

SCIENCE & LIFE

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Relativity and aging

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FOR decades it's been known in the scientific communities that time passes faster at higher elevations. And this inquisitive aspect of Dr. Albert Einstein's theories of relativity (which by-the-way, single handedly altered the notion that time runs at the same rate for everyone, everywhere in the Universe) has been previously proven by comparing clocks on the earth's surface and a high-flying rocket back in 1976, by the Smithsonian Astrophysical Observatory. And again, physicists from the National Institute of Standards and Technology (NIST) of USA have measured this very effect at a more down-to-earth scale of 33 centimeters or about 1 foot very recently! And the result of the experiment was obvious, the further away is a person from the surface of Earth, the faster the time passes for her/him on a human scale. To put it more simply, a person ages faster even when she/he stands a couple of steps higher from

our planetary surface! Published in the Sept.24th issue of Science, scientists from NIST, however, explain that the difference (given that distance) is much too small for humans to perceive directly. And the research have found out that a height of that particular difference (one foot or 33 centimeters) actually resulted in a time variance of roughly a billionth of a second per year. Another aspect of the relativity that was observed by the NIST researchers was time also passes more slowly when one moves faster.

This is how the research went down. This new "time dilation" experiment was performed by the scientists with the aid of a pair of world's best experimental atomic clocks. These two nearly identical clocks, which were located in different laboratories at NIST and connected by a 75-meter long optical fiber (which allowed the scientists to compare the instruments' timekeeping), are based on the "ticking" of a single aluminum ion (electrically



NIST physicists compared a pair of the world's best atomic clocks to demonstrate that you age faster when you stand just a couple of steps higher on a staircase.

charged atom) as it vibrates between two energy levels over million billion times per second. These aluminum clocks are also very precise

and called "quantum logic clocks" since they borrow logical decision-making techniques from experimental quantum computing

which makes them extremely accurate. NIST post-doctoral researcher James Chin-Wen Chou, who is also the first author of the paper, explains that the aluminum clocks can detect small relativity-based effects due to their extreme precision and high "Q factor". And this allows the clocks to reflect how reliably the ion absorbs and retains optical energy in changing from one energy level to another. Once the backdrop for experiment was all set, the NIST team focused on two scenarios of Einstein's theories of relativity. For starter, the scientists raised one of the clocks to a height of 33 centimeters or about a foot. And then, when the two clocks were subjected to unequal gravitational forces due to their different elevations above the surface of the earth, sure enough the higher clock ran faster as it experienced a smaller gravitational force. And the lower clock ran slower than the elevated one, at the rate of a 90-billionth of a second in 79 years. Secondly, when the team applied an electric magnetic field to one clock, sending the

ion moving back and forth, the moving clock ran slower than the clock that was at rest. This is scientifically referred as the "twin paradox", where a 25-year-old twin sibling who travels the space near the speed of light in a duration which he perceives as only few months will return to Earth to find the other one has already reached his middle age.

This "clock research" does have greater implications as NIST is planning to improve the precision of its aluminum-ion clocks so that there can be a better understanding of how time flows differently on the scale of a centimeter (half an inch) in height differences. And this could open the way for the use of atomic-clock networks as "inland tidal gauges". And such networks, NIST hoping, could vitally record the ups and downs in Earth's gravity field created by the geological shifts. And eventually this, in turn, could provide a crucially better understanding of how seismic events arise.

The contributor is a freelance science writer.



TRUTH TOLD

UFOs disarming nukes?



At an unusual press conference recently held in Washington, D.C., a UFO author and a half-dozen or so former U.S. military airmen asserted that "The U.S. Air Force is lying about the national security implications of unidentified aerial objects at nuclear bases and we can prove it." They claim that since 1948, extraterrestrials in spaceships have not only been visiting Earth but hovering over British and American nuclear missile sites and temporarily deactivating the weapons.

UFO author Robert Hastings, who organized the news conference, said, "I believe these gentlemen believe that this planet is being visited by beings from another world, who for whatever reason have taken an interest in the nuclear arms race."

Hastings claims that a global conspiracy exists in which all major governments have been covering up evidence of UFOs for decades.

