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Living Optics | Lightning Strikes | Dinos

CELEBRATING
25
YEARS

Discover

Is *String Theory* about to *Snap?*

Or does
it explain
everything
about the
universe?



The concept
that everything
is made of tiny
vibrating strings
stretches human
imagination to the
breaking point

The Science
Behind Artificial
Sweeteners

Why Desert People
Trump Forest People

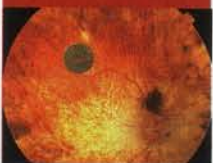


AUGUST 2005

I Spy a Bionic Eye



"This is very futuristic," says ophthalmologist Julia Haller of the new eye chip.



Ronnie Rainge was forced to retire as an Air Force physician in 1997 because he was legally blind with retinitis pigmentosa. Five years later, a silicon retinal chip was implanted in his right eye, and within days he was able to see the hands on his bedroom clock. "I woke up about 3 o'clock in the morning," he says. "I was able to see things I wasn't able to see before." Over the next few

months, his vision improved "drastically." He could even see the colors of TV newscasters' ties.

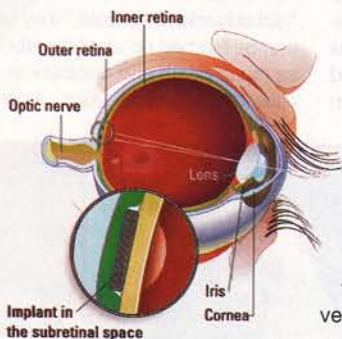
In 2002 Rainge, now 58, was one of 10 patients to receive a retinal chip developed by physician Alan Chow and his brother Vincent. This past spring another 20 patients got the silicon device. "When this chip is put into the eye under the retina, its solar cells and the electrodes come into contact with the poorly functioning light-sensing cells," says Alan Chow. Light stimulates some of the 5,000 microscopic solar cells on the chip to produce a tiny electric current that wakes up the eye's failing photoreceptor cells.

The chip holds promise for up to 1.2 million patients worldwide whose visual fields slowly shrink until they snuff out entirely. "Any improvement in people with retinitis pigmentosa is big because it's an inexorable disease where you gradually go blind," says Julia Haller, a professor of ophthalmology at Johns Hopkins University who has worked with the implant. "So anything that changes that downhill trajectory in any way is very big."

But the chip works in ways that are hard to explain. As in the case of Rainge, it can improve vision throughout the eye rather than solely in the two millimeters covered by the tiny chip. Further, it sometimes helps the *other* eye, the one without the implant. And last, color vision can get better, even though the chip can't detect color at all. One explanation is that it may stimulate production of neurotrophins, chemicals that encourage neural growth, Alan Chow says. "It's almost like an engine that turned off and we've jump-started it."

These anomalies might also be the result of the eye repairing itself in response to the implant. "Then the worry, of course, would be that [the reparative effect] would wear off as the eye completely healed," says Haller. "Or would it stimulate some type of long-term healing process? It's a very interesting thing."

—Anne Casselman

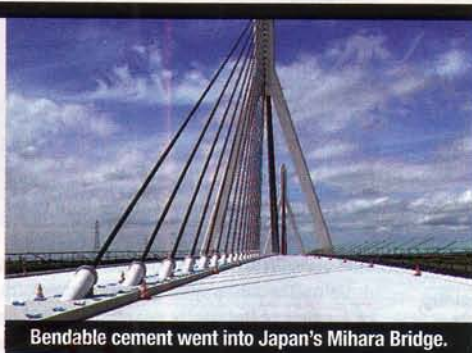


CONCRETE GETS FLEXIBLE

Earthquake-proof buildings? Roads without potholes? Just use engineered cement, a concrete composite that is stronger, more flexible, less likely to crack, longer lasting, and lighter than materials usually used in roads, bridges, and buildings today. Developed at the University of Michigan by engineering professor Victor Li, it has already been used in earthquake-prone areas in Japan

and Korea. It makes an American debut in October in slabs linking sections of the Grove Street Bridge over Interstate 94 in Ypsilanti, Michigan.

The concrete can be mixed and applied using traditional methods. Instead of gravel, Li uses polyvinyl alcohol fibers and extremely fine (100 micrometers in diameter) silica sand. One drawback is the price tag.



Bendable cement went into Japan's Mihara Bridge.

The flexible concrete is three times more expensive than the ordinary kind, but Li says the cost should be offset by fewer repair bills and a longer life span. Because it is 500 times more flexible, Li believes his concrete could influence design choices in

skyscrapers. "It requires less reinforcing steel, which allows architects to create freer forms and shapes," says Li. "It is much easier to use and costs less than regular concrete construction, which requires bending steel." —Zach Zorich

Saturn's newest moon is but a dot.

NEW MOONS

Planetary scientists have long suspected there was something strange about Saturn's 140-mile-wide satellite Phoebe. For starters, it is tipped on one side, and it revolves in the opposite direction from the planet's other 46 moons. Last year detailed Cassini images showed Phoebe as dark and highly pock-marked, with bright streaks beneath the craters. That gave scientists the idea that the moon was a former comet. Now they have proof.

Using Cassini's visible and infrared mapping spectrometer, planetary scientists discovered that Phoebe's surface is among the most complex in the solar system. The mish-mash of water ice, iron-rich minerals, organic and cyanide compounds, and possibly clays could have been created only if Phoebe had once done loops through the solar system. Researchers suspect that Phoebe's surface has probably changed very little during its captivity, meaning the moon offers unprecedented insights into objects in the Kuiper belt, the icy band from which comets arise.

Meanwhile, time-lapse Cassini images reveal yet another moon nestled within a gap in Saturn's outermost A ring. The little five-mile-wide moon, named S/2005 S1, is only the second to be discovered within the rings. As it orbits, its gravity kicks away ring particles, clearing a wavy path through the gap. Most likely, it won't keep moving for long. Between abrasion from micrometeoroids and ring dust, it will eventually erode away and become part of the ring itself. —Kathy A. Svitil

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