Animal behaviour

Birth control by royal pheromones in ants

Proc. Natl Acad. Sci. USA **101,** 2945–2950 (2004)

In an ant colony with a fertile queen, worker ants don't expend their energy in breeding — they save it for colony upkeep. The queen somehow conveys this message to worker ants despite not coming into direct contact with them. Annett Endler *et al.* wondered how this signal is spread and found the answer to be a pheromone on the queen's eggs.

The researchers set up colonies of the ant species *Camponotus floridanus* without their queen. Without the queen's eggs, the workers started producing their own eggs. But when the queen's eggs were present, they did not produce their own eggs. Adding both workers' eggs and queen's eggs to a colony caused the worker ants to destroy one another's eggs but leave the queen's eggs intact, hinting that it was the eggs that carried the signal.

But what is so distinct about the queen's eggs? Endler *et al.* identified certain hydrocarbons on the surface of the queen's body and swapped these for different hydrocarbons from the workers' eggs. The workers destroyed significantly fewer eggs when they were disguised in this manner, so Endler *et al.* conclude that the queen's unique hydrocarbon signature marks her omnipotence. **Laura Nelson**

Gravity

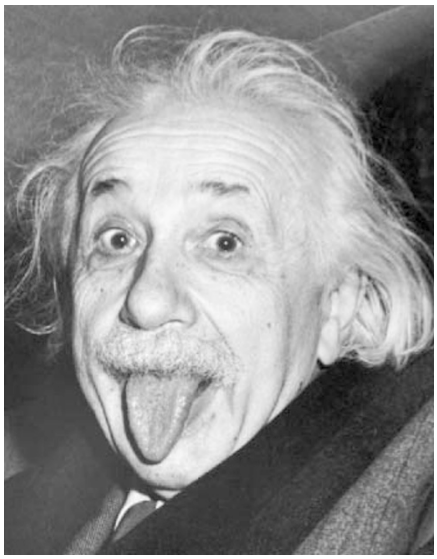
Room for the fat graviton?

Phys. Rev. D **69,** 044014 (2004)

Like Einstein before them, physicists are still rather bothered by the cosmological constant. This seemingly arbitrary add-on to general relativity allows for the expansion of the Universe, and data have confirmed that its value is not zero.

Surely this troublesome number should arise in a more natural way in a more complete theory, string theory perhaps? Clues might lie, not at cosmological distances, but at the micrometre scale. So says Raman Sundrum, who has re-examined the proposal that such a complete theory might include a 'fat graviton': if so, he argues, we could be on the verge of seeing a breakdown in Newton's law of gravity.

All fundamental particles are considered to be point-like. But if the graviton (the as-yet-unseen mediator of the gravitational force) has some finite size, according to Sundrum's estimates its effect might be noticed as a distortion of Newton's law at scales of around 20 micrometres. Experimenters have so far checked out gravity down to around the 100-micrometre mark, and Sundrum urges them to continue "to vigorously hunt" for signs of the fat graviton. Even if the graviton turns out to be somewhat slimmer, closing this door to solving the problem of the cosmological constant will be helpful. **Alison Wright**



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Einstein hated the cosmological constant: could the 'fat graviton' be part of a theory that better justifies its existence?

Photonics

Light arrested in forest

Phys. Rev. Lett. **92,** 083901 (2004)

A new way to trap a light beam could prove invaluable for optical computing and quantum information processing. Mehmet Fatih Yanik and Shanhui Fan show how light can be stopped and stored using a lattice of microscopic semiconductor pillars.

In effect, a light pulse passing through this forest of pillars gets stuck by bouncing from pillar to post, until released again if the refractive index of the pillars is altered. Yanik and Fan show that light propagating along a row of optical cavities, made by slimming down individual pillars in the lattice, can be shunted into cavities to either side of the row and held there for a controlled delay time. The stored pulse emerges unscathed — there's no distortion of the signal.

So far, the researchers have only demonstrated their approach using computer simulations. Such semiconductor structures are easy enough to build, but controlling their refractive index might be trickier. 'Stopping' light inside a solid has been reported before (*Phys. Rev. Lett.* **88,** 023602; 2002), but that involved using a laser to tune the electronic states of atoms in a large crystal. Using a microscale pillar array should make the process more compatible with silicon-chip technology. **Philip Ball**

Neurodegeneration

Model motor neuron death

Neuron **41,** 687–699 (2004)

Researchers have created a mouse model for a rare human disease called spinal and bulbar muscular atrophy, which causes motor neuron degeneration and muscle wasting. In this disease, an altered gene drives the production of a faulty protein, an androgen receptor, that contains an unusually long run of the amino acid glutamine.

Bryce L. Sopher *et al.* have created mice that have a human androgen receptor containing 100 glutamines. The animals develop progressive limb weakness around mid-adulthood as their motor neurons began to degenerate. These symptoms are strikingly similar to those seen in human spinal and bulbar muscular atrophy.

Not only do the mice provide a useful model of the disease, they also shed light on the mechanisms of motor neuron death. The spinal cords of these mice showed reduced levels of vascular endothelial growth factor, a molecule known to aid motor neuron survival, and when the researchers treated degenerating motor neurons in culture with this growth factor, the cells recovered. So vascular endothelial growth factor may play an essential role in motor neuron degeneration. **Helen R. Pilcher**

Environmental science

Sulphur from soil

Atmos. Environ. **38,** 1473–1480 (2004)

Coastal soils can be significant sources of atmospheric sulphur dioxide (SO_2), according to Bennett C. T. Macdonald and colleagues. Soils have long been recognized as sinks for sulphur. But the authors believe that this is the first direct measurement of SO_2 emissions from soils containing sulphide minerals, mostly in the form of pyrites (FeS_2).

Coastal lowland areas often contain sulphidic soils deposited since the last major ice age. When the wet soils are drained, the sulphides oxidize and produce a mixture of sulphur species — some of which apparently end up as SO_2.

Macdonald *et al.* estimate that, globally, these soils may emit about three million tonnes of sulphur each year. This is roughly the amount produced by ships, as estimated by others, and is thought to cause elevated SO_2 levels in coastal areas. Much of this coastal SO_2 may come from soils rather than ships, say Macdonald and colleagues. But humans are still implicated in the emissions — the soils release more SO_2 when they are disturbed or drained as part of land reclamation. **Mark Peplow**