

Scientists steal a moment in time

THINK Harry Potter movie magic: Cornell researchers have demonstrated a "temporal cloak" -- albeit on a very small scale -- in the transport of information by a beam of light.

The trick is to create a gap in the beam of light, have the hidden event occur as the gap goes by and then stitch the beam back together. Alexander Gaeta, Cornell professor of applied and engineering physics, and colleagues report their work entitled "Demonstration of temporal cloaking," in the journal Nature (Jan. 5, 2012).

The researchers created what they call a time lens, which can manipulate and focus signals in time, analogous to the way a glass lens focuses light in space. They use a technique called four-wave mixing, in which two beams of light, a "signal" and a "pump," are sent together through an optical fiber. The two beams interact and change the wavelength of the signal. To begin creating a time gap, the researchers first bump the wavelength of the signal up, then by flipping the wavelength of the pump beam, bump it down.

The beam then passes through another, very long, stretch of optical fiber. Light passing through a transparent material is slowed down just a bit, and how much it is slowed varies with the wavelength. So the lower wave-



Scientists demonstrate how they have created, a new invisibility technique that masks an entire event.

length pulls ahead of the higher, leaving a gap, like the hare pulling ahead of the tortoise. During the gap the experimenters introduced a brief flash of light at a still higher wavelength that would cause a glitch in the beam coming out the other end.

Then the split beam passes

through more optical fiber with a different composition, engineered to slow lower wavelengths more than higher. The higher wavelength signal now catches up with the lower, closing the gap. The hare is plodding through mud, but the tortoise is good at that and catches up. Finally, another four-wave

mixer brings both parts back to the original wavelength, and the beam emerges with no trace that there ever was a gap, and no evidence of the intruding signal.

None of this will let you steal the crown jewels without anyone noticing. The gap created in the experiment was 15 picoseconds

long, and might be increased up to 10 nanoseconds, Gaeta said. But the technique could have applications in fiber-optic data transmission and data processing, he added. For example, it might allow inserting an emergency signal without interrupting the main data stream, or multitasking operations in a photonic computer, where light beams on a chip replace wires.

The experiment was inspired by a theoretical proposal for a space-time cloak or "history editor" published by Martin McCall, professor of physics at Imperial College in London, in the Journal of Optics in November 2010. "But his method required an optical response from a material that does not exist. Now we've done it in one spatial dimension. Extending it to two [that is, hiding a moment in an entire scene] is not out of the realm of possibility. All advances have to start from somewhere," Gaeta says.

Funding for the research: The Defense Advanced Research Project Agency (DARPA) and by the Cornell Center for Nanoscale Systems, which is supported by the National Science Foundation and the New York State Division of Science, Technology and Innovation.

Source: Science Daily



TEMPERATURE SAVVY

Evolution exploits editing



The nervous system of this warm water-dwelling Octopus vulgaris functions smoothly thanks to edits in the animals' RNA.

The frigid waters of the Southern Ocean don't slow Antarctic octopuses down, even though their nervous systems are governed by the same genetic instructions as their tropical counterparts. Now scientists know why: Edits to the creatures' genetic instructions tweak the octopuses' nerve cells for smooth operating in the numbing polar waters.

The discovery is the first report of such editing actually helping an organism adjust to its environment, scientists report online January 5 in Science.

Because nerve cells can't send signals as quickly in the cold, scientists decided to compare genes from Pareledone, an octopus that lives in the icy waters off Antarctica, with those of the warm-water species Octopus vulgaris. To the researchers' surprise, the genetic instructions were pretty much the same.

"It was a real disappointment at first," says molecular neurobiologist Joshua Rosenthal of the University of Puerto Rico Medical Sciences Campus in San Juan. "We thought there was going to be a difference in their genes, but they were basically identical. It was puzzling."

Rosenthal and graduate student Sandra Garrett figured something must alter the way the DNA instructions are relayed to and interpreted by the body's nerve cell building machinery.

DNA always stays put in the nucleus of cells, and sections of it are copied when instructions for functioning or building parts are needed. So the researchers looked at this genetic photocopy, the mRNA. It turns out that an enzyme that specializes in editing mRNA alters the blueprints for the octopuses' nerve cells in both polar and tropical species, the researchers discovered.

The mRNA edits slightly change the way that nerve cells open and close gates to produce electrical impulses. In the Antarctic octopus species, the edits speed up the closing of one gate, while in the tropical species, the edits make that gate close more slowly. Because cold slows the gates down, these editing tweaks nicely counteract the effects of temperature and keep the gates in sync with other parts of the nervous system.

Science News



CONSERVATION TOOL

Virtues of traditional farming

TRADITIONAL farming methods are crucial for protecting a number of threatened bird species in the developing world, including bustards, cranes, ibises and vultures, a study has found.

Livestock grazing and features associated with arable farming such as hedgerows create environmental conditions that certain birds currently depend on for food, shelter and breeding, the authors report.

But as industrial farming methods eliminate these habitats, these species are threatened with extinction, said Hugh Wright, a researcher in the School of Environmental Sciences at the University of East Anglia, United Kingdom, and lead author of the study, published in Conservation Letters earlier this month (5 December).

