

# SCIENCE & LIFE

DHAKA TUESDAY NOVEMBER 23, 2010, E-MAIL: science&life@thedailystar.net

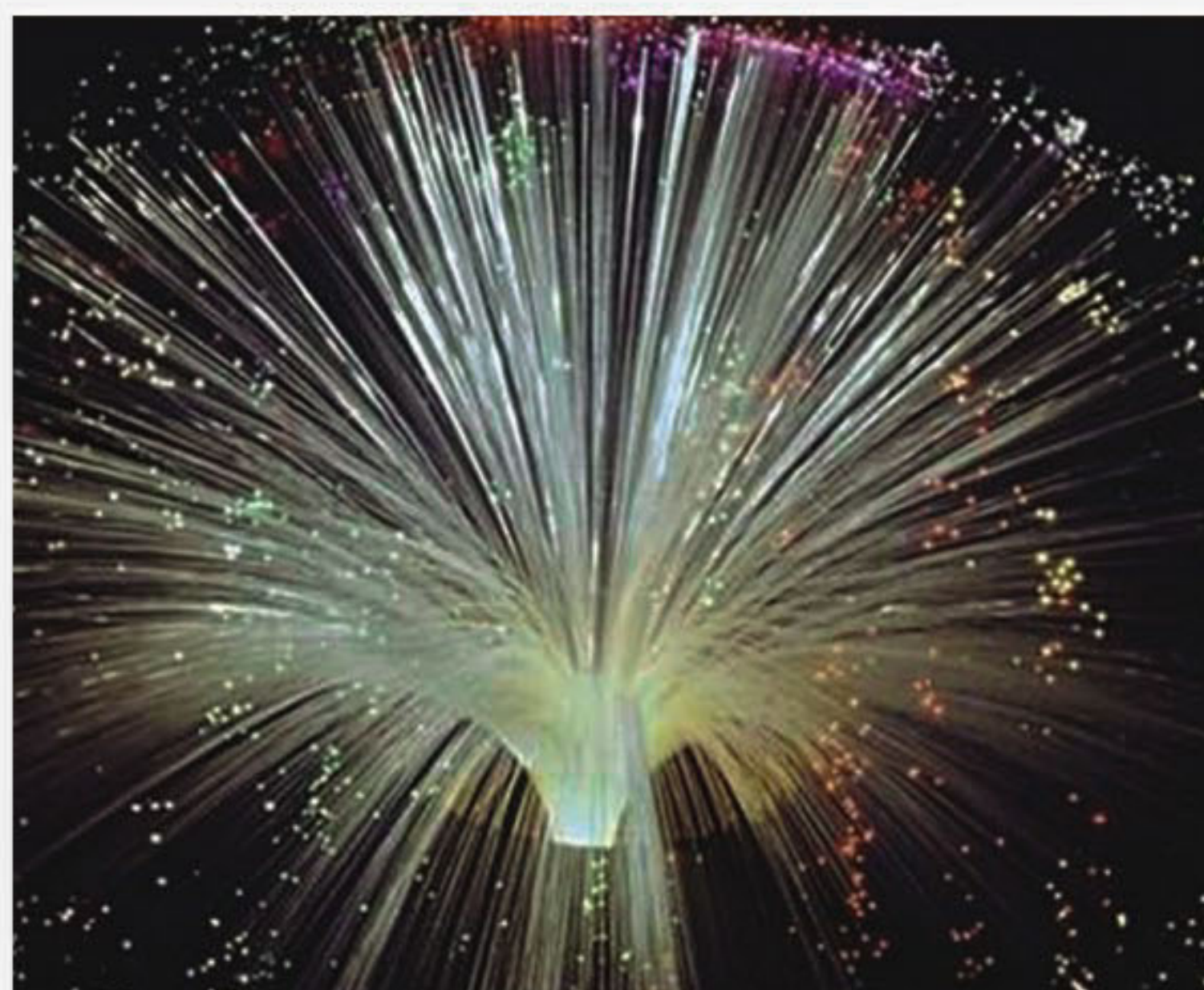
## EDITING HISTORY

# The space-time cloak

OBADUR RAHMAN

RECENTLY, physicists from the Imperial College London (ICL) conducted a study on manipulating the nature of space and time and concluded that it was possible to hide actual events from the plain sight of the viewer. In other words, an event could take place; say a journey from one location to the other, however, the "journey" in-between, from the point of start to the destined location would remain entirely invisible to the naked eye. Scientists believe this wondrous scientific scheme, which is being referred to as "space-time cloak" can be the ultimate hiding place, like a hole carved right out of space and time. And the very nature of physics, in this particular case, would manipulate light to such an extent that the actual events in real life would be "cut off", just as an editor cuts off scenes from the reel of film that s/he does not want public to watch. This means that this space-time cloak theory is actually based on censoring the flow of events that we generally perceive as a stream of light particles, which are also known as photons that strike the retina of ours and allows us to see the events as they take place.

Sure sounds lot like a fantasy that authors and espionage personas dream of but physicists from the ICL have proved that it could work in theory. This theory of space-time cloak, details of which have been published in the 16 November issue of the Journal of Optics, is believed to be an upgraded version of the "invisibility cloak" that was first proposed by Sir John Pendry, a theoretical



