Fraser University in Burnaby, Canada, and Laurent Keller of the University of Lausanne in Switzerland noticed that some combinations of genes are more common in queen harvester ants (*Pogonomyrmex rugosus*) than in workers, and vice versa. So they crossed queens from six colonies with males of the same and different colonies to see what effect this might have.

The duo found that certain cross-colony pairings — and therefore particular gene combinations — reliably skewed the proportion of queens to female workers compared with the average.

NEUROSCIENCE

Twitchy details

Cell **135,** 334–342 (2008); *Neuron* **60,** 285–297 (2008)

The connections between nerves and the muscles that enable animals to move and breathe cannot form without a protein called Agrin that activates an enzyme called MuSK. Two research groups have discovered that Agrin binds to Lrp4, a receptor, and together they switch on MuSK.

Steven Burden and a team from New York University Medical School stimulated normal and Lrp4-deficient developing muscle fibres with Agrin. MuSK was only activated in cells with Lrp4. The team then infected the mutant cells with a virus carrying the Lrp4 gene, which caused these cells to start producing the receptor. Agrin could then turn on MuSK.

Lin Mei, of the Johns Hopkins University School of Medicine in Baltimore, Maryland, and his co-workers linked Lrp4 expression to the clustering of neurotransmitter receptors at the junction of nerve and muscle cells.

MOLECULAR BIOLOGY

On the mend

Science **322,** 597–602 (2008)

Some sorts of DNA damage tend to get repaired right at the edge of a cell's nucleus, Susan Gasser of the Friedrich Miescher Institute for Biomedical Research in Basel, Switzerland, and her colleagues have shown.

They followed the process of DNA repair by inducing a DNA double-strand break and tracking fluorescent proteins tagged near the site of the break. Damaged DNA was shunted to the edge of the nucleus — to a subcomplex of the nuclear pore that facilitates the exchange of RNA and proteins between the cytoplasm and the cell nucleus. The transport involved repair proteins that are bound to a protein called SUMO, and are also recognized by a pore-associated ubiquitin ligase, a type of enzyme.

ECOLOGY

Cone heads

Proc. R. Soc. B doi:10.1098/rspb.208.0742 (2008)

The affinity of insects for bright lights is well known, but at least one species seems to 'see' the heat of seed cones (pictured below, right image taken with infra-red camera) from afar.

Gerhard Gries of Simon Fraser University in Burnaby, Canada, and his colleagues have identified infra-red (IR) receptors on conifer seed bugs (*Leptoglossus occidentalis*), and shown with the aid of IR sources in the lab and the field that these creatures prefer hot things. The insects displayed a preference for traps that emitted strong rather than weak IR — unless their IR receptors were covered with silica paint.

S. TAKACS

ASTRONOMY

Planet probing

Astrophys. J. **686,** 1341–1348 (2008)

A tiny bit of light from an extrasolar 'hot Jupiter' has allowed astronomers to speculate about the diversity of the atmospheres of similar planets.

David Charbonneau of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, and his colleagues used the Spitzer Space Telescope to observe a relatively nearby hot Jupiter before and after a 'secondary transit'. These occur as a planet goes behind a star. The number of photons detected before and after the eclipse is compared with the number detected during the eclipse, and the difference is the number that can be attributed to the planet itself.

Charbonneau's team discerned that the hot Jupiter emitted less light in three spectral bands associated with water than in surrounding bands, contrary to findings from another hot Jupiter. This suggests that there are at least two types of hot-Jupiter atmosphere: one that gets cooler with altitude, and another that has a hot layer high up.

JOURNAL CLUB

Bartosz Grzybowski
Northwestern University, Evanston, Illinois

A physical chemist is pleased to learn that 'microscale' swimming isn't that hard after all.

Even if small organisms perfectly mimicked gold medallist Michael Phelps's technique, they wouldn't win a microswimming Olympics. The viscosity of water is so high that these little fellows have had to develop some unusual swimming styles. In 1977, E. M. Purcell formally expressed this idea with his famous 'scallop theorem'. He showed that swimming forwards cannot be achieved at the micrometre-scale with 'time-reversible' motions such as the back-and-forth wiggling of a rigid tail. Instead, tiny organisms must use complex, asymmetrical strokes.

But this is not always the case, according to engineers at the Massachusetts Institute of Technology in Cambridge and the University of California, San Diego. In July, they proved that time-reversible tail-wiggling or wing-flapping can be a viable mode of propulsion through a fluid, provided it is done next to a deformable interface such as a soft membrane (R. Trouilloud *et al. Phys. Rev. Lett.* **101,** 048102; 2008). The reversible motions of the swimmer couple in a nonlinear way to the deformations of the interface, producing additional flows and forces that are sufficient for locomotion.

One of the most exciting extensions of this result might be in creating 'nanosubmarines' — a much-criticized dream of nanotechnologists to have devices navigate blood vessels, finding and fixing damaged organs as they go. The idea has so far seemed implausible because such machines would need elaborate nanopropellers — which are prohibitively difficult to build — to sculpt asymmetrical swimming motions. But what about using a simpler propulsion mechanism and relying on the deformations of blood-vessel walls to move nanosubmarines along? Is there a nanoshipyard out there somewhere to put this idea to the test?

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