

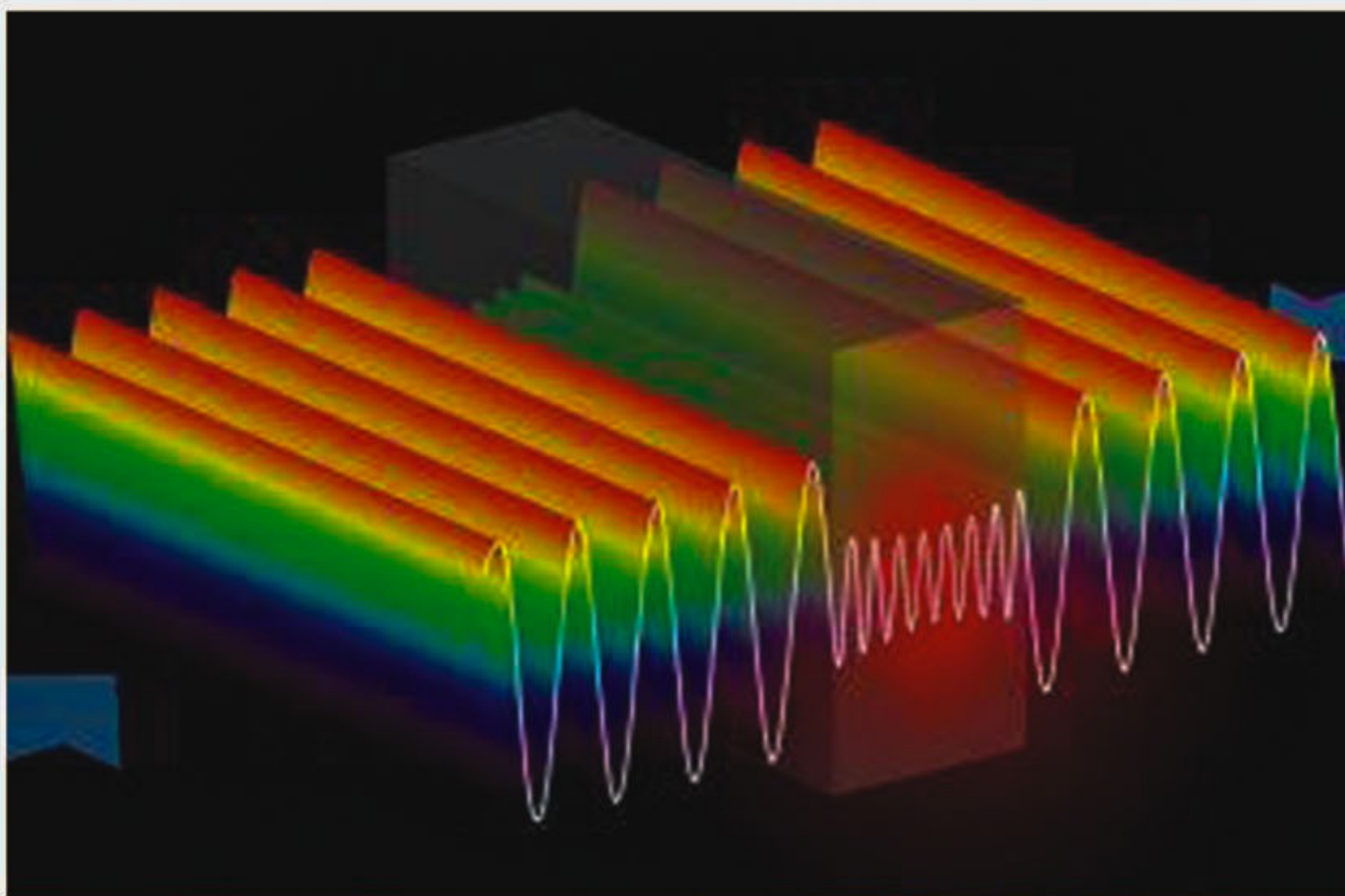
# World's first anti-laser

**M**ORE than 50 years after the invention of the laser, scientists at Yale University have built the world's first anti-laser, in which incoming beams of light interfere with one another in such a way as to perfectly cancel each other out. The discovery could pave the way for a number of novel technologies with applications in everything from optical computing to radiology.

Conventional lasers, which were first invented in 1960, use a so-called "gain medium," usually a semiconductor like gallium arsenide, to produce a focused beam of coherent light -- light waves with the same frequency and amplitude that are in step with one another.