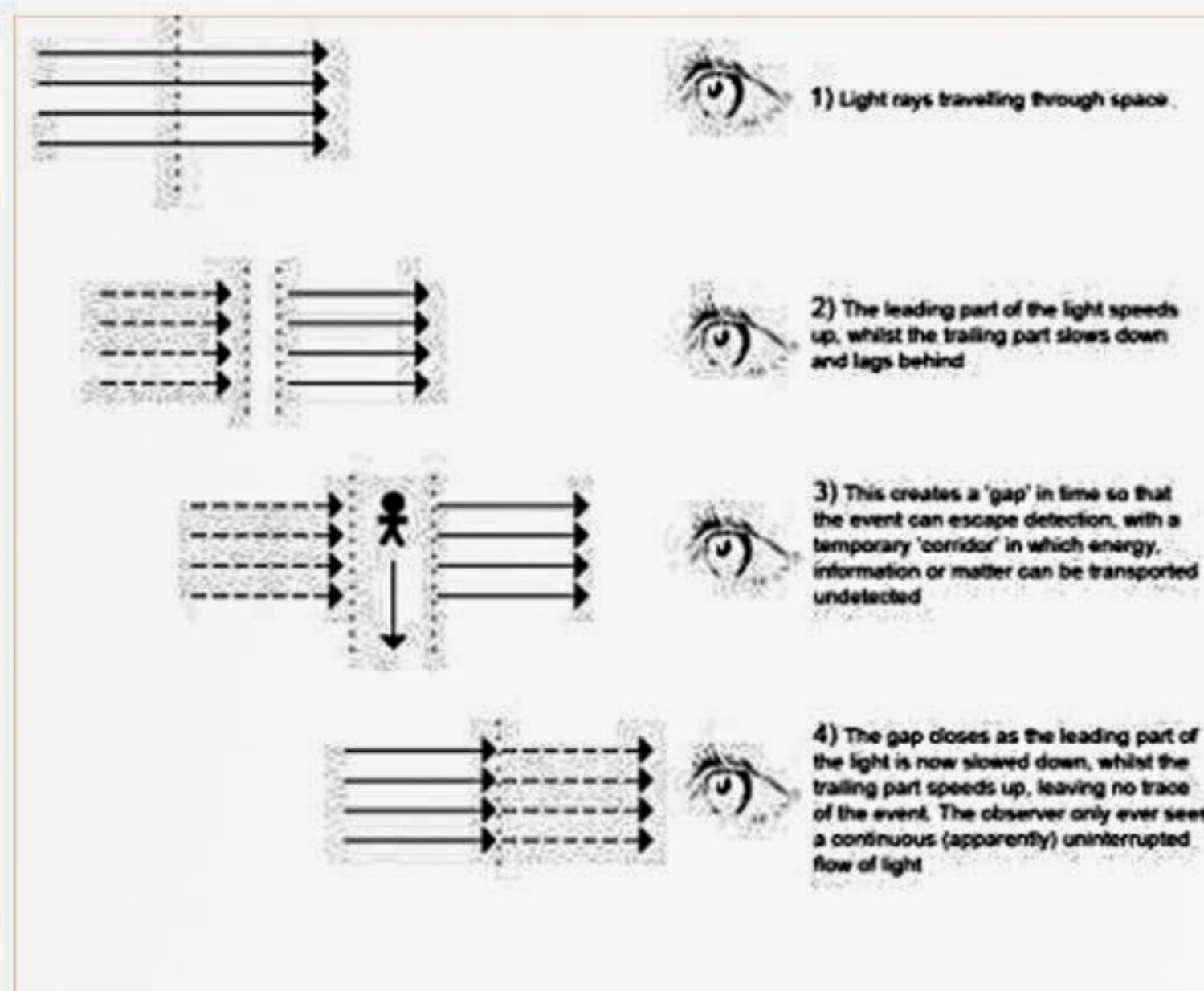
Light travelling through optic fibers

physicist of the same ICL, back in 2006. And that study involved metamaterials.

What are metamaterials? Put simply, metamaterials are a new class of materials which can be artificially engineered to distort light or sound waves. With conventional materials, light travels along a straight line but with metamaterials, it is possible to exploit a wealth of additional flexibilities to create undetectable blind spots. By deflecting certain parts of the electromagnetic spectrum, an image, thus, can be altered or at-least made to look like it has disappeared and metamaterials with their complex internal structures channel light

around objects like water flowing around a rock in a river.

According to Prof. Martin McCall, team leader of the recent project and professor of theoretical optics of ICL, "Light normally slows down as it enters a material, but it is theoretically possible to manipulate the light rays so that some parts speed up and others slow down". The fact is the space-time cloak theory involves the refractive index, which is the optical property that basically administers the speed of light within a material that is continually changed, pulling light rays apart in time. And according to scientists this is when light "opens up", and that is, the leading half of the light



This graphic shows how the "space-time" cloak works

speeds up and arrives before an event while the trailing half that is made to lag behind arrives comparatively late. When the leading edge of a light wave hits the space-time cloak, the metamaterial is engineered to speed up the light but when the trailing edge hits, the light slows down and is delayed.

And the study predicts that between these two parts of the light, there will be a temporal void, an empty space in which there will be no illumination of light for a brief period of time. During this particular gap an event or action can take place and then by reversing the speeds of light, the gap can be closed again before the light

reaches the observer, making it look nothing has happened. Experts believe that such space-time cloak could open up temporary corridors through which energy, information and matter could be transported, fairly undetected. Prof. McCall explains, "If you had someone moving along the corridor, it would appear to a distant observer as if they had relocated instantaneously, creating the illusion of a Star-Trek transporter. So, theoretically, this person might be able to do something and you wouldn't notice!"