Despite claims that the airmen were "breaking their silence," there was very little new information presented at the press conference; in fact many of the UFO reports they cited date back 30 or 40 years, and had appeared in magazine articles, books, and websites. Instead of any new evidence or real proof they offered merely a rehashing of old, discredited reports that didn't yield any significant evidence when they were originally reported decades ago.

These "revelations" in fact raise more questions than they answer.

For example, if extraterrestrial intelligences have been watching over humanity and are so concerned about nuclear weapons, why didn't they prevent the atomic bombings of Hiroshima and Nagasaki at the end of World War II? Preventing those bombs from exploding instead of demonstrating the atom's awesome destructive power to the world could have been a much more effective way to head off a nuclear arms race.

Furthermore, the point of the press conference is muddled in contradictions. On one hand, the stated purpose was to encourage governments of the world to finally publicly admit that they are aware of aliens, presumably because they pose a threat to national security. On the other hand, the larger message seems to be not to worry about nuclear proliferation, because our alien space brothers will take care of us and avert any potential nuclear attacks (at least in the US and UK no word on if the aliens are concerned about Iran's nukes).

If that's true, then the aliens would not really be a threat to national security since they seem to be playing galactic peacekeepers.

Source: LiveScience



COLOURFUL CRITTER



FADING PUZZLE

Dinos taller than thought

SOME dinosaurs may have been at least 10 percent taller than previously thought, US paleontologists said in a study that found the creatures had large amounts of cartilage.

"Our study of the limbs of modern-day relatives of dinosaurs shows that dinosaurs were significantly taller than original estimates," said study lead author Casey Holliday, an anatomy professor at the MU School of Medicine.

She explained that many dinosaurs' long bones, such as the femur or tibia, lack major articulations and have rounded ends with rough surfaces.

"This indicated that very thick cartilages formed these structures, and therefore the joints themselves, and would have added significant height to certain dinosaurs," Holliday added.

In contrast, mammal bones have small protrusions at their ends that help them connect with other bones at a joint. The bones are then linked with a very thin layer of cartilage.

The study, which was published in the Public Library of Science's journal PLoS-ONE, shed further light on how reptiles and mammals such as humans build their joints with different amounts of cartilage and bone.

The researchers compared articulations of ostriches and alligators -- the closest living relatives to dinosaurs -- to fossilized limbs of dinosaurs like Tyrannosaurus rex and Triceratops.

They found that alligators' and ostriches' limbs included six to 10 percent cartilage.

By applying a "cartilage correction factor," Holliday found that many theropod dinosaurs, such as Tyrannosaurus, were only modestly taller, while ornithischian and sauropod dinosaurs like Triceratops and Brachiosaurus, may have been 10 percent taller or more.

