

Limits to growth in leaves and trees

Taller trees tend to have smaller leaves, and Kaare Jensen of Harvard University and Maciej Zwieniecki of the University of California in Davis think that they have worked out why. The reason seems to lie in the circulatory system of trees. Glucose is made in leaves by photosynthesis and despite leaves speeding up the process, it is possible that the stems, branches and trunk act as bottlenecks. At some point it is simply not worth growing larger leaves because the effect becomes more pronounced the taller the tree and the greater these bottlenecks.

Of course, leaves cannot be too small



either, and detailed calculations based on data from 1925 species – with leaves from a few millimetres to more than a metre long – then constrain the maximum height of a tree to be about 100 m. The tallest California redwoods reach about 116 m.

• Further reading

K H Jensen and M A Zwieniecki 2013 *Phys. Rev. Letts.* **110** 018104.

The Sequoia sempervivens of California are among the tallest trees in the world. (Image credit: Urasr/dreamstime.com.)

A reason for wrinkles

Hands always suffer from wrinkling when they stay in water too long but it seems that there is a good reason for it. Kyriacos Karelak and colleagues of Newcastle University have found that while wrinkled fingers are no better at handling dry objects, they do function better with submerged objects.

Fingers could complete a task involving passing objects from one bin of water to another through a barrier with a small hole 12% faster after soaking for 30 minutes in water. This does make some sense – after all, it is only hands and feet that wrinkle when soaked.

• Further reading

K Karelak *et al.* 2013 *Biology Letters* **9** 20120999.

Planck scale on a tabletop

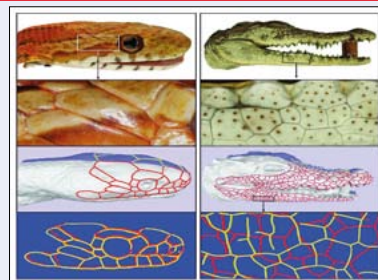
As the LHC reaches ever higher energy, the Planck scale still seems a long way off – but there is reason for optimism. Jacob Bekenstein of the Hebrew University in Jerusalem has suggested a table-top experiment, just within the reach of present-day ultrahigh vacuum and cryogenic technology.

The idea is to couple a (quantum mechanical) single photon to a macroscopic piece of dielectric material by having it go through it, causing a tiny translation. No permanent impulse has to be imparted, with the translation inferred from detection of the photon and conservation of momentum. If the photon gets through, then the material must have moved by a Planck length. If space–time is rough on the Planck scale then

Crocodile heads and the limits of genes

With all of the recent successes of genetics, it has become commonplace to think of biological patterns as arising from reaction-diffusion mechanisms controlled by genes. However, the crocodile has something to add to this.

Michael Milinkovitch of the University of Geneva and colleagues studied the patterns of crocodile-head scales and found that they are driven by physical processes. As crocodiles grow, their keratinized skin cracks in random ways, with no symmetry between one side of their head and the other – in contrast to what happens with the scales of snakes. So even a crocodile's genome has no say in how its scales will turn out. They will be distributed by physics with some randomness, rather than by information in genes.



Left: Head scales in most snakes are polygons (two upper panels), which overlap when reflected across the sagittal plane (bottom). Right: Polygonal head scales in crocodiles have a mainly random spatial distribution with no correspondence between left and right.

• Further reading

M C Milinkovitch *et al* 2013 *Science* **339** 78.

this should show up as a change in the odds that a photon gets through. Amazingly, the numbers suggest that this could work.

• Further reading

J D Bekenstein 2012 *Phys. Rev.* **D86** 124040.

Quantum dots from earthworms

Quantum dots – fluorescent nanocrystals – have a range of applications but they are not always easy to make. Now, Mark Green of King's College, London, and colleagues have found an environmentally friendly way of making biocompatible cadmium

telluride (CdTe) quantum dots. They spiked the ground where earthworms (*Lumbricus rubellus*) lived with cadmium chloride and sodium telluride. Eleven days later, they were able to recover green fluorescent CdTe quantum dots from the guts of the worms. As a bonus, the dots came out coated with a passivating layer that makes them water-soluble. In addition to being a fabrication technique, understanding the biology and biochemistry involved could help in heavy-metal remediation

• Further reading

S R Stürzenbaum *et al.* 2012 *Nature Nanotechnology* **8** 57.

LHC

Large Hadron Collider - CERN
The mission of the most powerful particle accelerator in the world is to uncover some of the mysteries that still shroud the origin, creation and future of the universe, reproducing in the laboratory conditions close to those occurring during the Big Bang.

RENEWABLE ENERGY

Thermonuclear fusion is one of the few truly sustainable forms of energy for the planet that will probably be available in the mid to long term.

It is a technology that offers the prospect of safe, environment-friendly operation, combined with excellent fuel availability and procurement security.

MAGNETIC RESONANCE

An imaging technique used mainly in the field of medical diagnosis, based on the physical principle of nuclear magnetic resonance.



HIGH ENERGY PHYSICS

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Building the world of tomorrow, today.



ITER (originally an acronym for the International Thermonuclear Experimental Reactor, now used in the Latin sense of "itinerary") is an international project that will demonstrate the feasibility of a nuclear fusion reactor able to reproduce the physical phenomenon that occurs in stars in controlled conditions, for the purposes of generating clean energy in the future without the collateral effects typical of current fission technology (waste, contamination risk).

HADRON THERAPY
In this medical treatment cancer cells are irradiated with heavy hadron particles (carbon protons or ions) which have less impact on healthy tissue than other techniques.



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