The contributor is a freelance science writer.



## TRAPPED VISITOR

### Planet from another galaxy



Artist's impression of HIP 13044 b

OVER the last 15 years, astronomers have detected nearly 500 planets orbiting stars in our cosmic neighbourhood, but none outside our Milky Way has been confirmed [1]. Now, however, a planet with a minimum mass 1.25 times that of Jupiter [2] has been discovered orbiting a star of extragalactic origin, even though the star now finds itself within our own galaxy. It is part of the so-called Helmi stream -- a group of stars that originally belonged to a dwarf galaxy that was devoured by our galaxy, the Milky Way, in an act of galactic cannibalism about six to nine billion years ago.

The results are published in Science Express. "This discovery is very exciting," says Rainer Klement of the Max-Planck-Institut für Astronomie (MPIA), who was responsible for the selection of the target stars for this study. "For the first time, astronomers have detected a planetary system in a stellar stream of extragalactic origin. Because of the great distances involved, there are no confirmed detections of planets in other galaxies. But this cosmic merger has brought an extragalactic planet within our reach." The star is known as HIP 13044, and it lies about 2000 light-years from Earth in the southern constellation of Fornax (the Furnace). The astronomers detected the planet, called HIP 13044 b, by looking for the tiny telltale wobbles of the star caused by the gravitational tug of an orbiting companion. For these precise observations, the team used the high-resolution spectrograph FEROS [3] attached to the 2.2-metre MPG/ESO telescope [4] at ESO's La Silla Observatory in Chile.

Adding to its claim to fame, HIP 13044 b is also one of the few exoplanets known to have survived the period when its host star expanded massively after exhausting the hydrogen fuel supply in its core -- the red giant phase of stellar evolution. The star has now contracted again and is burning helium in its core. Until now, these so-called horizontal branch stars have remained largely uncharted territory for planet-hunters.

