themselves in localized structures that prevented both rapid flow and crystallization.

Paddy Royall of the University of Bristol, UK, Hajime Tanaka at the University of Tokyo and their colleagues have created a model of glass that helps verify these predictions. The team suspended microscopic beads in a polymer that caused them to attract one another. They watched as beads clumped into larger structures, creating a glass-like gel. The work confirms the earlier theory about localized structures and will improve the understanding of glasses, the authors write.

GENETICS

Sex and the cortex

PLoS Genet. **4,** e1000100 (2008)

How male and female brains differ is debated around the water cooler as much as the lab bench. Working at the latter, Elena Jazin at Uppsala University in Sweden and her colleagues looked for differences in gene-expression patterns in the cortex, which is associated with higher brain functions such as cognition. The team found that some human sex-specific gene-expression patterns are mirrored in the brains of other primates — macaques (*Macaca fascicularis*) and marmosets (*Callithrix jacchus*) — and that the sequence of these genes is more conserved than that of a control set of genes.

The fact that these differences are conserved across species suggests that evolution has deemed them worthy of preservation and that they may underlie some differences between the sexes, the authors say. The nature of those differences, however, remains water-cooler fodder.

ECOLOGY

Drought and the lion

PLoS ONE **3,** e2545 (2008)

Extreme weather can cause mass die-offs in the animal kingdom by altering host–pathogen relationships, according to researchers led by Craig Packer of the University of Minnesota in St Paul.

They found that high lion mortality in Tanzania in 1994 and 2001 seemed to be linked to severe drought followed by heavy rain. Blood work on lions suggested the following explanation: the drought-starved buffalo had heavy tick infestations after the rains, often killing them and providing carcasses for lions to scavenge. A coincident epidemic of normally non-fatal canine distemper virus suppressed the lions' immune systems, allowing the also normally harmless tick-borne blood parasite *Babesia* to reach fatal levels.

ACOUSTICS

Fiddling the numbers

PLoS One **3,** e2554 (2008)

Subtle shifts in density that occur within individual pieces of wood might help to explain why violins made in eighteenth-century Cremona, Italy, sound so special.

Berend Stoel, of Leiden University Medical Center in the Netherlands, and Terry Borman, a violin maker based in Fayetteville, Arkansas, measured the density of five classical violins — including two made by Antonio Stradivari (such as that pictured below) — and eight modern instruments, using computed tomography. The difference in density between spring- and summer-growth spruce and maple was significantly smaller in the classical instruments than in the modern ones. Stoel and Borman suggest that these variations in density may influence the wood's acoustic properties by affecting its stiffness.

L. PITARAKIS/AP

NANOTECHNOLOGY

Electron windmills

Phys. Rev. Lett. **100,** 256802 (2008)

Carbon nanotubes can be sent spinning by passing an electrical current through them, Steven Bailey and his colleagues at Lancaster University, UK, say.

Their calculations show that electrons passing through a nanotube with a typical 'chiral' structure, in which helical ribbons of carbon hexagons wind around the tube axis, will pick up angular momentum on the way and create a twisting torque on the tube. For a tube nested inside the sleeve of a wider one, this force should be big enough to overcome frictional resistance and drive rotation, auguring well for nanoscale drills and motors.

JOURNAL CLUB

Peter Csermely
Semmelweis University, Budapest, Hungary

A network scientist highlights active sites of enzymes, cells, brains and society.

For proteins, chemical binding is a tricky business. Special signals must be sent across a sea of water molecules to the desired partner, and complex mutual structural adjustments (a fluctuation fit) must be completed before each successful binding event.

I have long taught that a protein at its lowest-energy conformation still has regions of higher energy. But I've always been intrigued: how is the extra energy of the active sites preserved? And why do we need such big enzymes when their active sites occupy only a tiny region?

Piazza and Sanejouand found part of the answer by identifying special energy-preserving segments of proteins (F. Piazza and Y.-H. Sanejouand *Phys. Biol.* **5,** 026001; 2008). Taking into account the effect of the surrounding water, they modelled proteins with a computer program that arranges oscillating elements in the same pattern as amino acids in real proteins. In most of these proteins, they identified a few easily excitable segments that collected and harboured long-lived, localized vibrations. An analysis of 833 enzymes showed that these segments co-occur with the catalytic active sites; are located on the stiffest parts of the proteins; and have many connections but are surrounded by a less well-connected environment.

The generality of many network properties prompts me to ask: can we find 'active sites' of cells, brains, ecosystems and societies? Piazza and Sanejouand's segments correspond to Ronald Burt's "structural holes" in social networks — whereby areas of greatest economic potential are areas of low connectedness, where brokers can make new connections. Indeed, not only amino acids, but people may also act as brokers, mediators and catalysts. It may be worthwhile to think about creative, broker proteins as drug targets. One could even imagine creative sets of neurons.

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