MATERIALS SCIENCE

Grinding makes a harder metal

Materials scientists have found a way to produce ultra-hard nickel, which could be useful in industrial manufacturing.

Researchers often harden metals by rapidly deforming them to disrupt their microstructure. This creates a congested arrangement of randomly oriented crystalline grains that block atomic movement and make the metal difficult to bend or scratch.

Ke Lu from the Shenyang National Laboratory for Materials Science in China and his colleagues report a technique that produces denser, smaller grains than any other method. They used a tungsten-carbide-based tool to grind the surface of a rapidly spinning nickel rod; the result was a 'nanolaminated' surface packed with ultra-fine grains. That structure made the nickel extremely hard and strong, even when heated to 500 °C. The same process could be used to make other metals less susceptible to wear and fatigue, the researchers say.
Science 342, **337–340 (2013)**

HRIDESH KEDIA/WILLIAM T. M. IRVINE

NEUROSCIENCE

Poisonous RNA in neural diseases

Cells from people with amyotrophic lateral sclerosis (ALS) reveal how a mutation kills neurons, but also show how to reverse its effects.

In both ALS and frontotemporal dementia, the most common genetic abnormality is a repeated six-nucleotide motif in the gene *C9ORF72*. A team led by Rita Sattler and Jeffrey Rothstein, both at Johns Hopkins University in Baltimore, Maryland, took skin cells from people with ALS who carry this mutation, then turned them into induced pluripotent stem cells and directed these cells to become neurons. By studying the neurons, the team found that the mutation causes RNA transcripts to clump together with RNA-binding proteins, which alters gene expression and eventually causes cell death. Strings of 'antisense' nucleotides that bind to the mutation on *C9ORF72* RNA template molecules reversed these effects.

The findings suggest that defective RNA processing contributes to both diseases, the authors say.
Neuron 80, **415–428 (2013)**

MICROBIOLOGY

The microbial corpse clock

Telltale microbes reveal how long an animal has been dead and could one day aid criminal investigations.

Forensic scientists sometimes use insects to gauge a corpse's time of death, but the method's margin of error ranges into weeks. Reasoning that microscopic organisms would make a more accurate clock, Rob Knight of the University of Colorado Boulder and his colleagues used high-throughput sequencing to characterize the microbial communities residing in mouse corpses that had been buried for up to 48 days. The groups of bacteria and microbial eukaryotes changed as the corpses decomposed and eventually ruptured, releasing bacteria from the gut.

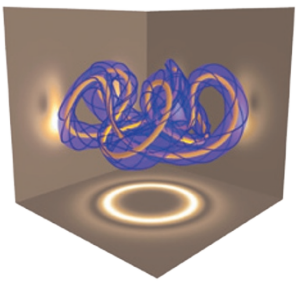
The progression in microbial communities provided a clock that reveals the time of death with an error of just over 3 days. More work is needed to assess how well this works with human corpses and to study the effects of temperature and soil type.
eLife 2, **e01104 (2013)**

PHYSICS

Tying knots with light beams

Beams of light can, in theory, be tied into three-dimensional knots that hold their shape.

Hridesh Kedia at the University of Chicago in Illinois and colleagues found solutions to equations that govern classical electromagnetism and thus light — the visible frequencies of electromagnetic radiation.



The solutions yield trefoil knots with three loops, cinquefoil knots with five loops (**pictured**) and other types of torus knot. Whereas previous approaches produced only ephemeral structures, the new knots remain stable because their electric and magnetic field lines are always at right angles to each other and of equal strength. This gives rise to strands that, like rubber bands, stretch and deform but keep their shape.

Focused laser beams could potentially create such knots, which might be used for moulding plasma and other types of matter, the researchers suggest.
Phys. Rev. Lett. 111, **150404 (2013)**

COMMUNITY CHOICE

The most viewed papers in science

BIOLOGICAL TECHNIQUES

Tracking genes in myriad single cells

HIGHLY READ on nature.com in October

An automated technique reveals gene activity across thousands of individual cells.

Accurately assessing variations in gene expression among cells could help to answer questions about cancer, regeneration and development, but large-scale measurements have been a challenge. A team led by Lucas Pelkmans at the University of Zurich in Switzerland modified a lower-throughput technique in which fluorescent molecules are attached to RNA templates from active genes. The team worked out ways to boost the fluorescent signal, such that individual templates can be detected at a magnification that allows many cells to be imaged at once. They developed a standardized, automated protocol to label RNA templates and adapted software to measure the templates' number and location.
Nature Methods **http://doi.org/pct (2013)**

CLIMATE SCIENCE

Pollution alters cloud reflection

Air pollution has suppressed the effect that natural airborne particles have on the climate, in particular how well clouds reflect Earth-warming sunlight.

Dominick Spracklen and Alexandru Rap of the University of Leeds, UK, used a computer model to test how the effects of natural aerosols, such as dust and sea spray, were altered by airborne particles from human sources, such as emissions from cars and power plants. In the Northern Hemisphere, artificial aerosols have halved the effect that natural aerosols have on cloud reflectivity. Such an effect has not yet occurred in the more pristine Southern Hemisphere.

Abundant artificial aerosols could complicate efforts to understand the feedback between natural aerosols and climate in the past.
Geophys. Res. Lett. 40, **1–4 (2013)**