the industrialization of food systems.

"Culturally, we're agricultural chauvinists. We tend to think that producing food is always beneficial, but the picture is much more complex than that," says Emory anthropologist George



Amanda Mummert led the first comprehensive, global review of the literature regarding stature and health during the agriculture transition

Armelagos, co-author of the review. "Humans paid a heavy biological cost for agriculture, especially when it came to the variety of nutrients. Even now, about 60 percent of our calories come from corn, rice and wheat."

In 1984, Armelagos and M. N. Cohen wrote the book, "Paleopathology at the Origins of Agriculture," which drew from more than 20 studies to describe an increase in declining health and nutritional diseases as societies shifted from foraging to agriculture.

The book was controversial at the time, but the link between the agricultural transition and declining health soon became widely accepted in what was then the emerging field of bioarcheology.

The current review was undertaken to compare data from more recent

studies involving different world regions, crops and cultures. The studies included populations from areas of China, Southeast Asia, North and South America and Europe. All of the papers used standardized methods for assessing health at the individual level and examined how stressors were exhibited within the entire skeleton, rather than a concentration on a particular skeletal element or condition.

"Unless you're considering a complete skeleton, you're not getting a full picture of health," Mummert says. "You could have an individual with perfect teeth, for example, but serious markers of infection elsewhere. You could see pitting on the skull, likely related to anemia or nutritional stress, but no marks at all on the long bones."

Adult height, dental cavities and abscesses, bone density and healed fractures are some of the markers used to try to paint a more complete picture of an individual's health.

"Bones are constantly remodeling themselves," Mummert says. "Skeletons don't necessarily tell you what people died of, but they can almost always give you a glimpse into their ability to adapt and survive."

While the review further supports the link between early agricultural practices and declining stature and health, it's important to keep re-evaluating the data as more studies are completed, Mummert says.

One confounding factor is that agriculture was not adopted in an identical fashion and time span across the globe. In some ancient societies, such as those of the North American coasts, crops may have merely supplemented a seafood diet. "In these cases, a more sedentary lifestyle, and not necessarily agriculture, could have perpetuated decreased stature," Mummert says.

Source: Science Daily

DESIRE GROW

How Tall Can Trees Grow?

The tallest tree in the world, a California redwood, stands 379 feet (116 m) tall, or slightly taller than a football field is long. Redwoods of the past that have since been cut down probably stood even taller, and may even have reached the theoretical maximum height for trees.

Indeed, there is an upper bound.

Two main opposing forces affect a tree's height; one pushes it upward while the other holds it down. By analyzing the interplay between these forces, a team of biologists led by George Koch of Northern Arizona University calculated the theoretical maximum tree height, or the point at which opposing forces balance out and a tree stops growing. This point lies somewhere between 400 and 426 feet (122 and 130 m).