Source: Science Daily.

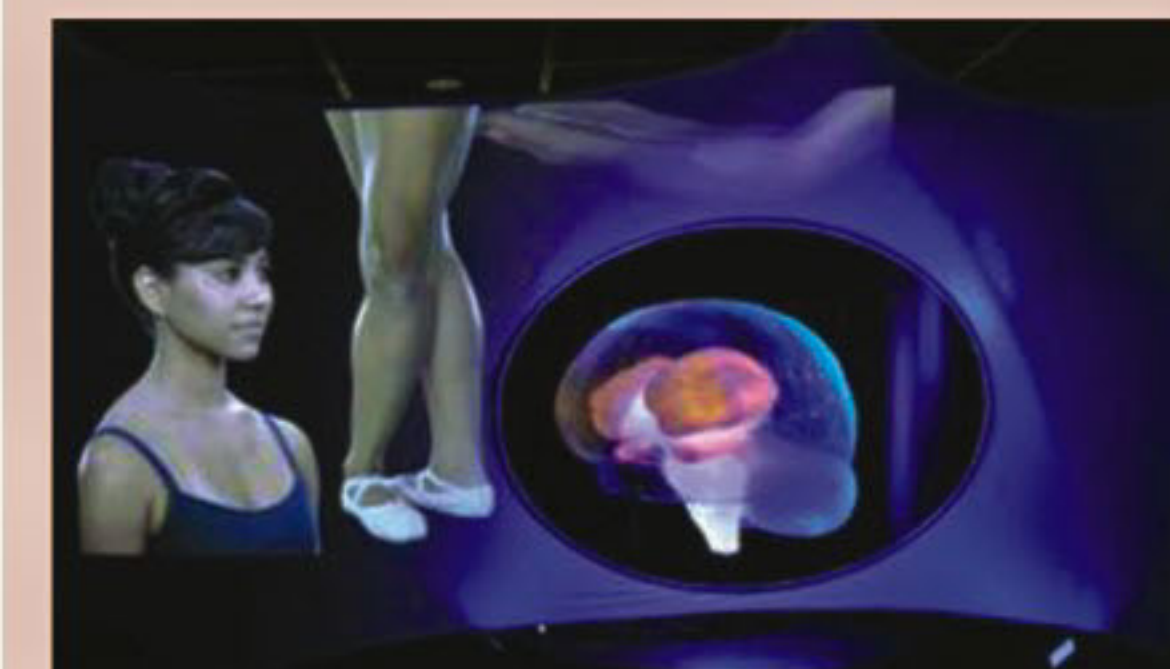


## MYSTERY BOX



## CARBON FIXERS

### Exhibit called 'Brain'



In the theater presentation on the brain and brain function, a clear resin 3D brain that lights up relevant brain areas

BARS of light passing across a massive tangle of cables give the sense of being surrounded by crackling electrical signals and firing neurons as you enter the American Museum of Natural History's new exhibit here. Most people may visit the museum for the fossils, but this time they'll want to stay for the brains.

First-time attendees at a preview event on Tuesday (Nov. 16) paused at the entrance to gaze upon a 3-pound preserved brain that looked unremarkably pale and placid compared with what lay ahead. As visitors journey deeper into the exhibit, they encounter an interactive sensory feast that both surprises and stimulates.

The exhibit, called "Brain: The Inside Story," represents a bit of a departure for the museum, said Joy Hirsch, director of the functional MRI Research Center at Columbia University. She consulted on the exhibit as an expert on brain imaging, but confessed to being floored when she saw everything come to life for the first time.

"Museum exhibits like this are traditionally about fossils, about things other than who we are," Hirsch said.

As she spoke, a raised circular pedestal on the exhibit floor showed a spinning movie of brain images of accomplished people such as cellist Yo-Yo Ma and basketball player Landry Fields of the New York Knicks. Hirsch's lab used functional magnetic imaging (fMRI) scans to record brain activity of the celebrities as they looked at photos and listened to themselves at work.

That was "to make the point that all of us are the product of our brains," Hirsch told LiveScience. "Whatever we do and feel and hear and experience is coded by our brains."

