Evolutionary biology

Asexual means of mutation control

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The crustacean *Darwinula stevensoni* has managed to reproduce without sex for at least 20 million years, making it the oldest known asexual animal species. Isabelle Schön and Koen Martens now report that it is also remarkable for the fact that different individuals and populations vary very little from one another genetically.

This is actually not what one would expect. As the separate lineages of asexual species go through the generations, mutations should accumulate, creating differences in the genome that will not be removed during sexual reproduction: one explanation for the prevalence of sex in the natural world is that, by shuffling DNA, it helps to get rid of mutations, which will mostly be damaging.

Yet Schön and Martens found that the genetic distance between individuals of *D. stevensoni* is only about a quarter of that between members of a closely related sexual species. They speculate that *Darwinula* has special mechanisms to prevent it from accumulating mutations, such as exceptionally good DNA repair. **John Whitfield**

Cell biology

Muscle mice

J. Cell Biol. **160,** 909–918 (2003)

Cell-based treatments for muscle-wasting disorders such as muscular dystrophy have tended to focus on replacing like with like. But adult muscle cells are hard to culture, and age rapidly. In contrast, less specialized cell types such as stem cells are easier to multiply up in culture, and may contribute more fully to skeletal-muscle regeneration.

Cosimo De Bari and colleagues have now injected bone-marrow-derived adult stem cells, taken from human knee joints, into immunodeficient mice with a form of toxin-induced muscle wasting. The multi-talented cells homed in on the damaged area, producing functional satellite cells (muscle-cell progenitors) and contributing to muscle fibres. As the stem cells differentiated into these other cell types, they did so naturally — their gene-expression patterns mimicked those seen during normal embryonic muscle formation.

The stem cells also helped to repair damage in a mouse model of Duchenne muscular dystrophy. Muscle fibres once again made dystrophin, a structural protein whose loss is implicated in wasting diseases, and more of mechano growth factor, involved in maintaining and repairing skeletal muscle. The findings suggest that the transplant of adult stem cells, derived from patient biopsies, might be an effective treatment for Duchenne muscular dystrophy. **Helen R. Pilcher**

Earth science

Stream flow and shaken soil

Geophys. Res. Lett. doi:10.1029/2002GL016618 (2003)

Shortly after an earthquake, the flow of streams in the vicinity often increases. This phenomenon has baffled geologists for many years. Michael Manga and colleagues now propose that shaking forces water out of surface soils and produces the extra stream input.

Previous explanations for this were of two types. First, that compression following earthquakes squeezes water-bearing rocks, forcing more water out of them. Second, that the earthquake-induced strain on rocks creates fissures or pores that allow water to percolate out faster. From their studies of the flow history of Sespe Creek in southern California, Manga *et al.* come to a different conclusion. Sespe Creek has experienced 48 strong earthquakes since its monitoring began in 1928. Not all of those events produced increases in water flow, but when they did, it was regardless of whether the watershed was compressed or expanded.

Manga *et al.* hypothesize that seismic shaking compacts surface soils and forces more water out of pores between soil particles. Laboratory tests on a shaking table suggest that sufficient volumes, typically equivalent to a few millimetres of extra rainfall, can be produced from soils by earthquakes. **Tom Clarke**

Neurobiology

Spine conducts hip-hop

Science **299,** 1889–1892 (2003)

Most mice scamper — but without certain genes, they hop like rabbits. Klas Kullander *et al.* now show that these genes wire up a neuronal circuit in the spinal cord that may trigger walking.

This spinal-cord circuit, called the central pattern generator, is thought to stimulate an innate, alternating left–right gait under directions from the brain. In support of this, the authors found that, in normal mice, electrical signals shoot out alternately from the left and right sides of the lower spinal cord. But in mice genetically engineered to lack either ephrinB3 or its receptor EphA4 — molecules that guide growing nerves — some nerves stray across the middle of the spinal cord. Electrical signals shoot out from both sides, triggering a kangaroo-kick.

These molecules are the first to be identified that direct the development of nerves in the mammalian central pattern generator, and may lead researchers to the equivalent circuits in humans. This could ultimately help patients who have suffered spinal-cord injury, by highlighting which areas to salvage — and, perhaps, how best to stimulate them to recreate a walking movement. **Helen Pearson**

Nanoelectronics

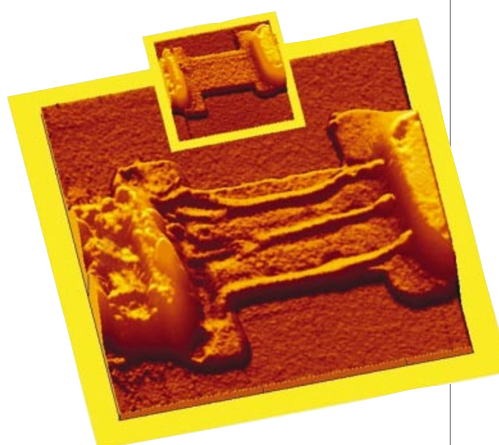
Silicon springs leaks

Appl. Phys. Lett. **82,** 1727–1729 (2003)

Nanoscale silicon devices already face severe obstacles to their creation, and now N. Clement *et al.* show that their prospects are even worse: the devices may be rapidly eaten away by the current passing through them, becoming riddled with hollow channels between their electrical terminals.

Silicon devices could become as small as a few tens of nanometres within a few years. But this poses potential problems, such as current leakage. The high electric fields created in such small devices may also accelerate mobile electrons to such energies that they act like bullets, colliding with silicon atoms and producing electron–hole pairs, boosting the current through the device.

Clement and colleagues suspect that something of this sort is creating the channels (about 45 nm wide) that open up between the terminals in their transistor-like devices (see picture). These terminals are connected by a 20-nm-thick slab of silicon laid down on silicon dioxide — the 'silicon-on-insulator' structure being considered for next-generation miniaturization. The channels, which seem to result from heat-induced diffusion of the silicon ions created by electron impacts, play havoc with the current–voltage relationship of the devices, rendering them useless. **Philip Ball**



Before and after: atomic-force-microscope images show the damage done to a silicon nanowire subjected to a high voltage (the inset shows the nanowire before the voltage was applied).