

Sciencewatch

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Biological cells bring laser to life

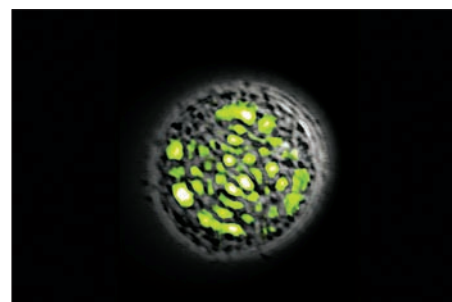
The latest in the ever-growing list of things that can be made to exhibit laser action is a single living cell. Malte C Gather and Seok Hyun Yun of the Wellman Center for Photomedicine, Massachusetts General Hospital in Boston (and other affiliations), genetically engineered human kidney cells to express green fluorescent protein (GFP). GFP, derived from a jellyfish, is often used as a marker in cell biology, but only via its incoherent fluorescence.

To make a laser, the researchers placed the cells one at a time between tiny mirrors each just 20 μm across. On illumination with blue

light, the cells became tiny lasers, emitting an intense green beam. The cells remain alive throughout the lasing process and in fact, as living things, constitute a self-healing laser, in that if GFPs are destroyed the cell will just make more. The work opens new possibilities for imaging where amplification of signal light could take place inside a biological system rather than in external devices.

● Further reading

Malte C Gather and Seok Hyun Yun 2011 *Nature Photonics*. doi:10.1038/nphoton.2011.99.



Genetic engineering leads to a living laser. (Image credit: Nature Photonics and the Wellman Center for Photomedicine.)

How round is the electron?

The typical mental image that many people have of an electron is as a spherically symmetric, spinning point charge. However, if an electron has an electric dipole moment (edm), this would represent a distortion of the usual image and the sphere would have to be thought of as stretched into an ellipsoid. Now, J J Hudson and colleagues of Imperial College, London, have set the lowest limit so far on such an edm, using ultracold molecules of ytterbium fluoride; the edm of the molecule reflects any possible dipole moment of an unpaired electron.

The team made the measurement using an interferometric technique, in which external electric and magnetic fields make two states that differ in energy by an amount proportional to the electron edm. The limit obtained, which is the world's best, is now less than 10.5×10^{-18} e.cm. The scales for any new physics involved are comparable to the tera-electron-volt scale and could spell trouble for supersymmetry, which typically predicts a non-zero value in this range. Plans are underway to improve this result by a factor of 10.

● Further reading

J J Hudson *et al.* 2011 *Nature* **473** 493.

Full spectrum tunable LED

Standard LEDs light up in just one colour, but now in a remarkable breakthrough Gyu-Chul Yi of Seoul National University and colleagues have demonstrated an LED that can be tuned continuously from red to blue. The device is based on gallium

nitride nanorods coated with layers of indium gallium nitride to form quantum wells – effectively, tiny artificial atoms. The thicknesses of the layers vary naturally when they are produced and, by changing the applied voltage, current can be pushed through different layers, giving rise to different colours of emitted light. The implications for display technology are as obvious as they are amazing.

● Further reading

Young Joon Hong *et al.* 2011 *Advanced Materials* online. doi: 10.1002/adma.201100806.



A specific protein makes a queen bee, as opposed to a worker bee. (Image credit: Ibezzeb/Dreamstime.com.)

The protein that makes a queen

Honey-bee larvae become queen bees if fed “royal jelly”, and now Masaki Kamakura of Toyama Prefectural University in Imizu, Japan, has found out how. Noting that royal jelly loses its effectiveness over time, he studied each component that could decay and identified a single, specific

The physics of venomous snake bites

“Hydrodynamics of reptilian envenomation” is part of the title of a recent paper by Bruce A Young of the University of Massachusetts, and colleagues. They studied why it is that in the majority of venomous snakes, venom is conveyed via an open groove on the fang rather than through a channel down the middle in the style of a hypodermic syringe.

Their key insight is that surface tension and non-Newtonian behaviour of venom – which they measured for the western diamondback rattlesnake and the red spitting cobra – play a dominant role. Venom can be held ready in the groove while the snake waits for its prey, and then once the snake has bitten, surface tension pulls the venom along the “tube” formed by the channel and the victim's flesh.

● Further reading

Bruce A Young *et al.* 2011 *Phys. Rev. Letts.* **106** 198103.

protein – dubbed “royalactin” – that plays the role of queen-maker.

Royalactin works by switching on a gene, *Egfr*, found throughout the animal kingdom. So it seems likely that bee colonies started out “casteless” and only later developed queens and workers using a pre-existing signalling pathway.

● Further reading

M Kamakura 2011 *Nature* **473** 478.