Last summer, Yale physicist A. Douglas Stone and his team published a study explaining the theory behind an anti-laser, demonstrating that such a device could be built using silicon, the most common semiconductor material. But it wasn't until now, after joining forces with the experimental group of his colleague Hui Cao, that the team actually built a functioning anti-laser, which they call a coherent perfect absorber (CPA).

The team, whose results appear in the Feb. 18 issue of the journal Science, focused two laser beams with a specific frequency into a cavity containing a silicon wafer that acted as a "loss medium." The wafer aligned the light waves in such a way that they became per-



**In the anti-laser, incoming light waves are trapped in a cavity where they bounce back and forth until they are eventually absorbed. Their energy is dissipated as heat**

fectly trapped, bouncing back and forth indefinitely until they were eventually absorbed and transformed into heat.

Stone believes that CPAs could one day be used as optical switches, detectors and other components in the next generation of computers, called optical computers, which will be powered by light in addition to electrons. Another application might be in

radiology, where Stone said the principle of the CPA could be employed to target electromagnetic radiation to a small region within normally opaque human tissue, either for therapeutic or imaging purposes.

Theoretically, the CPA should be able to absorb 99.999 percent of the incoming light. Due to experimental limitations, the team's current CPA absorbs 99.4 percent.

"But the CPA we built is just a proof of concept," Stone said. "I'm confident we will start to approach the theoretical limit as we build more sophisticated CPAs." Similarly, the team's first CPA is about one centimeter across at the moment, but Stone said that computer simulations have shown how to build one as small as six microns (about one-twentieth the width of an average human hair).

The team that built the CPA, led by Cao and another Yale physicist, Wenjie Wan, demonstrated the effect for near-infrared radiation, which is slightly "redder" than the eye can see and which is the frequency of light that the device naturally absorbs when ordinary silicon is used. But the team expects that, with some tinkering of the cavity and loss medium in future versions, the CPA will be able to absorb visible light as well as the specific infrared frequencies used in fiber optic communications.

It was while explaining the complex physics behind lasers to a visiting professor that Stone first came up with the idea of an anti-laser. When Stone suggested his colleague think about a laser working in reverse in order to help him understand how a conventional laser works, Stone began contemplating whether it was possible to actually build a laser that would work backwards, absorbing light at specific frequencies rather than emitting it.

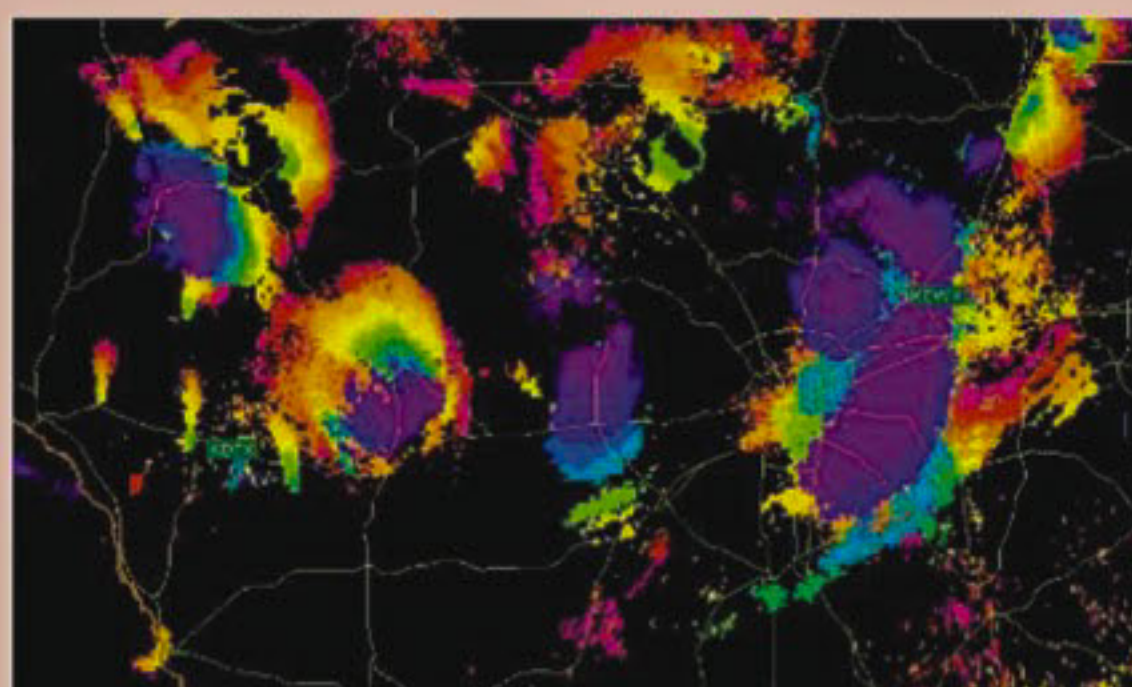
"It went from being a useful thought experiment to having me wondering whether you could really do that," Stone said. "After some research, we found that several physicists had hinted at the concept in books and scientific papers, but no one had ever developed the idea."

