CHEMICAL BIOLOGY

Protein caught in the act

A technique that can track proteins at atomic resolution in live cells could help to show how proteins fold and mature into functional forms.

A protein's environment strongly influences its maturation, but most analyses of protein dynamics require purified components. Radu Aricescu of the University of Oxford, UK, Lucia Banci of the University of Florence, Italy, and their groups used nuclear magnetic resonance spectroscopy to track the structure of the protein SOD1 in human cells.

The technique showed that another protein helps SOD1 to bind zinc and copper, and form internal disulphide bonds that aid stability. The method also showed that disulphide bonds can form even when SOD1 has not bound copper, a result that has not been seen using purified proteins.

Nature Chem. Biol. **http://dx.doi.org/10.1038/nchembio.1202 (2013)**

FLUID DYNAMICS

Tying fluids in knots

Vortex loops, of which smoke rings are a familiar example, occur when a fluid or gas spins in a tornado-like funnel that turns back on itself. The behaviour of 'knots' that can form in vortex loops is hard to study, but these important, complex objects have now been created experimentally.

Dustin Kleckner and William Irvine of the University of Chicago in Illinois generated vortex loops in water (**pictured**) by using precisely shaped plastic wings produced with a three-dimensional printer. They watched how these loops change over time; flows in vortices break and reconnect, causing knots to unknot. The evolution of knots is important to our understanding of energy transfer in solar plasmas, electromagnetic fields and turbulent fluids.

Nature Phys. **http://dx.doi.org/10.1038/nphys2560 (2013)**

For a longer story on this research, see go.nature.com/jjtthk

MICROBIOLOGY

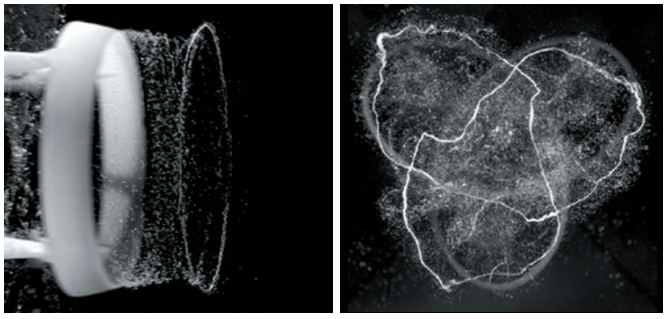
Before the bacterial cell wall

Much of the machinery in cells is devoted to division, but in the earliest cells this process may have been governed by changes in the ratio of surface area to volume.

Although all bacteria either have cell walls or are thought to have evolved from ancestors that did, Jeff Errington and his colleagues at Newcastle University, UK, found that excess production of cell membrane in mutants of the bacterium *Bacillus subtilis* drives them into a state without cell walls. Non-mutant bacteria forced into a shape with a greater surface-to-volume ratio also lost their cell walls. In both cases, cells divided through irregular bulges, rather than dedicated cell-division machinery.

In addition to providing a model for early cells, this work could help to explain how some infectious bacteria resist antibiotics.

Cell 152, **997–1007 (2013)**



DUSTIN KLECKNER/WILLIAM T. M. IRVINE

COMMUNITY CHOICE

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CHEMISTRY

X-rays read beer's bitter chemicals

HIGHLY READ on http://onlinelibrary.wiley.com in January

A technique developed in the twentieth century has helped researchers to pin down the conformations of the compounds that flavour one of the world's oldest beverages.

A team led by Werner Kaminsky at the University of Washington in Seattle used X-ray crystallography to study the bitter-tasting chemical humulone — a component of the beer additive hops — and its derivatives.

The authors purified acids recovered during beer-making and grew them into salt crystals that were then analysed with X-rays. This showed the exact position of the chemicals' molecular side chains, contradicting previous assumptions made from easier but less-rigorous techniques.

Now the arrangements of the humulone compounds are known, their purported health benefits can be better explored, the authors suggest.

Angew. Chem. Int. Edn 52, **1553–1555 (2013)**

MEDICAL SCIENCES

Sleepless nights affect gene activity

Sleep deprivation alters the expression of hundreds of genes, including some whose activity normally varies depending on the time of day.

Derk-Jan Dijk and his team at the University of Surrey in Guildford, UK, allowed study participants to sleep for up to 10 hours every night for one week and up to 6 hours a night another week. At the end of each week, all 26 participants were asked to stay awake for about 40 hours.

Genes affected by sleep deprivation included those involved in DNA packaging, gene-expression regulation, metabolism, and inflammatory, immune and stress responses. The authors suggest that studying the effects of sleep on gene expression can help to show how sleep deficits are linked to problems, such as cognitive impairment and obesity.

Proc. Natl Acad. Sci. USA **http://dx.doi.org/10.1073/pnas.1217154110 (2013)**

ASTRONOMY

Hot star with a cool layer

The nearby star α Centauri A has a relatively cool layer above its visible surface and beneath its superhot corona, one of several characteristics it shares with the Sun.

A team led by René Liseau at Chalmers University of Technology in Onsala, Sweden, looked at α Centauri A in far-infrared wavelengths with the Herschel Space Observatory and a ground-based telescope. They compared the star's light with a model of the stellar atmosphere to show a minimum temperature of 3,920 kelvin just above the surface — the first minimum observed on a Sun-like star.

Knowledge that this cool layer exists in other stars could help astronomers to understand how widespread such stellar atmospheric phenomena are.

Astron. Astrophys. 549, **L7 (2013)**

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