

SCIENCE & LIFE

DHAKA TUESDAY FEBRUARY 1, 2011, E-MAIL: science&life@thedailystar.net

QUIRKY WORLD

Quantum pendulum

Physicists have explained yet another quirk of the quantum world: why, if you swing a pendulum through a quantum fluid, it speeds up rather than slowing down. Tiny "quasiparticles" ricocheting around in the fluid are to blame, Finnish researchers report in an upcoming issue of Physical Review Letters.

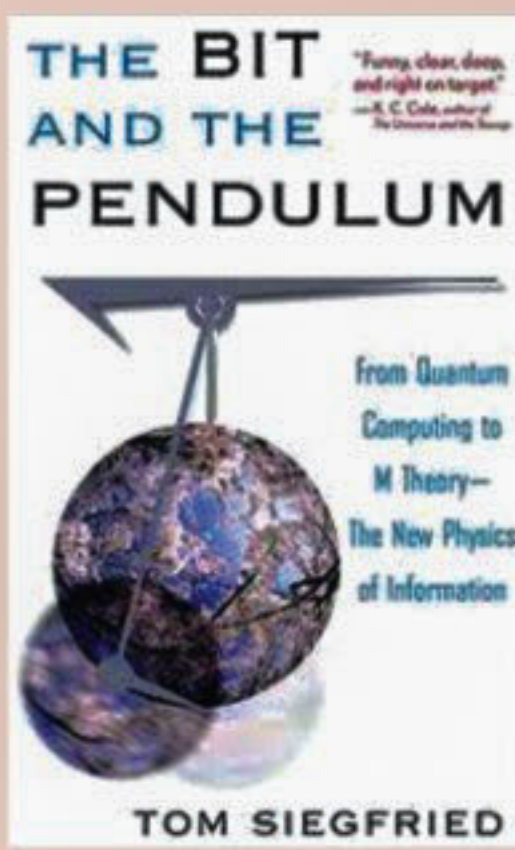
The effect is the opposite of that experienced in the ordinary world. Immerse the pendulum of a grandfather clock in water, for instance, and it will slow down.

It takes a special kind of fluid to pull off this quantum trick. Physicists Timo Virtanen and Erkki Thuneberg of the University of Oulu have been studying helium-3 atoms, which at very low temperatures form a substance known as a Fermi liquid. In such a liquid, the atoms stop interacting with each other as they ordinarily do and instead start behaving in strange quantum ways.

Researchers have studied Fermi liquids for decades to better understand phenomena that kick in at cold temperatures, such as superconductivity. "It's a very profound theory one of the most basic things to understand," says Thuneberg.

So he was intrigued when, in the early 2000s, researchers in Helsinki reported experiments in which a pendulum sped up when dunked in a Fermi liquid mixture. He decided to see if he could figure out why. In a series of calculations, Thuneberg and his student Virtanen worked out the mathematics of how the pendulum interacts with the fluid.

Source: Science News



JUPITER'S SCAR

An asteroid hurtles into it

THE object that plowed into Jupiter in 2009, creating a giant scar, was most likely an asteroid the size of the Titanic, rather than a comet, the latest evidence suggests.

