Win stuff

This month the special competition ahead of Chemistry Week in November continues. We're looking for budding science writers who can write about food, the theme for Chemistry Week 2009.

Write 400 words on how chemistry can help feed the world in the future and send your entry in to us by email.

For a chance to **WIN**, email us at: **chemnet@rsc.org**

It could be about the future for pesticides, fertilisers, preservatives, or food colourings. You might want to discuss the nutritional content of food and the role that plays in human health. The options are endless. We look forward to reading your entries.

The closing date is 10th October. The winning entry will receive a £20 HMV gift voucher and have their article published in November's ChemNet News.

Chemistry facts

Between 1981-2006, 974 new small molecule chemical entities were identified as promising for drug development. 63% were naturally derived or semi-synthetic derivatives of natural products. Despite this only a fraction of organisms have been tested for their potential contributions to medicinal chemistry.

If you want to register to use the discussion board email chemnet@rsc.org

Cutting-edge Chemistry

Déjà vu for axon regrowth

Damaged brain cells retrace their steps when they repair themselves, say US scientists. A microfluidic device has enabled an American team to study single mammalian axons, projections sent out by nerve cells, as they regenerate after laser-induced injury. Digant Davé and colleagues at the University of Texas, Arlington, say their method could provide insights into the effects of injury on the nervous system including the events that occur after spinal trauma. *'So much of regenerative neurobiology remains largely unknown,'* declares Davé.

After axons are cut, the nerve cell projections can regrow (left to right). The new device has three components: a microfluidic chip to isolate single axons, a laser for highly localised injury and a custom-built incubator, all on an inverted microscope. Using these tools, Davé's group can cut hundreds of individual axons reproducibly and at precise locations. In this way the team can monitor the axons as they regenerate and observe their growth over distances of several millimetres, which until now has not been possible using conventional tools.

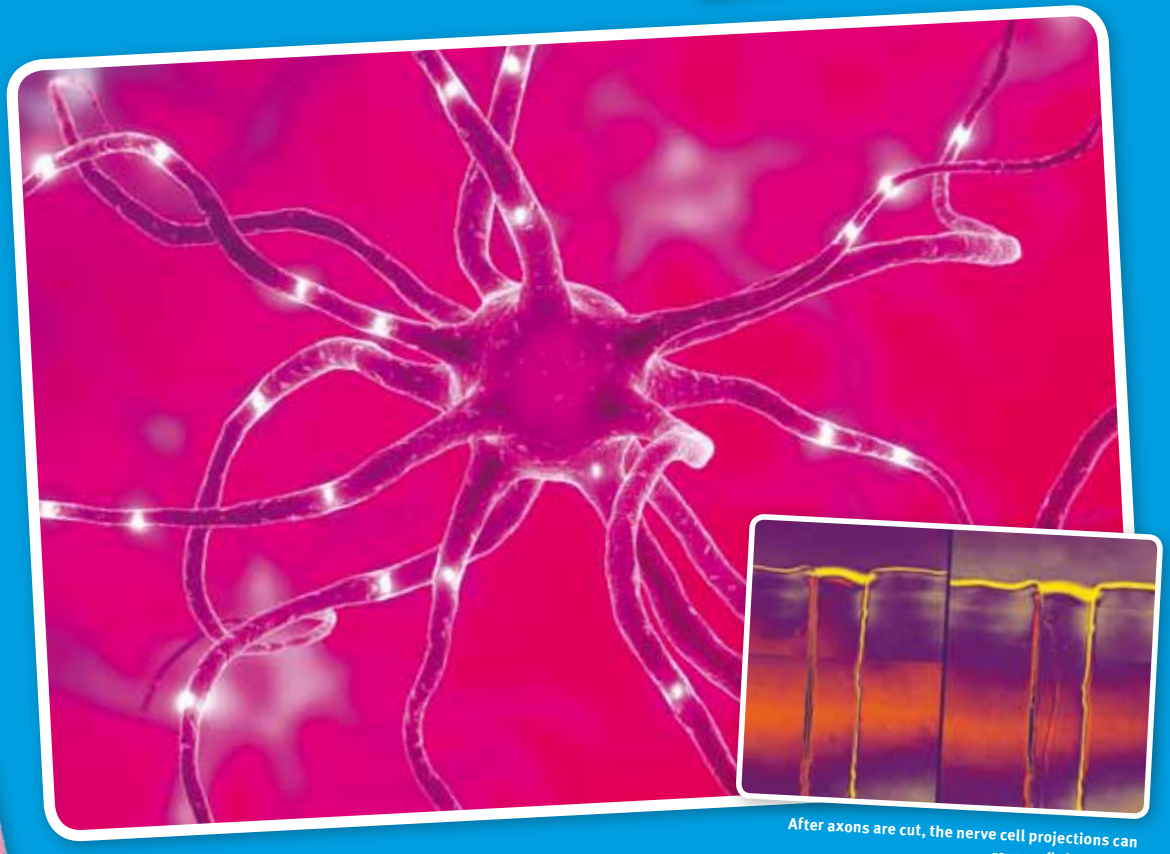
The researchers have made many surprising observations using the device. *'Very interestingly, we found that neurons [from the brain cortex] closely follow the same track they had before injury after regeneration,'* says Davé. In contrast, neurons found in the spinal nerve follow a new path.