Source: Science News

## Deepest undersea microbial world

THE first study to ever explore biological activity in the deepest layer of ocean crust has found bacteria with a remarkable range of capabilities, including eating hydrocarbons and natural gas, and "fixing" or storing carbon.

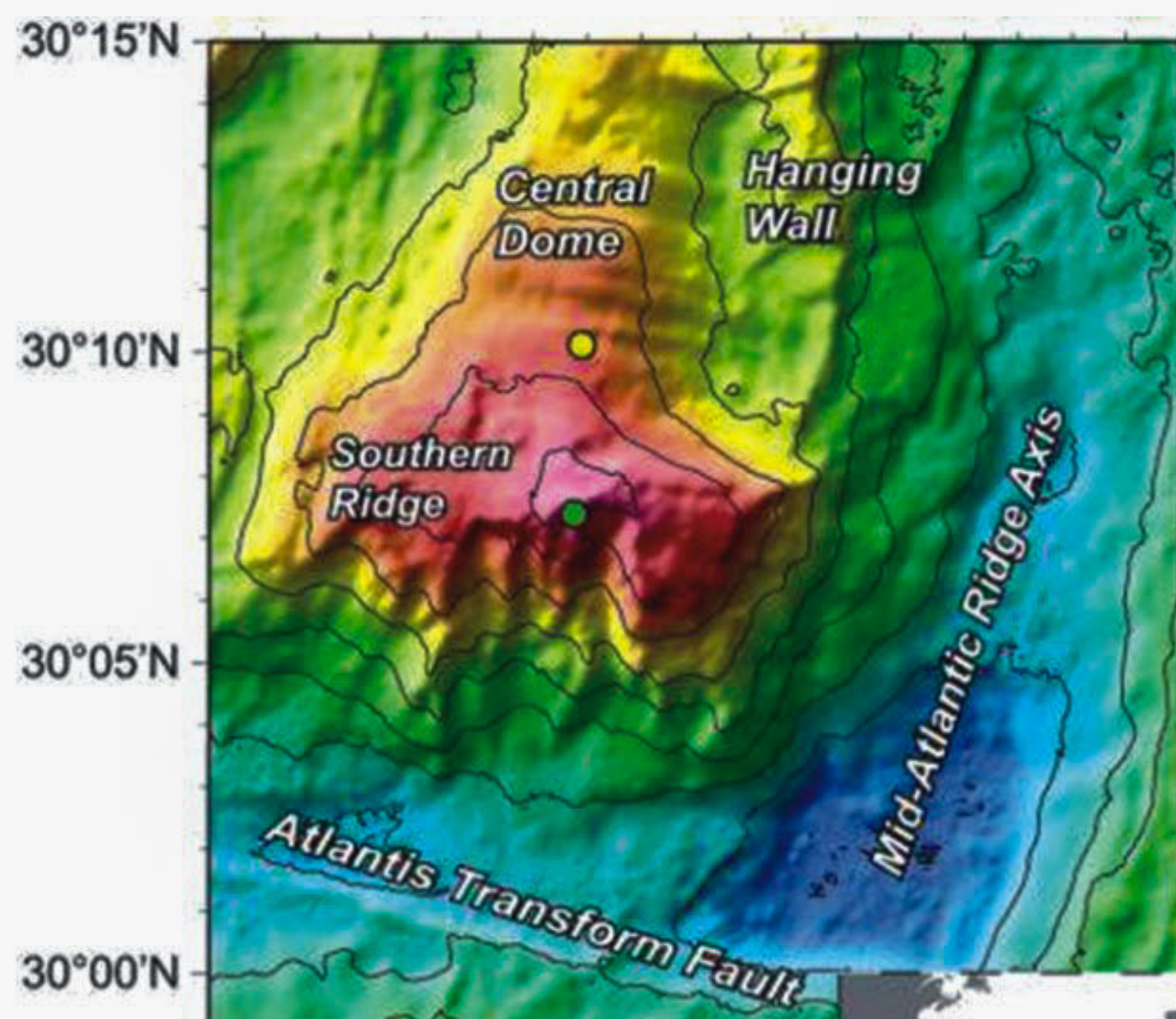
The research, just published in the journal PLoS One, showed that a significant number and amount of bacterial forms were present, even in temperatures near the boiling point of water.