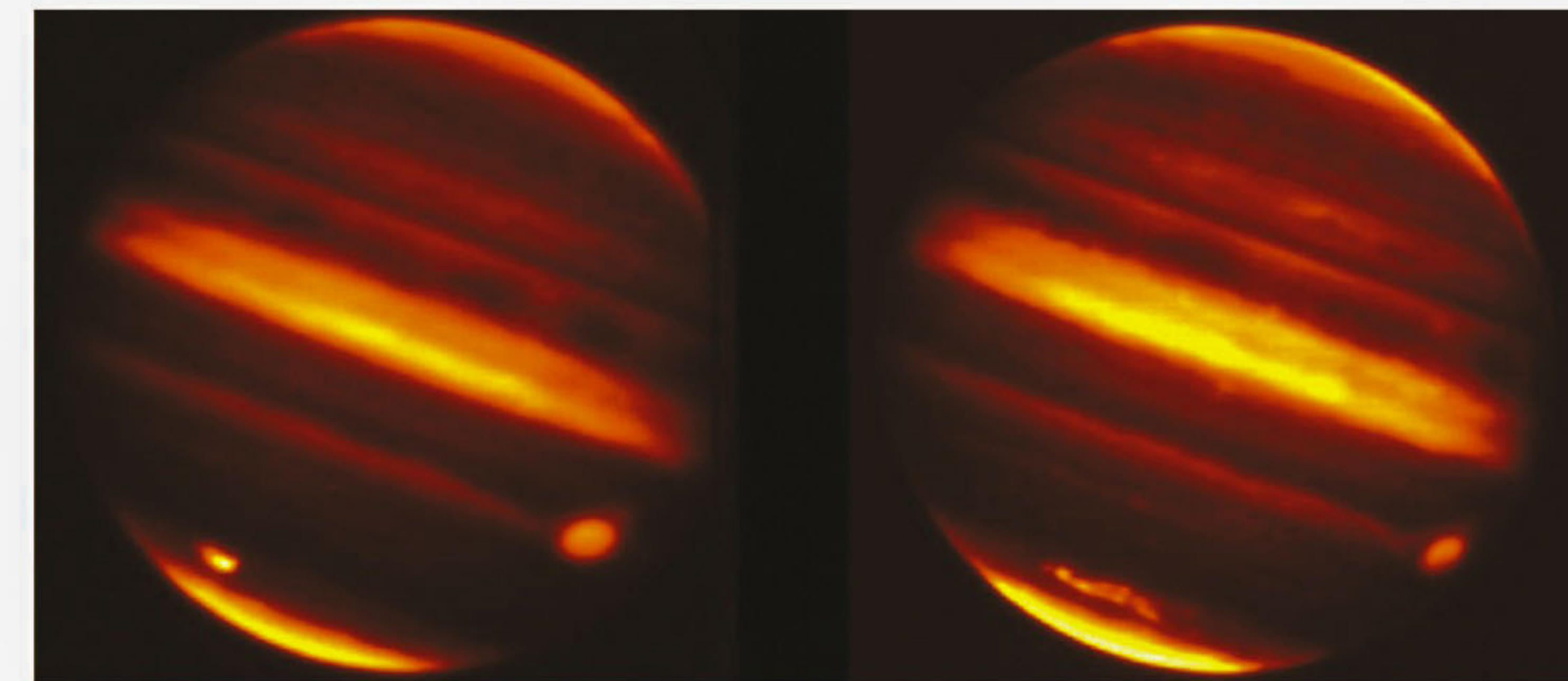
Astronomers, presuming Jupiter had already cleared most of the asteroids out of its gravitational sphere of influence, initially suspected it was a comet that tore through the gas giant's atmosphere and exploded on July 19, 2009. But follow-up research in 2010 began to push the investigation back toward an asteroid strike.

Two newly published studies of the Jupiter impact and its resulting debris cloud have pinned the blame more firmly on an asteroid.

"We weren't expecting to find that an asteroid was the likely culprit in this impact, but we've now learned Jupiter is getting hit by a diversity of objects," said researcher Paul Chodas, of NASA's Jet Propulsion Laboratory in Pasadena, Calif., in a statement released yesterday (Jan. 26).

Studying the impact The scar caused by the impact was first spotted by an Australian amateur astronomer, Anthony Wesley. A wealth of follow-up observations using ground and space telescopes then followed.

Chodas and other researchers, who reported their findings in two recent papers in the journal Icarus, said they had used several



Particle debris in Jupiter's atmosphere (bright smudges at lower left) after an object hurtled into the atmosphere on July 19, 2009

different infrared telescopes to study the scar as it evolved over the first week or so.

They determined that the collision had warmed Jupiter's lower stratosphere by 5.4 to 7.2 degrees Fahrenheit (3 to 4 degrees Celsius). That may not sound like much, but it signals a huge deposition of energy, since the warming was spread over such an enormous area, researchers said.

The asteroid had carved a channel of super-heated gas and

debris as it streaked through Jupiter's atmosphere.

Then, at some point deep below the clouds, it exploded, releasing energy equivalent to 5 gigatons of TNT, the researchers said about 250,000 times more energy than was released by the atomic bomb that the United States dropped on Nagasaki, Japan, in 1945 to end World War II.

The massive explosion launched gas and debris back out along the channel, above Jupiter's

clouds. This stuff then splashed back down into the atmosphere, warming it substantially and creating aerosol particulates.