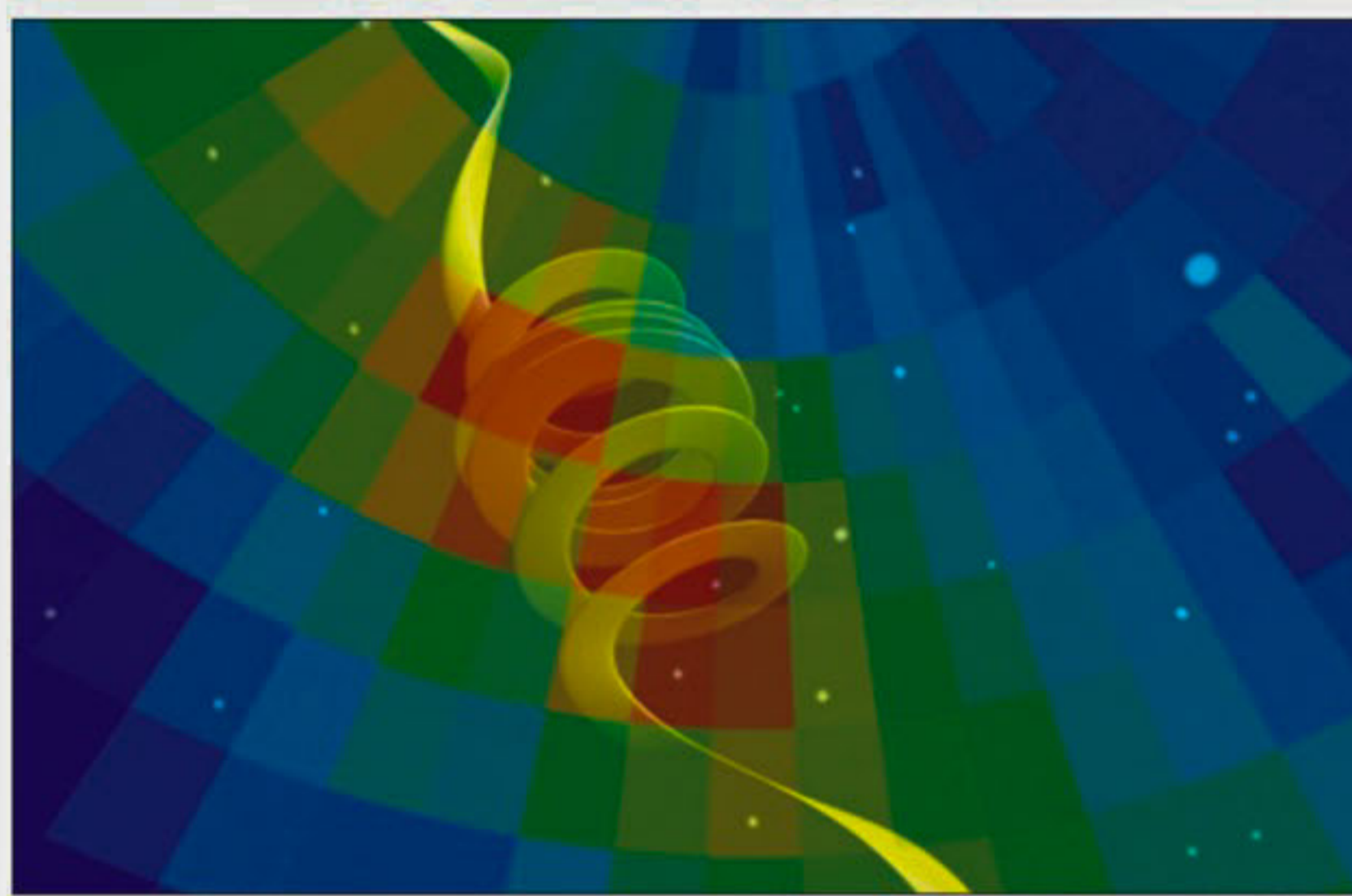
Brachiosaurus, which was previously thought to be 42 feet (13 meters) tall, may actually have been more than a foot taller with the additional joint cartilages, according to the researchers.

Source: AFP



Dinosaurs had thick layers of cartilage in their joints that may have added more than a foot (30cm) to their height

Atomic knot at heliosphere's edge



New observations show that a knot in a narrow ribbon of neutral atoms at the edge of the solar system, shown here in an artist's illustration, has faded

A puzzling knot of atoms at the edge of the solar system is fading, leaving space physicists with an even gnarlier mystery to unravel about the outer boundary of the heliosphere, where the vast bubble in which the solar system resides meets up with interstellar space.

Researchers reported last year that NASA's Interstellar Boundary Explorer, or IBEX, spacecraft had discovered the knot the densest part of an equally unexpected narrow ribbon of neutral atoms that makes nearly a complete circle around the fringes of the solar system (SN: 11/21/09, p. 15), about 100 to 125 times Earth's distance from the sun.

Now a map compiled by IBEX just six months after the first sighting shows that the ribbon remains, but the bright, dense knot has dimmed dramatically, diffusing into the ribbon, says IBEX researcher David McComas of the Southwest Research Institute in San Antonio and the University of Texas at San Antonio. He and his colleagues report the finding online September 29 in the Journal of Geophysical Research Space Physics. They also discussed the study during a telephone

press briefing September 30.

