

Nanotechnology



CAREERS SPOT

Nanotechnology has been a bit of a buzz word in recent years. I first came across the subject in a book called *Engines of Creation* in

which the author (K.Eric Drexler) hypothesised about a number of ideas for nanotechnology that leached into the public consciousness, such as the idea of “Nanobots”, swimming about in your bloodstream curing ills. You can read it online for free here:

www.wowio.com/users/product.asp?BookId=503

Then nanotechnology was hijacked for political reasons as scaremongers envisioned a day when self-replicating “Nanobots” turned the world into a big ball of grey goo. That won’t be happening anytime soon either. Nanotechnology has been maturing rapidly over recent years and current reality is now somewhat different to that original vision. Nanotechnology now appears in everything from toothpaste to socks. Indeed the

number of consumer products using nanotechnology has just passed the 1000 mark.

www.nanotechproject.org/news/archive/8277/

That means that jobs relying on and developing new nanotechnology products will continue to multiply; although probably not exponentially and certainly won’t be leading to the extinction of all other jobs.

The future potential is huge though. Those “Nanobots” are a way off yet and their final form may be very different to tiny machines propelled by mini-propellers on their backs, but chemists are working with physicists and biologists to work out what form they will eventually take. www.wellcome.ac.uk/Education-resources/Teaching-and-education/Big-Picture/All-issues/Nanoscience/index.htm

Welcome to issue 37



Nanotechnology covers a multitude of disciplines. We’ve got a couple of examples of the latest research in this issue as well as links to websites and further reading which can take you further into your exploration of the subject.

Included with your mailing this month, is a copy of the 2009/10 list of RSC Recognised and Accredited chemical science courses. This is an invaluable source of information for those of you considering applying for a chemical science degree course in the future and provides an excellent insight into the sheer number and diversity of courses on offer. The RSC accredits chemistry courses which are of a high standard in terms of intellectual challenge and content.

The RSC recognises a wide range of degrees based on chemical science for satisfying the admission requirements for qualified membership of the RSC. Good luck with your applications!



Robert Bowles – Editor

Dates for your diary

ChemNet Events:

► **35th Dalton Lecture: Making a Nano-Robot**
Northern School of Music,
Manchester

9 October 2009

Speaker: Professor Anthony Ryan OBE.

► **ChemNet 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 of the Senses**
The Open University,
Milton Keynes

1 December 2009

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

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
MRC Human Nutritional Research Laboratories,
Cambridge

10 November 2009

An insight into the research and careers of the scientists working for the MRC.

ChemNet pizza and quiz night
University of Bradford

11 November 2009

Answer questions on chemistry and eat pizza! There will also be the chance to talk to admissions staff at the university.

ChemNet lecture
Chemistry Centre, London

12 November 2009

The first ChemNet event at the newly opened Chemistry Centre in London. A lecture entitled "Food Colourful Food!" from author Tom Coulter.

Bristol University Residential Camp for Prospective Chemists

The School of Chemistry at Bristol University is once again running a two day Y12 Bristol University Chemistry Experience Camp for students who are considering studying chemistry somewhere in the UK.

The residential course, running on 5-6 July, will allow students the experience of working in modern undergraduate chemistry teaching laboratories, experience lectures, talks and tours and be with other bright, like-minded students. One session is given over to discussion with chemistry admissions officers.

Please contact: Tim Harrison t.g.harrison@bristol.ac.uk for further information.



Be inspired at... The Chemistry Centre, the RSC's recently refurbished premises in central London and venue for the ChemNet Food Colourful Food lecture on 12 November during Chemistry Week.

Careers: Sheer determination

Graham Ruecroft co-founded a firm that recently earned him his second RSC innovation award.



Curriculum vitae

Age 46

Work experience

2006-Present

Chief Technical Officer,
Prosonix, Oxford, UK

2003-2006

Head of process R&D,
C3 Technology, Accentus plc,
Didcot, UK

2003

Team leader, process R&D,
Ultrafine, Manchester, UK

1990-2003

Chirotech Technology Ltd,
Cambridge, UK

1989-1990

Ferring Research Institute,
Southampton, UK

1986-1989

The Open University,
Milton Keynes, UK

1983-1986

The Wellcome Foundation,
Berkhamsted, UK

Education

1989

PhD, Open University, UK

1986

MSc, North London
Polytechnic, UK

1983

GRSC Part II, Teeside
Polytechnic, UK

Hobbies

Music, motorcycling, running

Throughout a career spanning over 20 years, Graham Ruecroft has been driven to develop his knowledge of chemistry. As a teenager, his interest in higher education was sparked whilst working as a trainee research technician assisting PhD students at Durham University. *'Being surrounded by interesting and motivated people inspired me to go as far as I could,'* he says.

During his first chemistry degree at Teesside Polytechnic, he developed an interest in medicinal chemistry. Pursuing this, he landed a job at the Wellcome Foundation. Manufacturing drug molecules fuelled a desire to know more about organic chemistry. He enrolled in a part-time Masters degree in advanced synthetic organic chemistry, travelling to London two nights a week for classes whilst holding down a full-time job. Unfazed by this intense workload he decided, *'why stop there? Why not do a PhD?'*

Juggling work

Ruecroft applied for a PhD with Jim Iley of the Open University and, in 1986, once again found himself juggling a job and study. Concurrently with his PhD research, he worked as a research assistant at the OU, teaching undergraduates and demonstrating at summer schools. Using both biomimetic and isolated cytochrome P450 enzymes during his PhD to understand how anti-cancer drugs are modified by the body, he became fascinated by drug metabolism. During a secondment to the Institute of Cancer Research in Surrey, he met Ray McCague, who was to play an important role in his career.