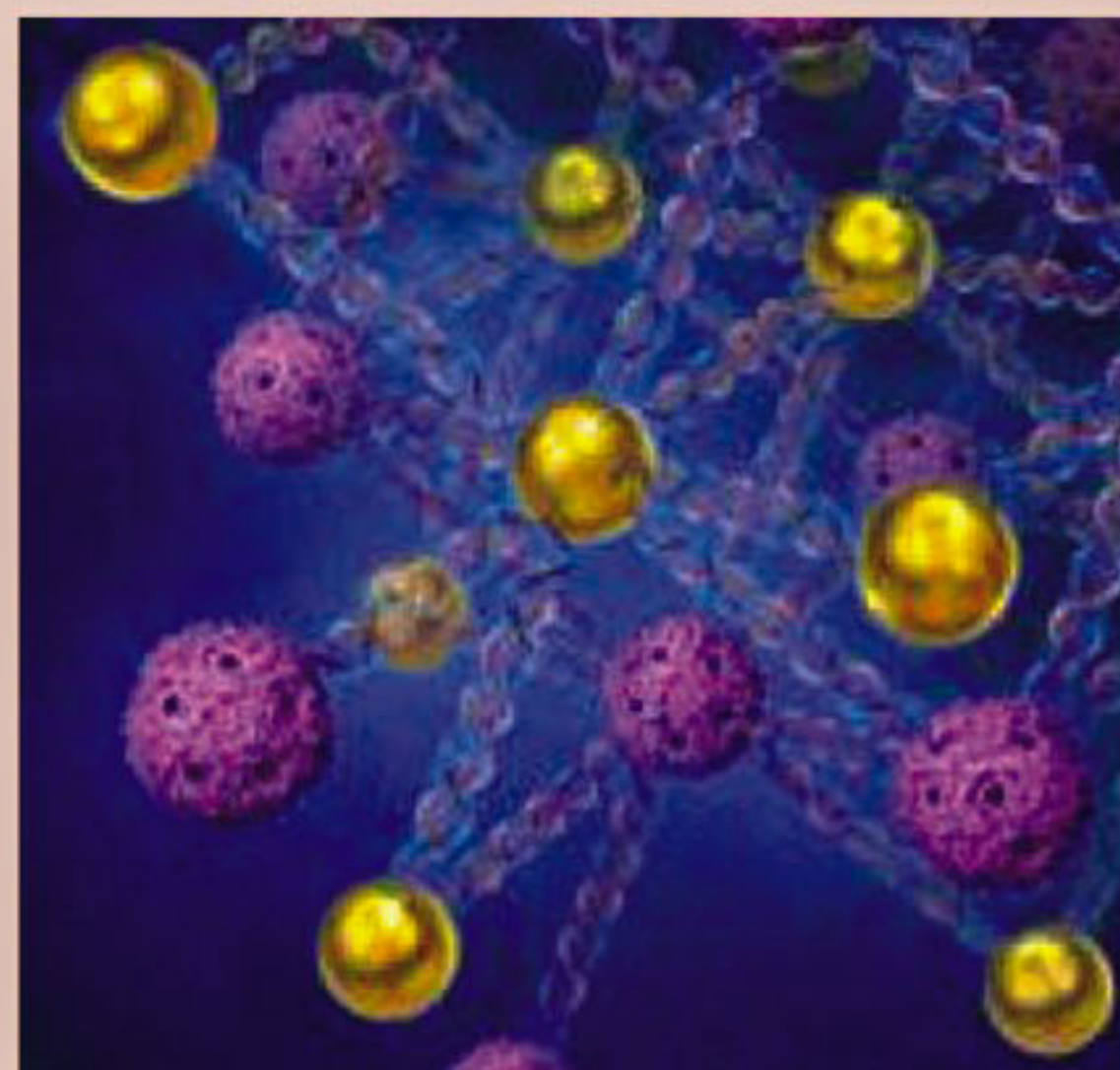
The researchers trained their infrared telescopes on the impact site, studying the chemical composition of the stirred-up debris. They found signatures of hydrocarbons, silicas and silicates, but no evidence of carbon monoxide. This unique chemical mix points strongly to an asteroid rather than a comet, they said.

Assuming the impactor had a rocklike density of around 2.5 grams per cubic centimeter, the researchers calculated its diameter to be 660 to 1,650 feet (200 to 500 meters). That would make the asteroid about the size of the ill-fated Titanic ocean liner, NASA officials said. The Titanic was 882 feet long, 92 feet wide at its widest point, and 175 feet tall (269 meters by 28 meters by 53 meters).