"There really is no hope for these species if industrial farming continues unchecked," he told SciDev.Net.

Although reintroducing or mimicking traditional farming techniques has had success in conserving wildlife in Europe, "conservation in the developing world has always focused on pristine forest ecosystems and has paid little attention to where farming might be beneficial," Wright said.

The study found 29 bird species threatened by the decline of traditional agriculture in developing countries. This number could be much higher if all organisms, rather than just birds, are considered, as evidence from Europe suggests that traditional farming also benefits reptiles, amphibians, butterflies and even plants, Wright said.

Farmers can benefit too from protecting biodiversity since it helps to justify traditional agriculture and could prevent big agri-businesses from forcing farmers off their land, he added. Also, by offering farmers economic incentives to continue these beneficial practices, governments can ensure that conservation and development move forward together.

Source: SciDev.net



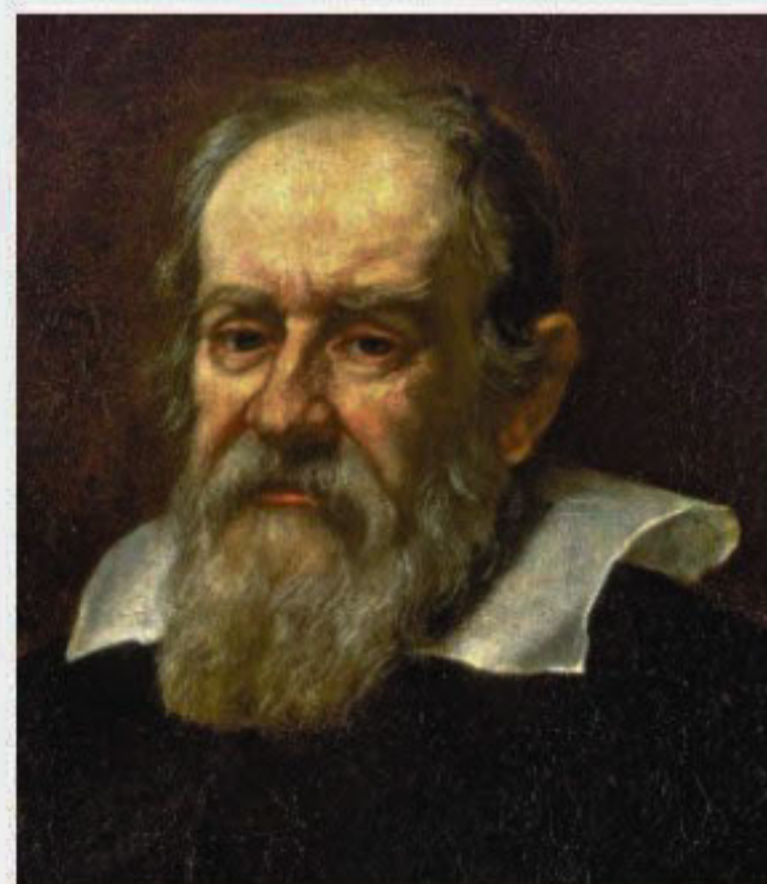
Bustards are among the threatened bird species

Galilean way of discourse

DEBASHISH CHAKRABARTY

THE life of Galileo Galilei (1564-1642) has a certain dramatic character, and this element of theatrical showmanship is evident even in the form of his scientific writings. His most famous works were dialogues, i.e., they are presented as plays, representing discussions between advocates of two opposing points of view. For example, in 1632 he published Dialogue on the Two Chief World Systems, in which fictional proponents of the ancient Ptolemaic/Aristotelian theory and the modern Copernican theory present their cases, each trying to win over a third character who represented an unbiased observer. The "modernist" is called Salviati, presumably named after Filippo Salviati, who until his death in 1614 had been a close friend of Galileo's in Florence. The clear-thinking representative of the educated public is called Sagredo, after Galileo's former student Giovanfrancesco Sagredo of Venice, who had died in 1620. The pedantic Aristotelian of the trio is called Simplicio, apparently named after Simplicio, a Greek philosopher of the 6th century AD known for his commentaries on Aristotle.

It's natural to think of Plato's classic dialogues as the inspiration for this mode of presentation. In addition, it has often been pointed out that the dialogue form enabled Galileo to present the case for the Copernican world view while maintaining "plausible deniability", i.e., he could claim that he was not advocating any particular point of view, but was merely present-



ing a fictional discussion among advocates of different points of view. Of course, it's perfectly clear from reading the dialogues that Salviati (the character who advocates Copernicus' theory) speaks for Galileo, but since the Copernican thesis was considered heretical in those days, it is suggested that Galileo chose the dialogue to insulate himself from direct attacks, especially since he had promised to Church officials in 1616 "not to hold, teach, or defend Copernicanism". In Galileo's mind, this promise did not preclude him from presenting an "unbiased" review of the issues, as long as he did not explicitly endorse one side or the other. (As is well known, the Church took a different view.)