***'Neuronal repair studies are important for improving our understanding of the mechanisms that enable functional recovery from traumatic injury to the nervous system,'* explains Larry Millet, an expert in neurobiology and microfluidics at the University of Illinois at Urbana-Champaign, US. Microfluidic devices are indispensable to control and manipulate the microenvironment in these studies, he adds.**

Davé's team has also used the platform to create a neuronal circuit model to study how injury affects connections between axons and muscles. *'It's simply amazing to see how dynamic these neurons are,'* says Davé. He describes how little outgrowths extend during axon regeneration. *'It looks like it's feeling its way out,'* he says.

www.rsc.org/Publishing/Journals/cb/Volume/2009/9/Deja_vu_for_axon_regrowth.asp

To book a place on a ChemNet event email: chemnetevents@rsc.org or call 01223 432340



After axons are cut, the nerve cell projections can regrow (left to right)

ChemNet news

RSC ChemNet

CHEMISTRY CAREERS ▶ CHEMNET EVENTS ▶ CUTTING-EDGE CHEMISTRY ▶ CHEMISTRY ON THE WEB

ISSUE 36 SEPTEMBER 2009

Medicinal chemistry

CAREERS SPOT

Some of you may be studying chemistry because you are interested in a career in medicine, but have you considered a career in designing and developing the pharmaceutical products which doctors prescribe?

Drug design, development and testing all rely on major input from chemists. Developing new antibiotics or treatments for cancer are just two of the ways you could be working at the cutting edge of science and technology and using and developing state-of-the-art techniques to provide the medicines of the future.

The first task in the drug discovery process is to find a 'hit' compound. This is a molecule which has a small amount of the desired activity against a molecular target which is believed to cause the disease being researched. To do this, medicinal chemists use state-of-the-art computer software to design virtual molecules that might interact with the molecular 'targets', or to design molecules based upon pharmacophore analysis (analysis of the structural features of a molecule which are responsible for its biological activity) of existing medicines.

Medicinal chemists then follow up these 'hits' by making structurally similar molecules in order to identify a 'lead', a compound with good activity and selectivity for the target. They then optimise the 'lead' by making small changes to the structure of the molecule so that is has the most beneficial level of activity in the body to treat the disease successfully, but without dangerous side effects. They must also make sure that these compounds have good solubility and chemical stability and also are not rapidly metabolised in the body.

Once they have optimised all of these characteristics, the chosen compound, or 'development candidate', is tested in patients to assess whether it is safe, effective and superior to previous treatments for the disease.

If you want a career that can make a real difference to thousands or even millions of people the challenge of medicinal chemistry could be for you. The following web-sites have additional information on medicinal chemistry careers:

www.abpi-careers.org.uk/your-career/school-and-college-students

www.rsc.org/Education/SchoolStudents/index.asp

Welcome to issue 36

This month marks the third birthday of ChemNet and to celebrate we're launching this new look ChemNet News. We've got more info about ChemNet events and careers info about medicinal chemistry.

