CD47 or the protein that binds it, TSP1, which regulates cell growth and survival in response to stress, such as that caused by radiation. They found that suppressing the CD47–TSP1 pathway in normal human cells improved their survival after irradiation and, in mice, led to reduced radiation injury.

In addition, the tumours of mice treated with a CD47-blocking molecule prior to radiation exposure were up to 89% smaller 30 days after irradiation than those of mice receiving radiation alone.

BIOPHYSICS

All seeing eye

Nature Photon. doi:10.1038/nphoton.2009.189 (2009)

Polarized light is used in optical devices, including some microscopes. Being able to control polarized light is key. Materials such as crystals can do the job, but only within a limited range of wavelengths.

Nicholas Roberts of the University of Bristol, UK, and his colleagues have worked out how a species of mantis shrimp can switch polarized light from one form to another over a range of colours. A thin band of specialized receptor cells in the eyes of *Odontodactylus scyllarus* have just the right structure, dimensions and composition to enable them to control polarization over most of the visible spectrum. The team believes that further study of this mantis shrimp's eyes could lead to better optical devices.

NEUROSCIENCE

Brain signal source

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0905509106 (2009)

Functional magnetic resonance imaging (fMRI), used to map brain activity, gives a signal when the levels of oxygenated blood increase. The signal is often preceded by a darkening, thought to indicate early oxygen absorption by the brain owing to local neural activity.

But a study by Aniruddha Das and his colleagues at Columbia University in New York casts doubt on this. They used intrinsic signal optical imaging, a technique similar to fMRI, to measure changes in blood volume and blood oxygenation in the brains of two macaques while they performed a visual task.

The researchers found that during the initial darkening, blood-oxygen levels changed little, but blood volume increased markedly. The team suggests that blood-volume change is a better signal to use in brain imaging because it seems to be more closely linked to neural activity, occurring even before changes in blood oxygenation.

SEXUAL SELECTION

Intruder alert!

Proc. R. Soc. B doi:10.1098/rspb.2009.1554 (2009)

Male redback spiders can sneak in and quickly copulate with a female after a rival male has already spent hours wooing her, yet avoid the usual penalty of short courtship — being eaten prematurely by his lover.

The female Australian redback spider (*Latrodectus hasselti*, pictured below) eats the male after mating, but sometimes consumes him prematurely — after he's copulated only once. Jeffrey Stoltz and Maydianne Andrade of the University of Toronto in Canada measured the spiders' courtship durations and found that females tend to eat their partners prematurely if courtship is less than 100 minutes long. However, intruder males can mate after a shorter courtship and avoid premature death if an earlier male had already exceeded this 100-minute threshold.

This could lead to lower quality males seeking out, rather than avoiding, competition with rival spider studs, the authors say.

For a longer story on this research, see http://go.nature.com/U6DPEG

K. JONES

ASTRONOMY

Galaxy size matters

Astrophys. J. **705,** 255–260 (2009)

A survey of distant galaxies shows that more loosely packed ones tend to form more stars.

The survey looked at 225 galaxies at distances of between about 2.8 and 3.4 parsecs from Earth. It found that compact galaxies tend to have fewer new stars than do their larger counterparts of comparative mass.

Sune Toft of the University of Copenhagen and his colleagues conclude that compact galaxies formed many stars quickly in one intense burst, early in the history of the Universe. Conversely, larger, more diffuse galaxies form stars gradually over a longer period of time. The results may explain why very distant galaxies are often more compact than the younger ones nearby.

JOURNAL CLUB

Jonathan Weissman
University of California, San Francisco

A biochemist looks at how DNA sequencing can reveal more than just sequences.

Huge advances in DNA sequencing have allowed us to readily determine the sequence of almost any living (and a few extinct) species. Yet arguably, most biological insight comes from work on five model organisms: *Escherichia coli*, baker's yeast, roundworms, fruitflies and mice. Unfortunately, many important biological processes are not captured in these creatures.

Papers from two groups, one led by Andrew Camilli of Tufts University in Boston, Massachusetts, the other by Brian Akerley at the University of Massachusetts in Worcester, describe new genetic tools that allow the quantitative dissection of gene function in a wide range of microorganisms (T. van Opijnen *et al. Nature Methods* **6,** 767–772; 2009; and J. D. Gawronski *et al. Proc. Natl Acad. Sci. USA* **106,** 16422–16427; 2009). These studies combine exhaustive transposon mutagenesis — whereby thousands of small DNA segments, or transposons, are introduced into the genome to mutate many genes — with massively parallel, or 'deep' sequencing of transposon/chromosome junctions to monitor the consequences of the loss of single or pairs of genes on the organisms' traits.

The real power of the approaches comes from the deep sequencing, which tracks the abundance of individual transposon mutants after they have been subjected to a stress. Knowing by how much each mutant has grown or suffered under the stress provides a measure of the relative roles that the mutated genes have.

I find it particularly gratifying that the advances in deep sequencing that have allowed us to catalogue so many genes from so many organisms can now be harnessed to help us figure out what these genes actually do.

Discuss this paper at **http://blogs.nature.com/nature/journalclub**

University of Texas at Austin exposed a type of virus called a T7 bacteriophage to a toxin that increased its mutation rate by 2–3 orders of magnitude, to about four mutations per genome each generation. After 200 generations, the virus's fitness had increased, rather than decreasing as expected. The genomes were riddled with hundreds of deleterious mutations, but 28 adaptive mutations, mostly in DNA-metabolism genes, reached high frequencies.