"This is a new ecosystem that almost no one has ever explored," said Martin Fisk, a professor in the College of Oceanic and Atmospheric Sciences at Oregon State University. "We expected some bacterial forms, but the long list of biological functions that are taking place so deep beneath the Earth is surprising."

Oceanic crust covers about 70 percent of the surface of the Earth and its geology has been explored to some extent, but practically nothing is known about its biology -- partly because it's difficult and expensive, and partly because most researchers had assumed not all that much was going on.

The temperature of the sediments and rock increases with depth, and scientists now believe that the upper temperature at which life can exist is around 250 degrees. The ocean floor is generally composed of three levels, including a shallow layer of sediment; basalt formed from solidified magma; and an even deeper level of basalt that cooled more slowly and is called the "gabbro" layer, which forms the majority of ocean crust.

The gabbro layer doesn't even begin until the crust is about two miles thick. But at a site in the Atlantic Ocean near an undersea mountain, the Atlantis Massif, core samples were obtained from gabbro rock formations that were closer to the surface than usual because they had been uplifted and exposed by faulting. This allowed the researchers to investigate for the first time the microbiology of these rocks.



Rock from deep beneath this undersea mountain in the Atlantic Ocean contains some of the microbial life interactions going on in the deepest ocean crust

A research expedition drilled more than 4,600 feet into this formation, into rock that was very deep and very old, and found a wide range of biological activity. Microbes were degrading hydrocarbons, some appeared to be capable of oxidizing methane, and there were genes active in the process of fixing, or converting from a gas, both nitrogen and carbon.

The findings are of interest, in part, because little is known about the role the deep ocean crust may play in carbon storage and fixation. Increasing levels of carbon dioxide, a greenhouse gas when in the atmosphere, in turn raise the levels of carbon dioxide in the oceans.

But it now appears that microbes in

the deep ocean crust have at least a genetic potential for carbon storage, the report said. And it may lend credence to one concept for reducing carbon emissions in the atmosphere, by pumping carbon dioxide into deep subsurface layers where it might be sequestered permanently.

The researchers also noted that methane found on Mars could be derived from geological sources, and concluded that subsurface environments on Mars where methane is produced could support bacteria like those found in this study.

Source: Science Daily.



## THAU' SKYLIGHT



## DO YOU KNOW?

### Florida in new light



This image provided by NASA and posted to Twitpic by astronaut Douglas Wheelock on Nov. 9, 2010, shows a view of Key West, Fla., as seen from the International Space Station. Earthlings are seeing their planet in a whole new light. They're beaming down dazzling images and guess-this-mystery-location photos

Source: AP

### Why does a bull react violently to the colour red?



It is the movement of the cloth that makes the bull react violently as like most mammals, the bull too is colour blind and cannot be affected by the colour of the cloth. When a matador moves a cloth (irrespective of the colour) in front of the bull, it perceives the movement as a threat and is angered, and as a result, reacts violently.



## THEY'RE EVERYWHERE!

### Rent-seeking bird

IN what some scientists are likening to a mob protection racket, a species of birds in Africa has been found to guard other birds from predators in exchange for food.

On one level, the security service offered by the drongo birds of the Kalahari Desert would seem to be legitimate. They do provide some true protection unlike quite a few mafiosos, who create the very threat that for a fee they will supposedly ward off.

Yet there's a hint of the criminal in the drongo operation too, scientists say. The avian guards help themselves to predators, then using the resulting confusion to snatch food from their feathered clients. Nor do the latter seem to specifically request protection; rather, the drongos are just there.

The drawbacks notwithstanding, the "client" birds, pied babblers, gain something from the arrangement, according to scientists. That's because the self-appointed sentinels, through their presence, allow the babblers to focus on foraging for insects rather than watching their backs.