The model provided by Plato's dialogues, and the usefulness of the dialogue form for surreptitious advocacy, may both have influenced Galileo's choice of format, but it's interesting to note that in his use of the dialogue form Galileo was actually carrying on a family tradition. Galileo's father, the musician and scholar

Vincenzo Galilei (1525-1591), was one of the founding members of the Florentine Camerata, a group of men who met in the home of Count Giovanni Bardi to discuss topics mainly related to musical theory, but also touching on science and the arts. The modern art form known as opera was created by this group, and the very first operas were composed by its members as part of their campaign to restore what they believed to have been the classical Greek forms in music, with simple monodal melodies emphasizing the words. Vincenzo wrote a book on musical theory, entitled A Dialogue on Ancient and Modern Music.

It's also interesting to note that one of Vincenzo's guiding principles was that we should not follow authority in matters that can be directly checked by experience. For example, the accepted wisdom in those days was that the frequency of the tone produced by a vibrating string in tension would be cut in half if the string were doubled in length. This is true enough, but it was also commonly believed that the frequency produced by a string of a given length would be reduced by half if the tension was reduced by half. Vincenzo conducted a series of experiments to test these beliefs, and found that although the frequency is indeed proportional to the length (for a given tension), the frequency is actually proportional to the square root of the tension). He demonstrated this by attaching weights to strings, showing that in order to double the frequency of the tone, it is necessary to quadruple the weight.



OOOH, AAAH, AUROORA!

Colourful night sky over Norway



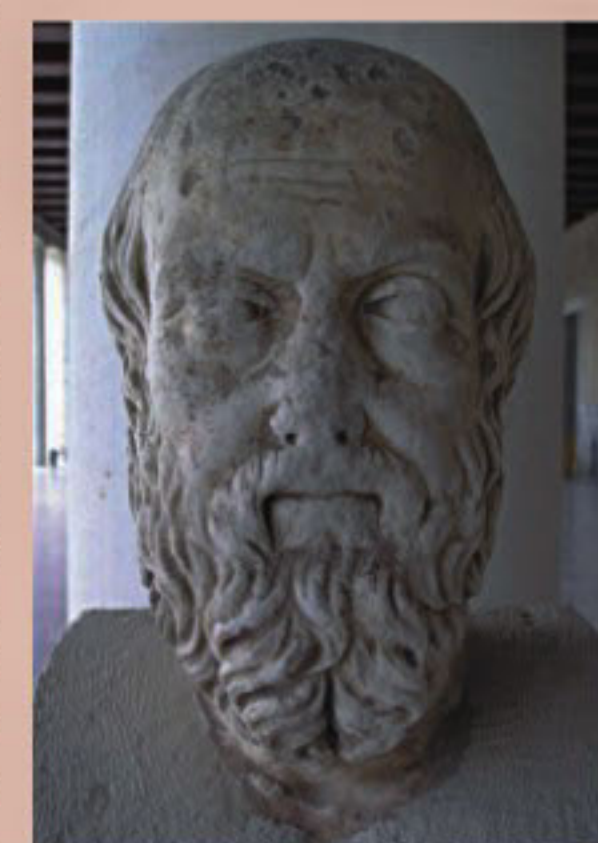
The night sky puts on a colourful show like no other in this compressed wide-angle view of the aurora over Norway in late 2011. The gyrating colors are caused by charged particles hitting atoms in the high atmosphere.

Source: Live Science



DID YOU KNOW?

Who is called 'Father of History'?



Greek thinker Herodotus (484 BC-425 BC) is known as Father of history. In his nine scrolls known as The Histories, Herodotus described the conflict between his own people, the Greeks, and the Persian Empire. While telling the story of their own civilization in conflict with another, many people would be inclined to take sides, but Herodotus strove to show each side's perspective in the struggle. In this, he was like the great poet Homer, but Herodotus innovated even further. Homer wrote his epic as if narrated by a goddess; Herodotus spoke with his own voice, and relayed his own experiences and research.



ETERNAL CLASH

Personality: Men vs women

MEN and Women Have Major Personality Differences: New Report Suggests Previous Measurements Have Underestimated Variation Between the Sexes

Men and women have large differences in personality, according to a new study published Jan. 4 in the online journal PLoS ONE.

The existence of such differences, and their extent, has been a subject of much debate, but the authors of the new report, led by Marco Del Giudice of the University of Turin in Italy, describe a new method for measuring and analyzing personality differences that they argue is more accurate than previous methods.

The researchers used personality measurements from more than 10,000 people, approximately half men and half women. The personality test included 15 personality scales, including such traits as warmth, sensitivity, and perfectionism. When comparing men's and women's overall personality profiles, which take multiple traits into account, very large differences between the sexes became apparent, even though differences look much smaller when each trait is considered separately.

However, the study indicates that previous methods to measure such differences have been inadequate, both because they focused on one trait at a time and because they failed to correct for measurement error.

The authors conclude that the true extent of sex differences in human personality has therefore been consistently underestimated.

Source: Science Daily



A new test has found that men and women have large differences in personality.