MOON MATTERS

Lunar hideaway

Geophys. Res. Lett. doi: 10.1029/2009GL040635 (2009)

A craft orbiting the Moon has discovered an apparent 65-metre-wide opening into a deep lava tube, offering a possible site for a station from which to travel farther into space.

Junichi Haruyama of the Japanese Institute of Space and Astronautical Science in Sagamihara and his team estimated from shadows that the tube is 80–88 metres deep, enough to shield a space outpost from meteors.

The tube is in the Marius Hills region of a volcanic province on the near side of the Moon. The SELENE polar orbiter, which operated from September 2007 until June this year, photographed the tube with a terrain camera and a multi-beam imager.

R. ANDREWS

NEUROLOGY

Impossible movements

Proc. Natl Acad. Sci. USA doi: 10.1073/pnas.0907151106 (2009)

Scientists can alter people's perception of their bodies by playing with their sensory input, for example by using trick mirrors or touch. Now Lorimer Moseley of the Prince of Wales Medical Research Institute in Sydney, Australia, and Peter Brugger of University Hospital Zurich in Switzerland show that the sensation of having impossible bodily forms can be generated using thought alone.

The team asked seven amputees who have a phantom arm to perform a wrist movement with the phantom limb that would be impossible with an actual wrist. Four were able to learn the movement, which induced a change in body image and made some previously easy movements of the phantom arm more difficult.

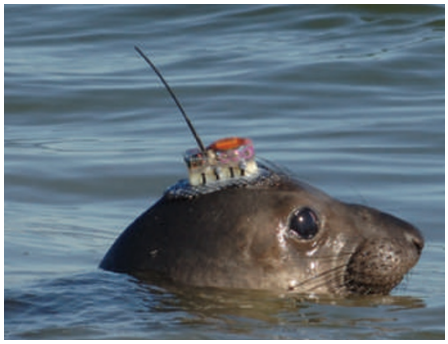
ANIMAL BEHAVIOUR

Deep sleep

Biol. Lett. doi:10.1098/rsbl.2009.0719 (2009)

Northern elephant seals (*Mirounga angustirostris*) spend months at sea, surfacing only briefly between 20-minute dives. Yoko Mitani of Hokkaido University in Japan and her colleagues attached data recorders to six animals (see picture, below) to see if they could be resting on 'drift dives', which involve little or no active swimming.

During such dives, they found, the seals descend rapidly to at least 135 metres, then roll onto their backs and drift downwards, wobbling like a falling leaf. This slows the descent rate significantly.



The authors suggest the seals dive quickly to below where killer whales and great white sharks normally hunt and then go belly-up to avoid sinking too far into the depths while they nap.

ECOLOGY

Boom and bust

Ecol. Lett. doi:10.1111/j.1461-0248.2009.01391.x (2009)

In an ecological system with two predator and two prey species, theory predicts two ways in which the species' population dynamics can become coupled. If both predators eat both prey, then prey populations will oscillate together, booming when predators are rare and crashing when predators, faced with a prey glut, boom in turn. But if each predator eats a separate prey, and the two prey species compete, theory says the prey populations will oscillate out of sync from one another, as first one, then the other, dominates resources.

Jef Huisman of the University of Amsterdam and his colleagues studied eight years of measurements from a Baltic Sea plankton community maintained in a laboratory. From amid the chaos of thousands of population measurements, they were able to discern for the first time in real life two coupled predator–prey cycles oscillating out of sync, showing strong effects of prey competition.

Correction

The Research Highlight 'Galaxy size matters' (*Nature* **461,** 1177; 2009) gave the wrong distances for the 225 galaxies surveyed by Sune Toft and his colleagues. They are actually between 4.4 billion and 5.9 billion parsecs from Earth.

JOURNAL CLUB

Jan Zaanen
Leiden University, the Netherlands

A theoretical physicist journeys to a hairy black hole's horizon.

Rumour has it that Steven Spielberg is producing the ultimate science fiction movie, using state-of-the-art general-relativity simulations to create a realistic image of the warped space-time near a black hole. But wouldn't it be great to see such worlds in real life? In fact, you can: by extending your eyesight with 'AdS/CFT', a mathematical result of string theory that describes a 'through the looking-glass' experience that would embarrass the imagination of Lewis Carroll.

AdS/CFT states that information about the strange world of the black hole is, in a very indirect way, encoded in or 'imaged' by the properties of certain quantum-weird forms of matter. Scientists realized recently that these 'quantum critical' states of matter are routinely produced in condensed-matter laboratories. But a particular prediction of AdS/CFT made the string theorists nervous: the event horizon of the special black hole that is imaged by the quantum critical electrons seems to imply that the latter should show a macroscopic entropy at zero temperature. It has further been predicted that the black hole would be unstable and would eventually suck up 'stuff' from its surroundings, covering its horizon with 'hair' (S. A. Hartnoll *et al. J. High Energy Phys.* **2008,** 015; 2008). In the electron system, out of the blue and at a quite low temperature, some unexpected order will set in that removes the ground-state entropy, giving it a unique ground state.

Intriguingly, I learned the other day that condensed-matter experimentalists, unaware of the string theorists' nervousness, are now in the grip of the same idea. The latest thermodynamic experiments on quantum-critical electrons are suggestive (albeit inconclusive) of a developing zero temperature entropy — for the experimentalists, a catastrophe — interrupted at a very low temperature by the onset of an exotic quantum liquid crystalline order (Z. Fisk *Science* **325,** 1348–1349; 2009). It may be that we don't need spacecraft or Spielberg to visit black holes, just a little patience with the condensed-matter experimentalists.

Discuss the papers at **http://blogs.nature.com/nature/journalclub**