"However shocking it was to see a narrow ribbon structure initially, it's even more shocking that you could have something change on a time scale as short as six months," McComas says. In contrast, large clouds and other scenery that the solar system encounters as it moves through space take thousands of years to change. McComas also notes that the sun's magnetic field, which fills the heliosphere and might be expected to have something to do with the knot's appearance, has an 11-year cycle. He suspects that the fading knot may be related to the unusually quiescent solar cycle that just ended and the shrinking of the heliosphere due to the reduction of the solar wind during that time.

Nonetheless, the "untying of the knot," as McComas calls the dimming of the bright feature, "reinforces the whole basic idea that what we thought was going on in interactions at the edge of the solar system we just didn't get right at all." Two additional IBEX maps, taken six months and a year after the one analyzed in the new report, show a similar dimming.

Because the wind of ions blowing out

from the sun and the solar magnetic field that threads through the heliosphere shield the solar system from galactic cosmic rays energetic charged particles from the Milky Way researchers are struggling to understand the processes that play out at the solar system's edge.

"Models that try to explain the interaction between the solar system and the rest of the galaxy are missing key effects," says Merav Opher of George Mason University in Fairfax, Va., who was not a participant in the new study.

During the most recent solar magnetic field cycle, in which the sun has been unusually quiescent, more galactic cosmic rays appear to have infiltrated the solar system, although a direct connection between changes in the cosmic ray population and global changes in the heliosphere are not definitive, says IBEX researcher Nathan Schwadron of the University of New Hampshire in Durham.

Schwadron says that last year he was "pretty well sold on the idea" that the ribbon and knot were generated by atoms from the solar wind that had streamed out beyond the heliospheric boundary and had been reflected back by the interstellar magnetic field. "However, the time variations we are seeing now throw yet another monkey wrench into that explanation," he adds.

A combination of reflection, compression of the outer part of the heliosphere and events in which magnetic fields break apart and reconnect with neighboring fields may all be playing a role, he suggests.

Understanding the extent to which magnetic fields at the boundary of the solar system filter out harmful cosmic rays will not only guide future astronauts as they make longer and deeper forays into space but may also help perfect models for assessing the potential for habitable planets around other stars, Opher adds. Even a planet that had the right temperature to maintain liquid water could not sustain life if it were bombarded by a huge dose of galactic cosmic rays, she notes.