Source: Science Daily



## "GOING BATS"

### Bat swarm portent of weather



**Radar images show masses of bats moving across the landscape (color bar below shows movements over time)**

The blips and blobs caused by flying animals may look like noise to storm-watchers studying Doppler radar data, but these signals could be a big hit with bat biologists.

Bats swirling out of caves show up on weather radar, as do masses of birds and other flying animals. Now that the National Severe Storms Laboratory in Norman, Okla., is merging its radar data onto a single nationwide frequently updated map, biologists have an opportunity to get a new view of aerial creatures, said ecologist Winifred Frick of the University of California, Santa Cruz. She presented a preview of biological studies using the stitched together Doppler data on February 19 at the annual meeting of the American Association for the Advancement of Science.

Biologically speaking, the air is "a very unexplored part of our biosphere," said Thomas Kunz of Boston University. Kunz, a bat biologist, has christened this emerging discipline "aeroecology."

At the meeting, Frick described how, in a radar sequence from southern Texas, she had seen something she had never imagined: swarms of bats following an evening weather front. "Radar is like a really fancy pair of binoculars," Frick said.

In the radar view of a storm front rolling over Texas, Frick pointed out a frayed tan bar indicating insect swarms moving with the air mass. The radar doesn't reveal much about the identity of species in a cloud, but Frick knew that the front was passing over a bat cave. A yellow burst on the radar showed what Frick identified as dense crowds of Brazilian free-tailed bats speeding out of their cave at sunset to hunt for insects. The burst bloomed into a cloud of bats, with an elongated mass sliding west along with the bugs. "It's a big aerial buffet line," Frick said.

Source: Science News

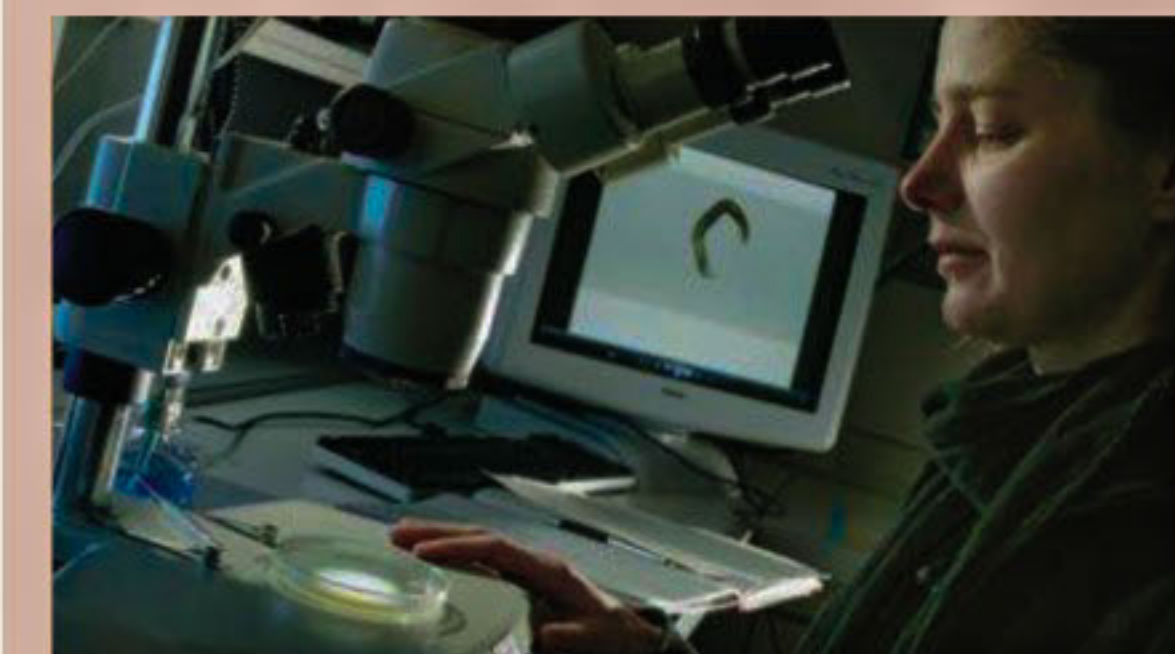


## FOUNTAIN OF YOUTH



## IN LIMBO

### Lithium for longevity?



**Dr. Kim Zarse from Jena University investigates how thium affect mortality in nematodes**

**A** regular uptake of the trace element lithium can considerably promote longevity. This is the result of a new study by scientists of Friedrich Schiller University Jena.