Three years ago, ChemNet News started as a two sided A4 sheet of plain text. Older copies can be accessed on the ChemNet website, so why not take a look and see how far we've come.

The success of ChemNet means that we have now expanded ChemNet News to bring you even more of the latest chemistry news, research and careers info that you have come to expect from us every month. We'd love to know what you think of the new look. Why not email me to let me know at: **chemnet@rsc.org**

As it's the start of a new school year and you have lots of chemistry ahead we've also included a **free** periodic table for you this month.

R. Bowles

Robert Bowles – Editor

Dates for your diary

ChemNet Events:

▶ ChemNet at Sheffield Assay office
13 October 2009
Learn more about the analysis and hallmarking of precious metals from the people who have been doing it for over 200 years.

▶ Look What Chemistry Has Done For Me careers event St Aloysius School, Glasgow
26 October 2009
A broad range of speakers from industry and academia offer insights into careers in chemistry

Chemistry Week Events:

▶ Look What Chemistry Has Done For Me careers event University of Kingston
9 November 2009
A broad range of speakers from industry and academia offer insights into careers in chemistry

▶ Spotlight on scientists at MRC Human Nutritional Research Laboratories, Cambridge
10 November 2009
An insight into the research and careers of the scientists working for the MRC

▶ ChemNet Lecture at the Newly opened Chemistry Centre, London
12 November 2009
Lecture on colour in food by author Tom Coultate.

We're currently organising a range of ChemNet events throughout the whole of the Autumn term, not just Chemistry Week. Visit **www.rsc.org/chemnet** regularly to see if there are going to be any events near you.

To book a place on a ChemNet event:
E: chemnetevents@rsc.org
T: 01223 432340
or book online and find more info about all the events at:
www.rsc.org/chemnet

Fancy getting your hands on £36,000 worth of gold?

In July ChemNet members from several schools in the Sheffield area did just that with a visit to Sheffield Assay Office. Here's what one ChemNet member thought of the trip:

'When we arrived there, we were welcomed by staff at the Assay Office and RSC ChemNet. While we were waiting for others to arrive, we chatted with the staff, who were all very friendly and welcoming.

Our first presentation was about the background and the services of the Assay Offices. There are four Assay Offices which are located in London, Birmingham, Edinburgh and Sheffield. The Assay Office in Sheffield opened in 1773. The purpose of the offices is to test and assess the metal content of an item so that purchasers of precious metals are protected from fraud.

The main services of the Assay Office include hallmarking and lasermarking the precious metals gold, silver, platinum and palladium. Once the metal content of the item is determined, it is given four marks. The marks state the maker, the purity, the location of the Assay Office and in which year the item was produced.

We were introduced to the hallmarking process so that we had an idea of what was involved before we actually visited the work place and the laboratories. That was the most exciting part! We were taken to the hallmarking area where we saw the techniques used to test the metal content, such as X-ray fluorescence and Inductively Coupled Plasma Mass Spectrometry, and the staff related the process to what we have learnt in chemistry. We were all amazed to see how quickly the lasermarking worked; the marks are made within a few seconds.

We were allowed to pass around a bar of 9ct gold weighing 6.5kg and valued at £36,000! We then visited the laboratories where they research new methods to test and assay metal items.

Vienne Ma
Queen Margaret's School, York

If you want to come to the next event in October, book online at **www.rsc.org/chemnet** and click on the events link for more details. You might be able to get your hands on a gold ingot worth £36,000, but getting it out of the building without anyone noticing will be a little trickier!