Source: Science News



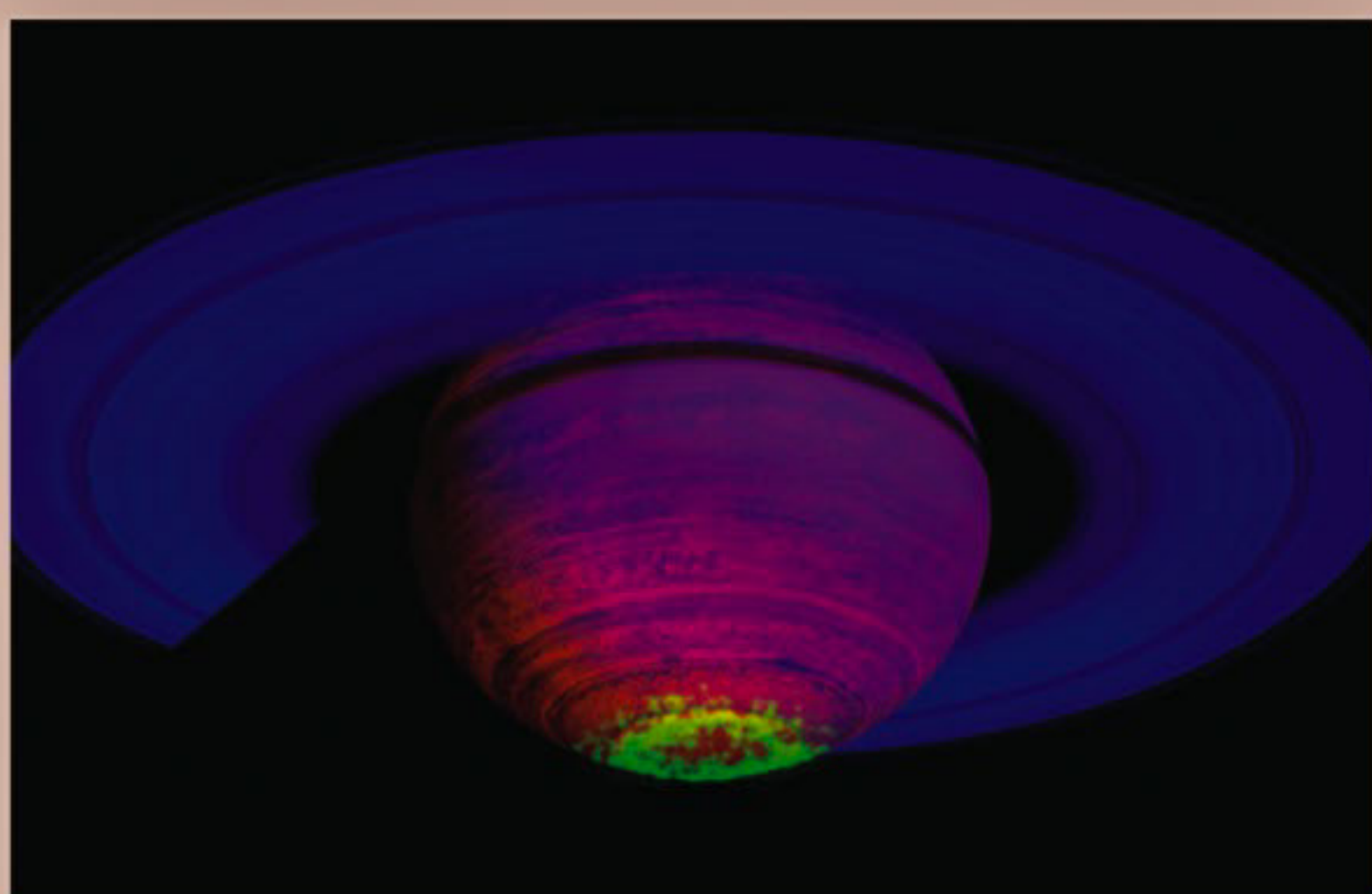
POWER OF NOTHING



DO YOU KNOW?

Saturn in infrared light

The familiar ringed planet resembles a round glowing ember in this infrared-light image. Infrared light is a low-energy form of light invisible to the unaided eye. It is often the only light that cool objects (such as planets) emit themselves, rather than simply reflecting off the Sun. Thus the "glowing" appearance of Saturn's orb in the image, which shows the giant gaseous planet in three "bands," or energy levels, of infrared. The photo is posted on NASA's Astronomy Picture of the Day website for Sept. 27.



Source: World Science

What is a time capsule?