Professor Dr. Michael Ristow's team along with Japanese colleagues from universities in Oita and Hiroshima have demonstrated by two independent approaches that even a low concentration of lithium leads to an increased life expectancy in humans as well as in a model organism, the roundworm *Caenorhabditis elegans*.

The research team presents its results in the online edition of the scientific publication European Journal of Nutrition.

Lithium is one of many nutritional trace elements and is ingested mainly through vegetables and drinking water. "The scientific community doesn't know much about the physiological function of lithium," project manager Ristow says. According to an earlier study from the US, highly concentrated lithium showed to be life-prolonging in *C. elegans*, the Professor of Nutrition in Jena continues. "The dosage that has been analyzed back then, however, is clearly beyond the physiologically relevant range and may be poisonous for human beings," explains Ristow. To find out if lithium has a life-prolonging impact at much lower concentrations, the scientists then examined the impact of lithium in a concentration that is regularly found in ordinary tap water.

Source: Science Daily

### MYSTERIOUS FOSSIL

## Is it plant or animal?

**S**TRANGE fossils, including some that could be predecessors to modern animals, found in China shed new light on the evolution of large, complex organisms, and indicate that they may have diversified earlier than thought.

Researchers believe that the rocks containing these fossils, found in southern Anhui Province, date between 635 million and 580 million years ago. The new types of organisms discovered in them include two that are fan-shaped, as long as 2 inches (5 centimeters), and resemble seaweed, as well as three other new types of organisms that are difficult to classify as animal or plant.

"Some of my colleagues are more leaning toward the animal interpretation," said study researcher Shuhai Xiao, a professor of geobiology at Virginia Polytechnic Institute and State University. "But my personal view is that we still don't know what they are."

One of the three could be interpreted as resembling the early life stage of a polyp, or a sea anemone. The other two mysterious organisms have tube-like structures that could represent the digestive system of worm-like animals. For one of these, the call for plant or animal depends on perspective.

You could interpret the bulbous structure at one end of its stalk as a holdfast, which seaweed use as an anchor, making the organism a plant. Or you could see a proboscis, a tube-like feeding structure, and a simple, worm-like animal, the authors



**One of the approximately 600-million-year-old fossils unearthed in China**

write in today's (Feb. 17) issue of the journal Nature.

These fossils were discovered in the black shale of what is called the Lantian Formation in China, and they date back to the first part of the Ediacaran Period, the time when life became big, or at least visible to the naked eye.

"Animals in the Ediacaran Period are almost universally bizarre, and it is very difficult to place them in any modern animal phyla," Xiao told LiveScience. "They may be precursors to modern animals or offshoots of modern animals that don't have any direct descendants."

Until now, scientists had thought the oldest collection of fossils of large, complex life forms was the Avalon assemblage, dating back to about 579 million to 565 million years ago. It contained equally strange and unclassifiable organisms called rangeomorphs.

Because the Lantian fossils are older and contain complex, but very different organisms from those in the Avalon formation, the researchers write that large, complex organisms may have diversified earlier than thought.

The fossils described by Xiao and his colleagues, including lead author Xunlai Yuan of the Chinese Academy of Sciences, were preserved at a critical time in Earth's history, arriving after the end of "a snowball Earth event," when global temperatures dropped and ice extended into the tropics. Meanwhile, the explosion of animal diversity that came with the Cambrian Period was still a few tens of millions of years away.

Source: Live Science



## TONGUE TREATS

### Healing power of language

**W**ANT to protect against the effects of Alzheimer's? Learn another language. That's the takeaway from recent brain research, which shows that bilingual people's brains function better and for longer after developing the disease.

Psychologist Ellen Bialystok and her colleagues at York University in Toronto recently tested about 450 patients who had been diagnosed with Alzheimer's. Half of these patients were bilingual, and half spoke only one language.

While all the patients had similar levels of cognitive impairment, the researchers found that those who were bilingual had been diagnosed with Alzheimer's about four years later, on average, than those who spoke just one language. And the bilingual people reported their symptoms had begun about five years later than those who spoke only one language.

"What we've been able to show is that in these patients... all of whom have been diagnosed with Alzheimer's and are all at the same level of impairment, the bilinguals on average are four to five years older which means that they've been able to cope with the disease," Bialystok said.