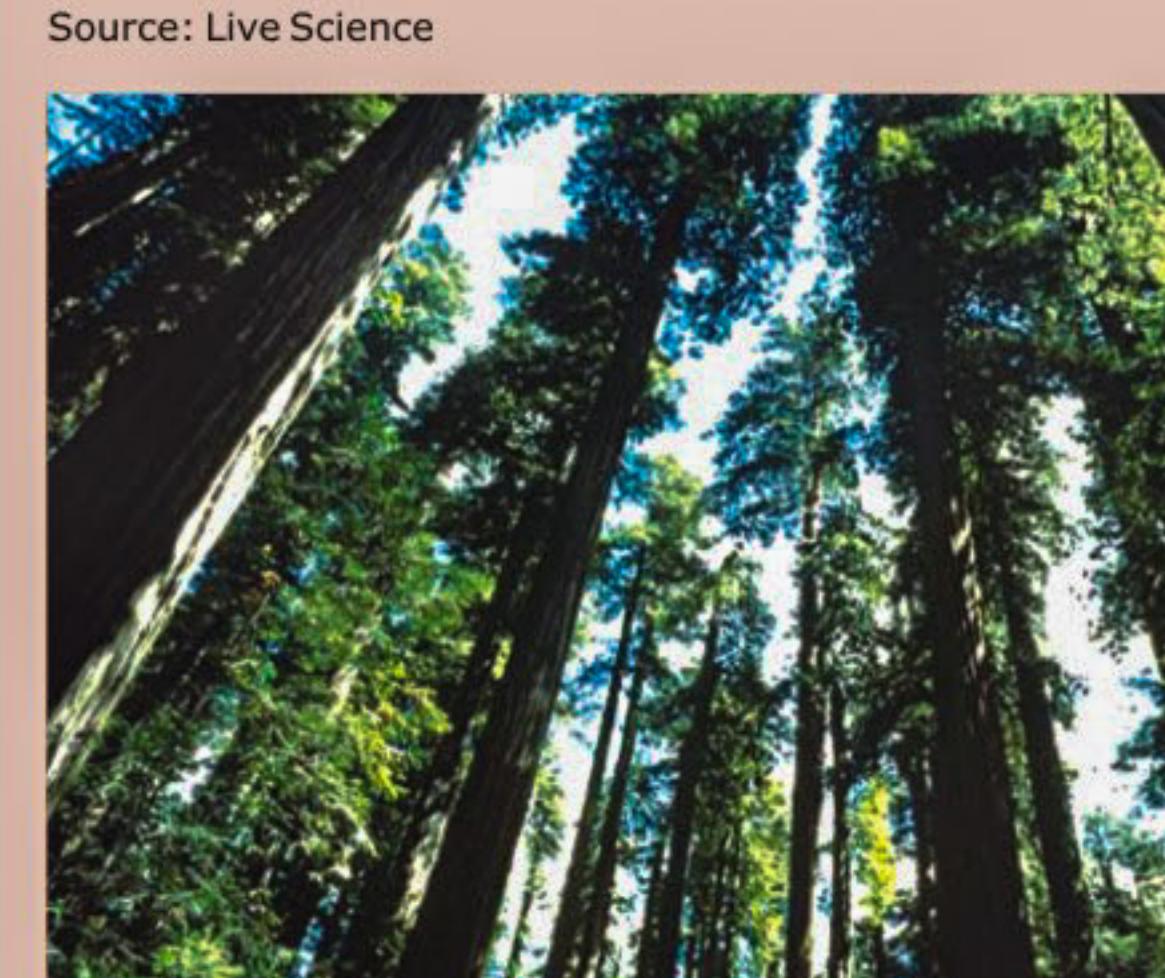
On the one hand, the researchers found, trees in forests "desire" to grow as tall as possible to overtake neighboring trees and reach stronger sunlight. On the other hand, gravity makes it more and more difficult to haul water upwards from the roots to the canopy as the tree grows, and leaves thus become smaller near the top.

When, at a certain height, leaves (or, in the case of redwoods, needles) are not cost-effective, the energy they rein in through photosynthesis doesn't pay for the energy it costs to bring them water, then the tree stops growing. [Read: Why Are Tree Rings Lighter or Darker?]

"As trees grow taller, increasing leaf water stress due to gravity and path length resistance may ultimately limit leaf expansion and photosynthesis for further height growth," the biologists wrote in a 2004 article in the journal *Nature*. This limit lies at or just above 400 feet.

Many factors account for the extreme height of redwoods, including the temperate Northern California climate, nutrient-rich soil, abundant rainfall, fog and even the tightly-packed redwood forests, which force trees to shoot upward in pursuit of sunlight. These conditions combine to make redwoods not simply the tallest trees in the world, but by Koch's and his colleagues' calculations, almost as tall as they could possibly be.

Source: Live Science



California redwood trees.

BUILD CHANGE



DID YOU KNOW?

Earthquake-proof homes



Source: SciDev.net

A project to design earthquake-proof homes in the developing world has won a US\$100,000 award for life-enhancing innovations.

Elizabeth Hausler, chief executive and founder of the non-profit organization Build Change, based in the United States, received the 2011 Lemelson-MIT Award for Sustainability last month (10 May) for designing disaster-resistant buildings in China, Haiti and Indonesia.

The lack of building standards in many developing countries leads to poorly designed buildings that collapse when earthquakes or other natural disasters strike.

During reconstruction efforts, Build Change works with residents to improve the safety of new homes. It also works with local governments to ensure that building rules take disasters into account. The organization has helped build almost 18,500 homes and trained more than 4,000 construction professionals and school children.

What is emission trading?



Emissions trading (also known as cap and trade) is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. A central authority (usually a governmental body) sets a limit or cap on the

amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of allowances (or credits) which represent the right to emit a specific amount.

Source: Live Science