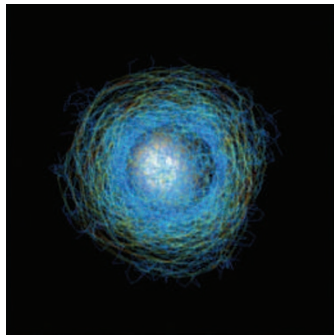
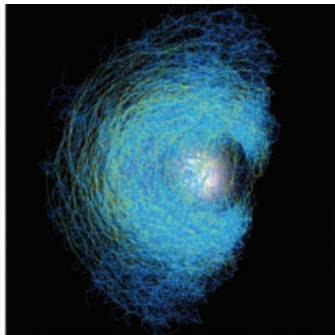


## RESEARCH HIGHLIGHTS



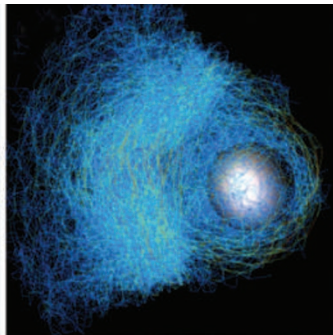
### Protein comets

*PLoS Biol.* **7**, e1000201 (2009)  
How do cells stay on the move?  
A computer model now describes how growing filamentous proteins

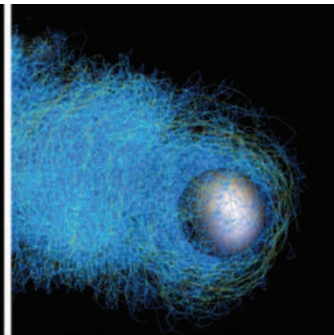


produce the forces that can drive the migration of certain cells.

Mark Dayel of the University of California, Berkeley, and his colleagues grew networks of the protein actin around tiny beads.



Actin forms a 'shell' around the bead that eventually splits, propelling the bead forwards. The protein then begins to form a thin 'comet tail', pushing the bead in one direction.



The model simulated these events (pictured) and predicted factors that would sustain cell movement under different conditions. Bead experiments confirmed the model's predictions.

M. DAYEL

## MOLECULAR EVOLUTION

### A colourful history

*Mol. Biol. Evol.* doi:10.1093/molbev/msp194 (2009)  
Despite fluorescent proteins' ubiquity in research, scientists still don't know much about their natural function or evolution. David Gruber of the City University of New York and his collaborators analysed the sequences of 102 different fluorescent and non-fluorescent proteins to work out their evolutionary history.

They found that a central domain of the proteins that contains the chromophore — the part that determines the molecule's colour — is highly conserved, and that its evolution does not correlate with the evolution of fluorescent colour. The proteins' outer regions are highly variable yet track well with fluorescent-colour evolution. The authors say that understanding the evolutionary pressures on fluorescent proteins will provide insight into their natural role.

## PARTICLE PHYSICS

### Top quarks measure up

*Phys. Rev. Lett.* **103**, 132001 (2009)  
A collaboration of physicists from the Tevatron Collider's D0 detector at the Fermi National Accelerator Laboratory in Batavia, Illinois, has successfully measured the mass of a top quark and its 'antitop' partner.

The fundamental symmetries of nature dictate that a particle and its antiparticle should have the same mass. But testing this prediction for quarks has been difficult because the tiny particles usually combine

to make heavier things (such as protons and neutrons) before their mass can be measured. The top quark decays before combining with other quarks, making it easier to measure directly.

The team found a mass difference of 2.2% +/- 2.2. In other words, top quarks and antitops seem to have the same mass.

## IMMUNOLOGY

### T cells on the move

*Nature Immunol.* doi:10.1038/ni.1790 (2009)  
Researchers have worked out a new mechanism by which T cells are blocked from attacking the body's own tissues and causing autoimmune diseases such as type 1 diabetes.

Brian Fife of the University of Minnesota in Minneapolis and his colleagues used multiphoton imaging techniques to look at individual immune cells in a mouse model of type 1 diabetes. They showed that an inhibitory molecule on T cells, called programmed death 1, binds to the PD-L1 protein found on many other cells and increases T-cell movement. These fast-moving

T cells interacted less with antigen-bearing immune cells in the pancreas, preventing autoimmune diabetes.

## BIOLOGY

### Antennae show the way

*Science* **325**, 1700-1704 (2009)  
Every autumn, monarch butterflies (*Danaus plexippus*) make a 4,000-kilometre journey from southern Canada to central Mexico. The butterflies navigate using the Sun together with an internal 'clock' to keep track of time and compensate for the Sun's shifting position in the sky.

Now, Steven Reppert of the University of Massachusetts Medical School in Worcester and his colleagues have discovered that this clock is housed in the antennae — not in the brain, as had long been assumed. When the researchers removed the monarchs' antennae, the insects flew in random directions. When the antennae were painted black to block out sunlight, the butterflies all flew in the same direction — just the wrong one. Monarchs whose antennae were coated with clear paint oriented themselves in the correct southerly direction.

For a longer story on this research, see <http://tinyurl.com/ydmwf49>.

## GEOLOGY

### Killer quake

*Nature Geosci.* doi:10.1038/ngeo636 (2009)

Geologists have pinned down the geometry of the fault that ruptured in China's Sichuan province in May 2008 (pictured, left), killing at least 70,000 people.



B. BOR/REUTERS