She presented her findings today (Feb. 18) here at the annual meeting of the American Association for the Advancement of Science. Some results of this research were published in the Nov. 9, 2010 issue of the journal Neurology.

CT brain scans of the Alzheimer's patients showed that, among patients who are functioning at the same level, those who are bilingual have more advanced brain deterioration than those who spoke just one language. But this difference wasn't apparent from the patients' behaviors, or their abilities to function. The bilingual people acted like monolingual patients whose disease was less advanced.

"Once the disease begins to compromise this region of the brain, bilinguals can continue to function," Bialystok said. "Bilingualism is protecting older adults, even after Alzheimer's disease is beginning to affect cognitive function."

Source: Live Science

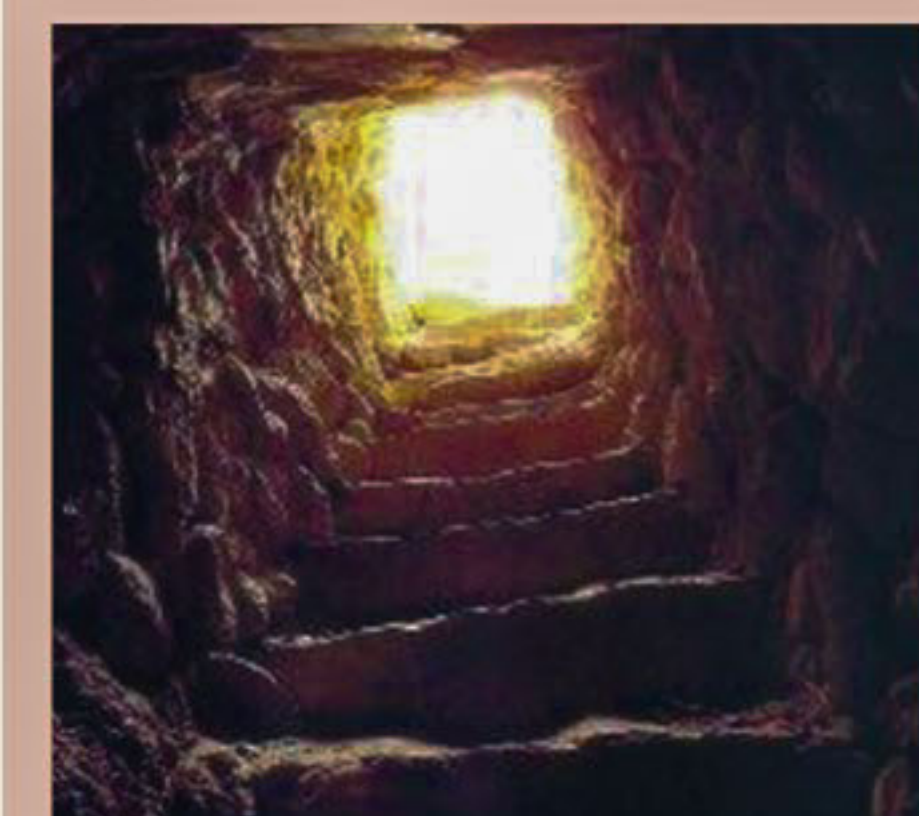


## TOWER OF POWER



## DO YOU KNOW?

### Mystery of Jericho monument



**Interior of the tower at Tel Jericho**

Since its discovery about 60 years ago, one of the earliest stone monuments in the history of humankind, a tower on the western edge of the ancient settlement of Tel Jericho, has inspired a number of theories about why it was built.

Now, after studying how the sun setting on the summer solstice, the longest day of the year, interacted with the tower and the landscape around it, two archeologists from Tel Aviv University have concluded the 28-foot (8.5 meter) tower symbolized power and might.

"We suggest that the tower was built not just as a marker or a time-keeping device, but as a guardian against the dangers present in the darkness cast by a dying sun's last rays of light," write the researchers, Roy Liran and Ran Barkai, in the journal *Antiquity*. (After the summer solstice, the nights begin to grow longer.) Their reconstruction revealed that, as the solstice sun set, the shadow of a hill to the west fell exactly on the Jericho tower before covering the village, suggesting the monument and the start of longer nights were linked.

Source: Live Science

### Who are jargonauts?



jargon-filled literature. A person who aims to invent new jargon.

Jargonauts are people who are fond of bureaucratic terms as also a person who uses a lot of jargon in everyday conversation or while writing. A jargonaut is also a person who is adept in comprehending everyday