Source: Space.com

STRANGE FABRIC

DNA-driven device



Crystal lattice created by Sung Yong Park and colleagues

Scientists have created a diamond-like lattice composed of gold nanoparticles and viral particles, woven together and held in place by strands of DNA. The structure -- a distinctive mix of hard, metallic nanoparticles and organic viral pieces known as capsids, linked by the very stuff of life, DNA -- marks a remarkable step in scientists' ability to combine an assortment of materials to create infinitesimal devices.

The research, done by scientists at the University of Rochester Medical Center, Scripps Research Institute, and Massachusetts Institute of Technology, was published recently in Nature Materials.

While people commonly think of DNA as a blueprint for life, the team used DNA instead as a tool to guide the precise positioning of tiny particles just one-millionth of a centimeter across, using DNA to chaperone the particles.

Source: Science daily

PHARO'S TROVE

Secret rooms in pyramid!

A French architect known for his theories on how the Great Pyramid of Giza was built now believes the 4,500-year-old structure houses two secret rooms at its heart.

Jean-Pierre Houdin told reporters Thursday (Jan. 27) that 3-D simulations and data from American Egyptologist Bob Brier backs up his theory, Physorg.com reported. The rooms would have held furniture meant to be taken into the afterlife by the Pharaoh Khufu, Houdin said. [Gallery: Amazing Egyptian Discoveries]

Pyramid theories

Houdin has argued for decades that the Great Pyramid was not built using ramps around the outside, but from the inside out. The idea is that Egyptians would have built the foundation of the pyramid using an outside ramp to pull blocks up from the ground. Then, about a third of the way up, they would have dismantled the ramp and used an inner cork-screw ramp to finish the structure. The original outside ramp would have been dismantled and the stones used to top off the pyramid.

In 2008, Houdin told National Geographic that L-shaped rooms in



Great pyramid of Giza

the pyramid support his theory. The rooms would have provided space for workers to maneuver large blocks, he said.

The theory remains unproven, though a Canadian research team plans to seek permission from Egypt's antiquities department to investigate further with thermal imaging of the pyramid, Houdin said, according to the Physorg.com article.

The construction debate isn't limited to how the Egyptians moved the blocks: Some researchers question where the blocks came from. Some tests suggest that at least some blocks weremade of

poured concrete instead of quarried a controversial theory.

Jean-Pierre and the chamber of secrets

Houdin's secret room proposal is based upon similar rooms found in the pyramid of Khufu's father Snefru, a king known for numerous pyramid-building projects. Based on blocks found in the king's chamber of the Great Pyramid, Houdin suspects Egyptologists have overlooked a passageway leading to the secret rooms.

"I am convinced there are antechambers in this pyramid," Houdin told reporters. "What I want is to find them."

Source Live Science

TIME'S DAWN

A galaxy far, far, far away

PUSHING the Hubble Space Telescope to its limits as a cosmic time machine, astronomers have identified what may be the most distant known object in the universe -- a tiny galaxy estimated to lie 13.2 billion light-years from Earth and hail from a time only 480 million years after the Big Bang.

Astronomers put the odds at 20 percent that the faint galaxy either lies much closer to Earth than the observations suggest or is merely a spurious light signal, they report in the Jan. 27 Nature. But if the light truly is a glimmer from near the dawn of creation, it could provide new insight about galaxy assembly in the early universe, notes study coauthor Garth Illingworth of the University of California, Santa Cruz.

That insight would stem from how rare such distant galaxies are compared with the 47 galaxies previously found by the team from an era just 170 million years later -- some 650 million years after the birth of the universe. Star formation rates must have increased about 10 times during that 170 million years to produce so many additional galaxies in such a short time, says collaborator Rychard Bouwens of Leiden University in the Netherlands.

