another material that can form atomically thin flakes, bismuth telluride (Bi_2Te_3).

Unlike graphene, which consists of layers just one atom thick, Bi_2Te_3 has five closely packed atomic sheets bound by weak forces. The researchers created flakes of five sheets or fewer by rubbing them off a larger crystal mechanically, a method similar to that used to isolate graphene. The flakes had different electrical properties depending on the number of atomic sheets they contained, which might allow Bi_2Te_3 sheets to be 'tuned' for different uses.

Moreover, Bi_2Te_3 can turn a heat gradient into an electrical current. This conversion, the authors suggest, might be more efficient in the graphene-like Bi_2Te_3 sheets than in their bulk crystal counterparts.

NEUROBIOLOGY

The science of silence

Neuron **65,** 412–421 (2010)

Hearing a sound stop is just as important as hearing it start, but how the auditory system processes the end of a sound has been unclear.

Michael Wehr and his colleagues at the University of Oregon in Eugene recorded activity in the brains of rats while playing tones to the animals. The researchers found that individual neurons respond to the beginning of tones at certain frequencies but respond to the end of tones at very different frequencies, so one neuron could not register 'on' and 'off' for the same tone.

The results suggest that the brain must integrate activity in separate neurons to register the beginning and end of a sound.

GEOLOGY

Mantle rising

Geology **38,** 155–158 (2010)

One of the driving factors shaping the face of the planet is subduction, the process in which Earth's massive tectonic plates dive beneath one another. But what happens when subduction stops?

One possible answer is that buoyant rock from deep within the mantle rises to alter the landscape for many millions of years after subduction ends. So say Rupert Sutherland of GNS Science in Lower Hutt, New Zealand, and his colleagues.

The researchers compared the results of a subduction model with observations of the sea floor between New Zealand and Antarctica. They say the idea that upwelling can begin after subduction stops explains a number of observed anomalies — including the fact that parts of West Antarctica and the adjacent sea floor have risen more than expected.

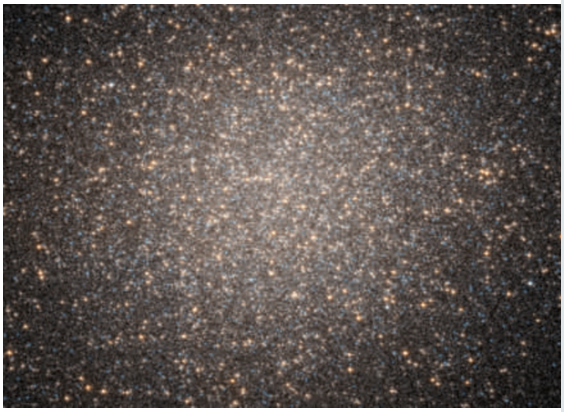
ASTROPHYSICS

Mystery medium

Astrophys. J. **710,** 1063–1088 (2010)

Omega Centauri, a globular cluster of stars that orbits the Milky Way, may not host a predicted black hole at its centre after all. Or, if it does, say Roeland van der Marel and Jay Anderson of the Space Telescope Science Institute in Baltimore, Maryland, the hole is much smaller than previously thought.

Black holes come in at least two sizes: small ones formed by the collapse of single stars, and giant ones at the centres of galaxies that have masses of millions of stars. Only a few candidate intermediate black holes have been proposed, including Omega Centauri (pictured below), and explaining their origin is a puzzle. By comparing observed motions for 170,000 stars that whirl around the cluster's centre with dynamic models, the researchers show that a black hole, if one exists at all, would have a mass less than 12,000 times that of the Sun.



NASA/ESA/HUBBLE HERITAGE TEAM (STSCI/AURA)

CHEMISTRY

Tie the knot

Nature Chem. doi:10.1038/nchem.544 (2010)

A little help from a template has allowed a long, straight molecule to be tied into a knot.

Molecular knots occur naturally in DNA and proteins, but are difficult to make synthetically. Christopher Hunter at the University of Sheffield, UK, and his colleagues solved the knotty problem by taking a long-chain organic molecule and wrapping it around a zinc ion. On its first circuit around the ion, the molecule formed a loop, and on its second circuit threaded through this loop. The two ends of the molecule then joined up and the zinc ion was removed, leaving an arrangement shaped like a trefoil, the simplest known knot.

The example suggests that it might one day be easy for chemists to make complex molecular machines involving knots.

JOURNAL CLUB

Rodney S. Ruoff
University of Texas at Austin

A physical chemist is excited by the electronic potential of a new arrangement of carbon sheets.

Graphene is high on the list of hot new materials. The one-atom-thick sheets of carbon have exceptional mechanical, thermal and optical properties, which researchers are impatient to exploit. Graphene is also interesting for its high electrical conductivity; it is possible that graphene could one day supplant or complement silicon in electronic devices.

That possibility was recently given a boost by Edward Conrad of the Georgia Institute of Technology in Atlanta and his colleagues, who grew layers of graphene on a special crystal face of silicon carbide (M. Sprinkle *et al. Phys. Rev. Lett.* **103,** 226803; 2009).

Normally, graphene layers occur in stacks in an arrangement we know as graphite — an important ore used worldwide in everything from pencils to automobile brake linings. The graphene layers in graphite repeat with a regular 'AB' pattern. Overall, graphite has poorer electrical conductivity than graphene.

The graphene film grown by the Georgia Tech team is quite different. It consists of stacked layers with a peculiar rotational order, and could mark a brand new phase of graphite. More importantly, the way in which the layers are stacked relative to each other preserves graphene's high electrical conductivity — in other words, the ensemble does not behave like graphite.

My research group had already layered graphene sheets into a similar 'non-graphite'. But we had to grow layers of graphene one at a time and stack them sequentially. The Georgia Tech group shows that a similar structure can be obtained all at once by growing a single film. The material could have important implications for nanoelectronics, and might find other uses — for instance, as films in which transparency and conductivity can be tuned by adjusting the number of graphene layers.

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