

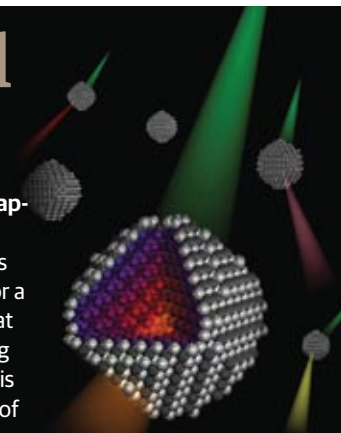
What's New at the Frontiers of
Science, Technology
and Exploration

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Crystal Clear

In order to create cheaper lasers and brighter LED lighting, scientists have been searching for a super-small particle that doesn't "blink." Blinking occurs when a particle is beamed with a stream of photons. Sometimes the particle re-emits the energy from the photons as light but sometimes it blinks at random times by converting the energy to heat.

Now US scientists at the University of Rochester have created a nanocrystal able to produce light steadily when "photo-excited." The reason for its unique property is in its construction. Previous nanocrystals consist of a core and outer shell separated by a distinct boundary. The new crystal doesn't have this dividing line, which allows it to release photons as steadily as they are received. The team also found that the colour the nanocrystals emit can be changed based on their size.



The Power of Prayer

Many people believe prayers have the ability to grant blessings and transform lives. But power light bulbs?

Taikkun Li, a Chinese citizen and graduate student at the School of the Art Institute of Chicago, has designed a system to do just that by harnessing the energy from Tibetan Buddhist prayer wheels spun millions of times a year. The wheels are cylinders imprinted with the mantra "Om Mani Padme Hum." It is believed that when the wheels rotate, the compassion-giving power of the mantra is released.

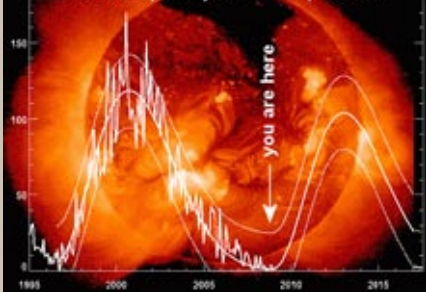
By attaching a system of bicycle gears and cheap magnetic motors to the

wheels, Li's system unleashes another type of power - 1 watt per wheel, per person - to help supplement Tibet's unreliable power grid. This is enough to power hundreds of LED lights.

Li says 380 prayer wheels are spun hundreds of times daily by up to 600 tourists at Jokhang Temple in Lhasa, Tibet. The monks also spin the wheels, so it's a very stable source of power. "I wanted to see what kind of modernisation I could bring to a city full of temples and tradition by using the existing prayer wheel infrastructure and just gearing them up," Li says. The power of prayer indeed.



The Sunspot Cycle: 1995-present



SOLAR CYCLES

The sun is eerily calm, and scientists are starting to worry. Just like Earth, the sun has weather patterns. Instead of seasons lasting a few months, the sun's cycles usually last for an average of 11 years. These periods fluctuate between solar maximums and minimums. During the maximums, the solar wind is most erratic, sunspots are at their highest levels and the magnetic field around the sun weakens and reverses.

During minimums, sunspots disappear, the sun's magnetic field is strong and stable, the solar wind evens out and there are fewer electrical disturbances here on Earth.

Because increased solar activity can disrupt power grids, satellites, mobile phones and other electronics, it is helpful for scientists to be able to predict minimums and maximums – which they've been able to do reliably in the past.

However, the Solar Cycle 24 Prediction Panel, an international organisation of solar and atmospheric scientists, seems to be having a hard time estimating precisely the next maximum and minimum. Most members of the panel had agreed that the sun would ramp up its activity starting in March 2008, but the sun remains relatively calm – caught in one of the longest solar minimums ever recorded. The latest prediction for the next solar maximum is May 2013. Initially it was expected as early as 2011.

According to Douglas Biesecker of the US National Oceanic and Atmospheric Administration's Space Weather Prediction Center, when the sun does begin to get covered by spots, it will actually get brighter.