After his PhD, Ruecroft applied for a job at the Ferring Research Institute in Southampton. A year-long appointment as a medicinal chemist followed. During the final months of his contract, he saw a job advert from one of the UK's first biotech companies, Enzymatix, founded by the biotech entrepreneur Chris Evans. *'Something about the job seemed an ideal fit,'* Ruecroft says. *'It was an inspirational environment.'* It was also his first experience of the rollercoaster ride of entrepreneurial business, *'but there were more ups than downs,'* he laughs.

Award winner

Enzymatix became Chiroscience, which successfully floated on the London Stock Exchange in 1994. It was a dynamic time in Ruecroft's career. *'We went from small biotech company to being listed on the stock exchange. It was a fascinating three years,'* he says.

When Chirotech (the chiral technology arm of Chiroscience) was acquired by Dow Chemical, he decided that it was time to move on to new entrepreneurial pastures. Rick Dyer, a former colleague from Chiroscience, offered him the post of team leader at Ultrafine, a chemistry service provider in Manchester. Shortly after his move, he received a call from another prior colleague, David Hipkiss, who was working at C3 Technology, part of Accentus. *'He said he had a fantastic technology, using ultrasound to mediate crystallisation. He thought we might get this out as a business in its own right,'* Ruecroft recalls. Hipkiss created a position for Ruecroft, and together with operations manager Andy Bush they considered a management buy-out. It was never to be; Accentus was sold in 2005. *'But we convinced the senior management who acquired the business that we were worthy of backing,'* he says. Jeremy Collier of Collier Capital agreed to spin out C3 Technology, which became Prosonix.

Chemistry on the web

The Institute of Nanotechnology has regular updates on nano-tech news, such as the use of Nanotechnology for increasing oil production and the uses of quantum dots.

www.nano.org.uk/



Courses in Nanotechnology:

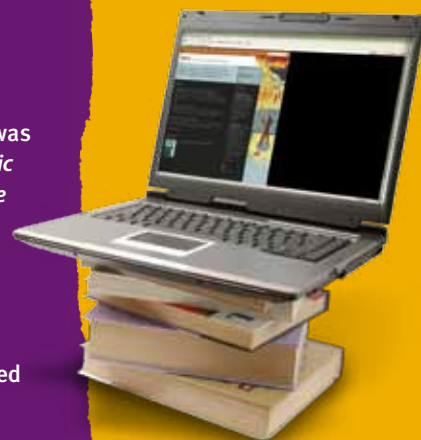
www.nano.org.uk/CareersEducation/education.htm

Interviews with leading writers and scientists including Professor Peter Atkins from Oxford University www.thesciencenetwork.org/programs/the-science-studio

US National Nanotechnology Initiative. Lots more information on uses and applications of Nanotechnology www.nano.gov/ Website of the month:

www.nanotechproject.org

A fantastic website introducing the uses and applications of nanotechnology.



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. It could be about the future for pesticides, fertilisers, preservatives, colourings, anything at all. 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.

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

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

Chemistry facts

An estimated global research and development investment of nearly \$9 billion per year is anticipated to lead to new medical treatments and tools; more efficient energy production, storage and transmission; better access to clean water; more effective pollution reduction and prevention; and stronger, lighter materials. Source: www.nanotechproject.org

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

Cutting-edge Chemistry

First-Aid for Electronics

US scientists have developed a first-aid kit for electrical systems that could stop circuits failing and lead to safer, longer lasting batteries.

Jeffrey Moore, at the University of Illinois at Urbana-Champaign, and colleagues made microcapsules with robust walls and filled them with carbon nanotubes (CNTs). They then ruptured the microcapsules using vigorous stirring and measured the contents' ability to conduct electricity between two electric probes separated by around 100 micrometres. As the team swept the applied voltage from minus to plus 50 volts, the CNTs migrated towards the probe tips. They aligned with the electric field and completed the circuit, enabling the current to flow.

Microcapsules filled with carbon nanotubes could be used to repair electronic circuits.

They found the best capsules were between 280 and 350 micrometres - smaller ones were too difficult to break and larger ones broke too easily.

'Battery safety and lifetime are two problems that may benefit from this approach,' says Moore. 'You may want to restore electrical conductivity of damaged battery electrodes. On the other hand, if battery electrodes short circuit, the battery becomes dangerous and has the potential to explode. One may thus want to

coat the electrodes with a resistive material to shut down a run-away battery. Exploring these ideas are some of our future plans.'

'I think it is a neat approach that can become very useful if taken further,' comments Vsevolod Rostovtsev, a nanotube expert at DuPont, Wilmington, US. 'The capsules need to become smarter so that their precise and accurate placement could be effected. The broken microcapsule shell needs to be removed from the electronic device to reduce contamination.'

View this article and other related stories online www.rsc.org/Publishing/ChemScience/

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



Microcapsules filled with carbon nanotubes could be used to repair electronic circuits