that is crucial for processing fragments of RNA called microRNAs, which silence other genes.

The authors showed that deleting a single copy of *Dicer1* led to more tumours, lower levels of microRNAs and reduced survival. However, full loss of *Dicer1* blocked tumour formation, presumably because some level of its protein is needed for cell growth or viability.

The team also looked at data for several human cancers. A high proportion of these also had partial, but never complete, loss of the tumour suppressor.

DEVELOPMENTAL BIOLOGY

To be or not to be sperm?

J. Cell Biol. **187,** 513–524 (2009)

When stem cells in the rat testes are at a developmental crossroads, they are able to make their decision independently of their surroundings, according to Zhuoru Wu and her colleagues at the University of Texas Southwestern Medical Center in Dallas.

Progeny of spermatagonial stem cells have two choices: become stem cells or differentiate into sperm. Some models predict that the cells' decision is determined by environmental cues.

But the researchers found that stem cells grown in the same culture medium gave rise to both differentiated cells and more stem cells. Mathematical modelling showed that each cell's decision was biased towards the stem-cell fate 67% of the time.

NEUROSCIENCE

Rats versus mice

J. Neurosci. **29,** 14484–14495 (2009)

Neuroscientists have generally assumed that there is little difference in how adult rats and mice regulate the generation of new brain cells. But a study by Jason Snyder and his colleagues at the National Institute of Mental Health in Bethesda, Maryland, reveals that rats are much more likely to recruit new neurons during learning than mice.

The researchers also showed that adult rat brains contain more young neurons than adult mouse brains, and that these cells mature much faster. In addition, more new neurons are activated in rats during memory tasks. These findings could resolve inconsistencies in the literature about rodent neurogenesis.

MATERIALS

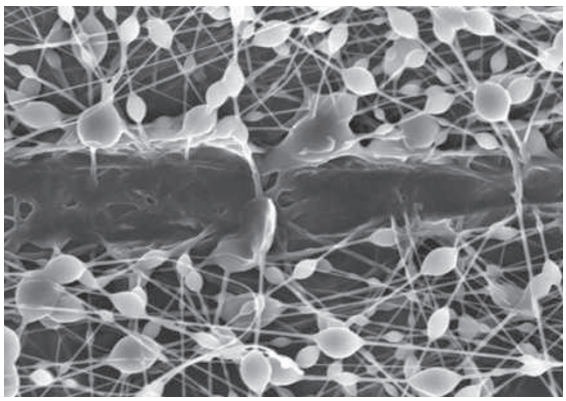
Healed steel

Adv. Mater. doi:10.1002/adma.200902465 (2009)

A polymer coating can enable damaged steel to 'heal' itself, according to Jeong-Ho Park and Paul Braun of the University of Illinois at Urbana-Champaign.

The coating consists of a mat of thin fibres spun using a technique called electrospinning, which creates fibres from a liquid by pulling it through an electric field. Trapped inside pockets along the fibres are bubbles of one or another of two liquid polysiloxane-based healing agents.

When these fibres are electrospun onto a steel surface and that steel surface is cut, the two liquids burst out (pictured below) and mix together in the crack formed during damage. The liquids then polymerize and fill in the gap with a solid substance. In the team's experiments, the healed steel didn't rust for three months, even after initially sitting in salt water for five days.



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METEOROLOGY

Can't beat the heat

Geophys. Res. Lett. doi:10.1029/2009GL040736 (2009)

Climate change has left its mark on temperature extremes in the United States. Data collected by weather stations across the country from January 2000 to September 2009 reveal that there have been about twice as many record warm days as record cold days during the period, according to Gerald Meehl of the National Center for Atmospheric Research in Boulder, Colorado, and his colleagues.

The trend is strongest in the western states, where observations roughly match patterns simulated by the centre's climate-system model. For one scenario of future climate change, the model suggests that record warm days across the United States could outnumber record cold days by 20 to 1 by 2050 and by 50 to 1 by the end of the century.

JOURNAL CLUB

Philippe Ciais
Laboratory of Climate and Environmental Sciences, Gif sur Yvette, France

A geoscientist is astounded by Earth's huge frozen carbon deposits.

I believe that the vulnerability of soil carbon to warming is one of the largest sources of uncertainty in the projection of future climate change. If, in a warmer world, bacteria decompose organic soil matter faster, releasing carbon dioxide, this will set up a positive feedback loop, speeding up global warming.

I was stunned to learn, from an article by Charles Tarnocai of Agriculture and Agri-Food Canada in Ottawa and his colleagues, that the global mass of soil carbon needs to be revised upwards by a frightening amount: from the 2,500 billion tonnes of carbon previously accounted for to more than 4,000 billion tonnes (C. Tarnocai *et al. Glob. Biogeochem. Cycles* doi:10.1029/2008GB003327; 2009). This is a result of the previously overlooked presence of vast amounts of peat, Siberian yedoma deposits (organic-rich permafrost) and other frozen carbon stores at high latitudes.

These massive stores deserve special attention because the boreal and arctic regions that house many of them are expected to warm more rapidly than average in the coming decades. Even a small leakage from these stores could cause an explosion in the growth rate of atmospheric CO_2 as well as methane, a potent greenhouse gas emitted by flooded thawed soils.

So what do these findings mean for the role of high latitudes in the Earth system? We need more extensive field observations to monitor the stability of frozen carbon, and studies to measure the decomposition rates of such stores. And we should incorporate these processes into climate models such as those used by the United Nations Intergovernmental Panel on Climate Change. If I had to pick just one new PhD subject right now, exploring this terra incognita of frozen carbon and its impact on climate change would be the one.

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