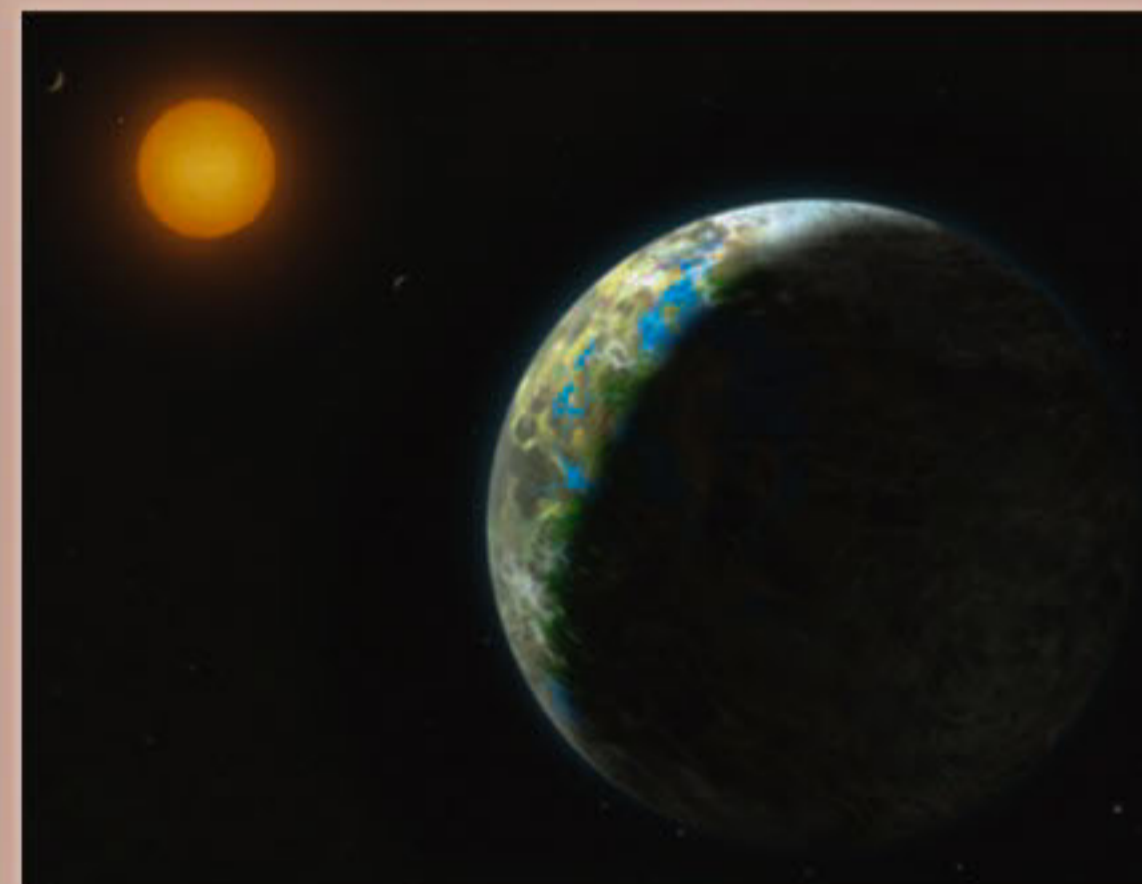
A time capsule is a cache of goods / information created to serve as a mode of communication with people in the future. These may include archaeologists, anthropologists or historians. The capsules are sometimes buried at sites where events are held. The term has been used

since about 1939. There are two types of capsules: intentional and unintentional. Intentional time capsules are placed somewhere deliberately, to be accessed at a particular future date. Unintentional capsules are usually archaeological in nature.



MIMICKING NATURE

Extrasolar habitable planet found



The new planet Gliese 581g bears Earthlike blues and greens in an artist's conception

Astronomers studying a nearby star say they've found the first potentially habitable planet likely a rocky place with an atmosphere, temperate regions, and crucially, liquid water, considered vital for life as we know it.

Other extrasolar planets have been called Earthlike, but, astronomer Paul Butler assured, "this is really the first Goldilocks planet" not too hot, not too cold.

Orbiting the red dwarf star Gliese 581g about every 37 days, the new planet, named Gliese 581g, is "just the right size and just at the right distance [from its star] to have liquid water on the surface," added Butler, of the Carnegie Institution for Science in Washington, D.C., during an online press briefing today.

Gliese 581g in Goldilocks Zone Located some 20 light-years from Earth, Gliese 581 is among the hundred closest stars to us. Already scientists have detected six planets orbiting the red dwarf, making Gliese 581 the hub of the largest known planetary system outside our solar system.

The star has also inspired perhaps the largest number of habitable-planet headlines.

For starters, planet Gliese 581c was announced in 2007 as potentially habitable but later found to orbit too close to the starmaking the planet too hot for life.

Another planet, Gliese 581d, is thought to orbit on the cold side of the habitable zone. While Gliese 581d could harbor life, the planet would need a thick atmosphere with a strong greenhouse effect to warm up to the point of habitability.

"They are very close to habitable, but not quite," Steve Vogt, a professor of astronomy and astrophysics at the University of California, Santa Cruz, said during the briefing.

"This one is right between the two, in the same system." Roughly three times more massive than Earth, the newfound planet is tidally locked to its star, which means that one side is perpetually basked in daylight, the other side constantly dark.

Aliens, if they exist, are most likely to live along the line between shadow and light, a temperate region known as the terminator, the scientists said.

Source: National Geographic