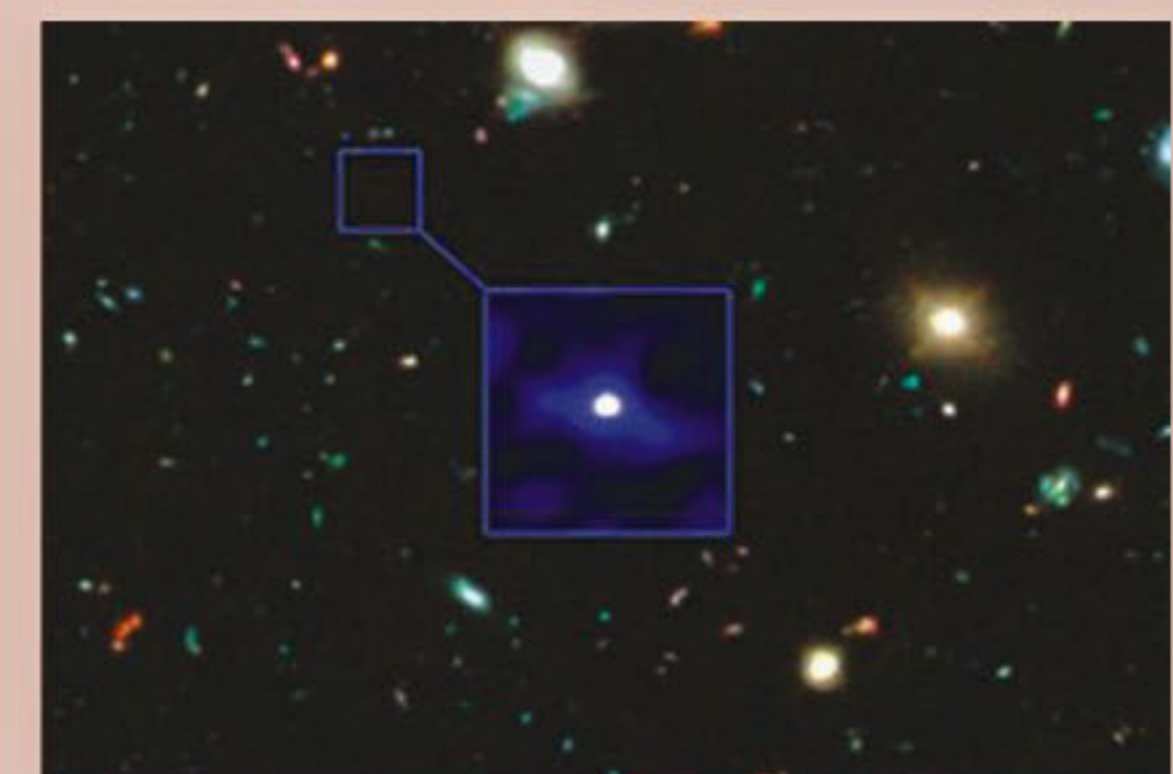
"The really strong result is the dramatic rise in star formation," says Illingworth. Even if the team finds other galaxies that could be just as distant as the newfound candidate, "they are very faint and very rare, and that alone tells us that there is a large change [in galaxy formation] between 480 and 650 million years" after the birth of the universe, he says.

Although exciting, "it's a bit of stretch to draw so much physical intuition about the early universe from what is, after all, a single detection recorded in a single wavelength band," says galaxy hunter Richard Ellis of Caltech, who was not involved in the new study. The search for extremely distant galaxies has a "checked history with many claimed detections" that have turned out to be wrong, he adds.

The current confirmed record holder for most distant object is a cosmic explosion known as a gamma-ray burst that erupted in a galaxy 13.035 billion light-years away (SN Online: 4/28/09).

Illingworth and his collaborators used Hubble's sensitive Wide Field Camera 3, which has taken the deepest infrared portrait of the sky, to detect the candidate remote galaxy.

Source: Science News



A candidate galaxy (inset) that may be the most distant object known in the universe

BENEATH ANTARCTICA

Drilling into lake Vostok



In the summer season (Dec to Feb), air temperature is relatively mild, about -30C, but in the winter it can plummet to -80C

With only about 50m left to drill, time is running out for the Russian scientists hoping to drill into Vostok - the world's most enigmatic lake.

Vostok is a sub-glacial lake in Antarctica, hidden some 4,000m (13,000ft) beneath the ice sheet.

With the Antarctic summer almost over, temperatures will soon begin to plummet; they can go as low as -80C.

Scientists will leave the remote base on 6 February, when conditions are still mild enough for a plane to land.

The team has been drilling non-stop for weeks. "It's like working on an alien planet where no one has been before," Valery Lukin, the deputy head of Russia's Arctic and Antarctic Research Institute (AARI) in St Petersburg, which oversees the project, told BBC News.

DO YOU KNOW?

How to fix max and min temps?



Maximum and minimum temperatures are measured using thermometers mounted inside a wooden box with slits, called Stevenson's screen, which is generally kept facing north. The maximum thermometer is mercury-in-glass - as the temperature rises, the mercury expands and moves freely up a constriction in the thermometer. When air temperature drops, the constriction prevents the mercury from flowing back due to higher pressure, and gives the maximum reading. The minimum thermometer is alcohol-in-glass and is kept horizontally inside the box.