ChemNet members visit Sheffield Assay office

Careers: Record breaker

As a teenager in a small Russian town, **Andrei Khlobystov** stood out for his desire to be a chemist. He is now making waves in the UK with his nano work, as he tells **Yfke Hager**

Age 31

Work experience

2005
Royal Society university research fellow,
School of Chemistry, University of Nottingham

2004
Leverhulme Trust research fellow, School of Chemistry, University of Nottingham

2002
Post-doctoral research assistant, department of materials, University of Oxford

Education

1997
MSc with excellence diploma in chemistry,
Moscow State University

Other

Holder of two patents

Hobbies

Antiques and antiquities; local history

'The first year was quite miserable,' Khlobystov recalls, *'I wasn't expecting so much maths, and I nearly gave up.'*

When Andrei Khlobystov was 15, he decided that he wanted to be a chemist. In the small Russian town where he grew up, this was unusual. *'Everyone wanted to be a doctor or engineer,'* Khlobystov says, *'but I was fascinated by the idea that everything is made up of molecules.'* Fast-forward 16 years and Khlobystov has certainly achieved his childhood ambitions: he is now a Royal Society fellow with a 1.2 million Euro (£800,000) research grant and a Guinness Book of World Records entry to his name.

However the road to academic independence wasn't always a smooth one; Khlobystov almost gave up during his first year at university. He applied to Moscow State University, which boasts the best chemistry department in Russia, and was awarded a place, but soon started doubting his decision. *'The first year was quite miserable,'* Khlobystov recalls; *'I wasn't expecting so much maths, and I nearly gave up.'* Encouraged by older students, Khlobystov persevered. *'I didn't lose sight of the bigger picture,'* he says, *'and now I can see that it laid a good foundation for topics like quantum mechanics.'*

Chemistry in the UK

Towards the end of his course, Khlobystov met Martin Schröder, an inorganic chemist from the University of Nottingham. Schröder invited Khlobystov to Nottingham for a three month research project, where Khlobystov met the people who would shape his research career. *'Meeting enthusiastic mentors makes all the difference',* Khlobystov says. After completing his PhD at Nottingham, he decided that he wanted to do something different. *'Up to this point, I had only done fundamental chemistry. Now I was driven by applications',* he says. In 2002 Khlobystov took up a postdoctoral position at the University of Oxford. Like many other people at the time, he was working on a fascinating new material: carbon nanotubes. He was also getting to grips with electron microscopy to visualise molecules inside carbon nanotubes. *'This is not a very common tool for chemists,'* Khlobystov explains. Electron microscopy is used much more in materials science and engineering departments. *'With electron microscopy, you can actually take snapshots of individual molecules inside the carbon nanotubes,'* Khlobystov enthuses. For the young chemist, who as a child had found it 'mindblowing' that we are all made up of molecules, it was amazing to see molecules for the first time.'

Tiny test tubes

Khlobystov's research sparked media interest when he and his colleagues developed the world's smallest test tube, a feat that gained an entry in the Guinness Book of World Records. Khlobystov and his colleagues developed a technique to polymerise fullerene oxide molecules (buckyballs) in an orderly fashion, using a carbon nanotube as a miniature test tube to coerce the buckyballs into a line just one molecule thick.

In 2005, Khlobystov landed a five-year, 1.2 million Euro research grant from the European Science Foundation as part of the European Young Investigators awards scheme. *'I believe that I am the only chemist in Britain to hold this type of award,'* he says. *'Getting a grant like this makes a substantial difference.'* It has allowed him to set up his own lab at the University of Nottingham, which already houses six research students and two postdoctoral researchers working on carbon nanotube functionalisation for electronic applications. *'We're aiming for research that can be commercialised,'* Khlobystov says.

Chemistry on the web

A series of videos from UCL showing how chemists are tackling the global challenges of the 21st century can be found here: **www.chem.ucl.ac.uk/schools/lifeinchem/index.htm**

Round table discussions from panels of experts discussing the next big thing in science, covering topics such as nanotechnology and new energy sources. See: **www.vega.org.uk/video/series/2**

Drug discovery and design are the major routes that chemistry graduates take into the pharmaceutical industry, but there are many others. Chemists can get involved in running clinical trials, work in manufacturing or explore their creative sides in medical writing, or sales and marketing.

More information about all of these careers and many others is available at the careers page for The Association of the British Pharmaceutical Industry (ABPI). **www.abpi-careers.org.uk/**

Like me, you probably enjoy the In the Pipeline column in Chemistry World written by Derek Lowe. His blog links to a bewildering array of other blogs offering an insight into medicinal chemistry; far more than I can fit in here. Click on: **www.corante.com/pipeline/**