"Sunspots are cooler than the surrounding areas, so one might jump to the conclusion that solar output is lower with more sunspots. However, at the same time that sunspots appear, larger areas known as plage also appear. [A] plage is brighter than surrounding areas, giving a net total increase in brightness of the sun," he says.

If it ever wakes up.



ALL IN ALL



Hazy Daze

Fighting fires in Indonesia has always been a dangerous battle. According to Robert Field, a PhD student in Atmospheric Physics at the University of Toronto, Canada, the fires that raged in Kalimantan, Borneo, in 1997 were “one of the worst air pollution episodes ever observed.”

But he may have found the cause: deforestation. “By opening up the tree canopy, more sunlight reaches the surface, drying out the fuel litter on the forest floor where fires can start most easily,” he says.

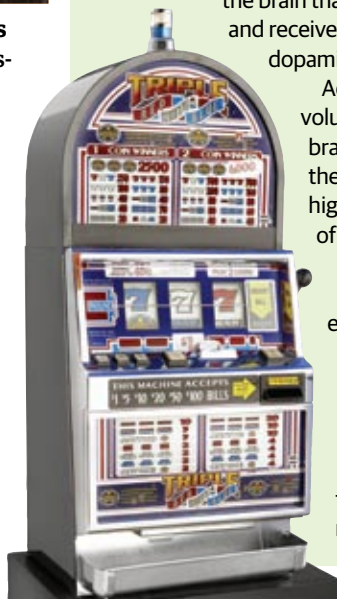
Forests in Indonesia are routinely cleared to make way for agriculture or timber production. When trees are removed, it is the earth itself that burns. “Peatlands drained for agriculture have reduced water-retention capacity, and can dry out to the point where they’ll burn. Once surface fires get underground, they’re nearly impossible for firefighters to extinguish,” Field says. To prevent future “haze disasters,” he believes better burning-management programmes must be put in place.

The Monte Carlo Fallacy

Cherry! Cherry! Aw ... lemon. Even though you didn't hit the jackpot, the near-miss keeps you gambling. At least that's what a study conducted by Dr Luke Clark at the University of Cambridge, England, suggests. Using functional magnetic resonance imaging (MRI), Clark and his team scanned the brains of 15 players. They discovered that when a spin of the slot machine delivers two out of three matching symbols, the striatum and insula cortex (the parts of the brain that process rewards) are activated and receive a dose of the feel-good chemical dopamine. A similar reaction to a win.

According to Clark: “We found that volunteers who showed a greater brain response to near-misses in the insula cortex tended to score higher on a questionnaire measure of gambling behaviour.”

It seems that Clark isn't the only one aware of this phenomenon. Slot-machine makers design their one-armed bandits to deliver near-misses about 30 percent of the time, keeping people on a winner's high and reinforcing the Monte Carlo Fallacy: the belief that after so many losses, a win must be round the corner.





Jumbo Joy

When Mosha the elephant was fitted with a prosthetic leg last year, she was frightened of the strange item. Now she loves it so much that her keepers can only remove it when she sleeps and, because of her increasing weight, doctors are having to develop a replacement.

When she was 7 months old, Mosha stepped on a land mine on the Thai-Myanmar border. Her future didn't look bright. She was taken to the Friends of the Asian Elephant hospital in Lampang, Thailand, the world's first facility of its kind. After her right front leg was amputated, doctors feared that as she grew she wouldn't be

able to support her increased weight and she would surely die. Then Mosha's luck changed. The elephant hospital was visited by Dr Therdchai Jivacate, a winner in 2008 of one of the prestigious Ramon Magsaysay awards, Asia's equivalent to the Nobel Prizes. His organisation has distributed over 21,500 free artificial legs to amputees across Thailand - and one very big leg for a fortunate baby elephant.

When Therdchai saw Mosha, he set to work fashioning her a leg made from sawdust, plastic and metal. Thanks to the first (and now second) jumbo-sized prosthetic, one baby elephant is back on solid ground.

PHOTO: FRIENDS OF THE ASIAN ELEPHANT