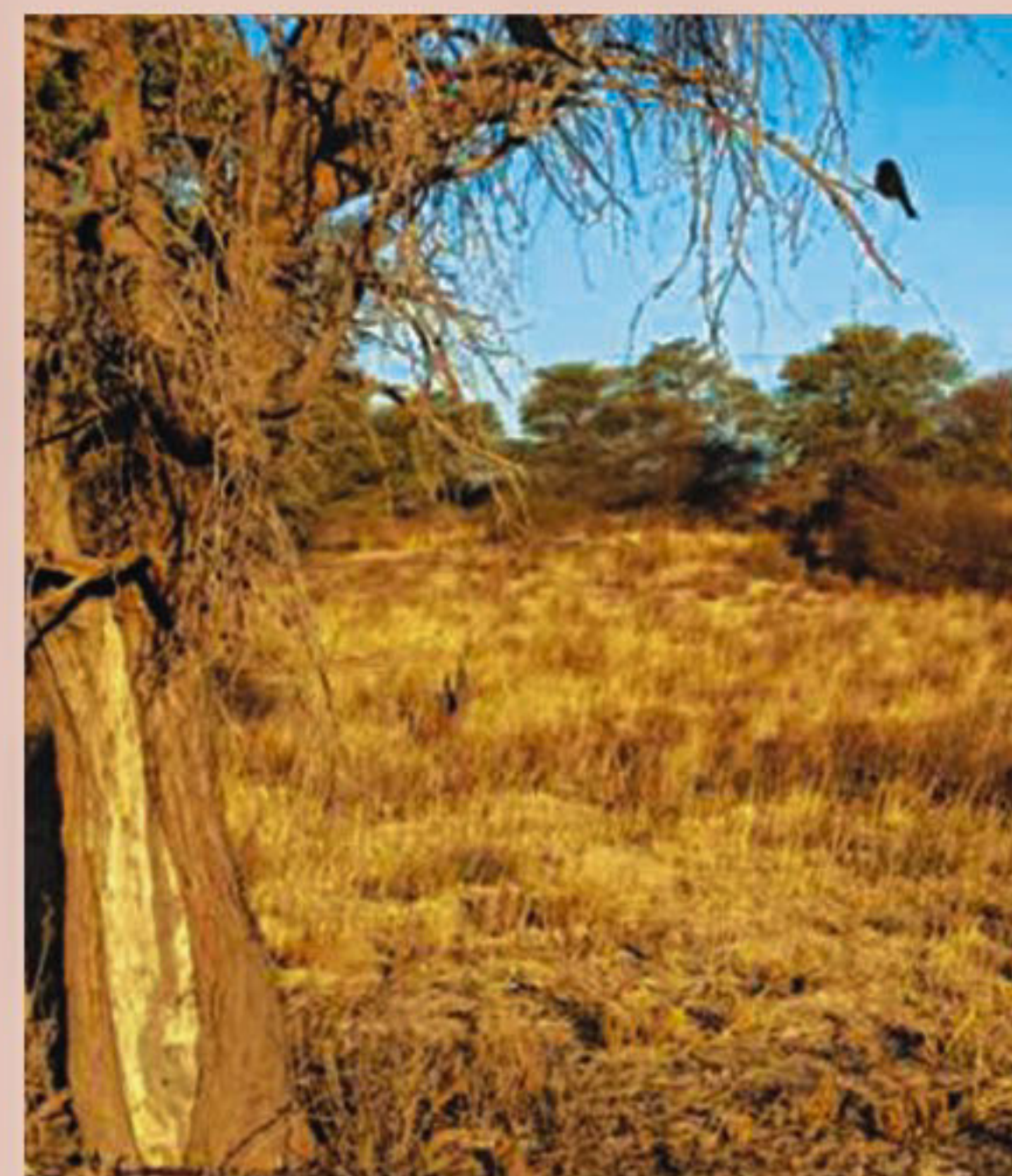
The behavior may be a rare example of two species evolving from a parasitic to a "mutualistic" relationship, say the investigators, reporting the findings in the research journal Evolution.

"Drongos are parasitic birds who swoop in to steal food from other species," explained Andrew Radford of the Universities of Bristol, U.K., one of the researchers. Given this unsavory way of life, he went on, it was somewhat surprising to find that drongos perched above foraging babblers advertise their presence rather than keep a low profile.

They announce themselves "by issuing a call called a 'twank' every four or five seconds," Radford said.

The explanation, he added, seems to be that the "twank" reassures babblers someone is keeping a lookout against predatory birds. This lets the babblers forage for insects more effectively. That, in turn, leads to better opportunities for the drongos to filch some of the catch. "When we played back these 'twank' calls to a babbler group, we found that they spread out over a larger area and lifted their heads less often, indicating that they were less fearful of predators when they thought a drongo was keeping watch," Radford said.

Source: World Science



A drongo perched on a tree above pied babblers