

Jobs to dye for...



Here is a great example of chemistry in action... well, walking

CAREERS SPOT

Many chemists wouldn't have jobs if it wasn't for the discovery of dye synthesis back in 1856 by William Perkin. Dyes could arguably put

forward a case for being responsible for one of the biggest booms in the chemical industry.

The ability to artificially create a coloured molecule demonstrated to many people the importance of chemistry. With the cost of naturally occurring dyes increasing with demand, the ability to create colour on demand took chemistry from the gentleman's parlour to the masses. It meant that brightly coloured clothes were affordable for more people, brightening up an otherwise grey wardrobe for many Victorians!

A good knowledge of dye chemistry is essential in jobs such as textile manufacturing and hair colouring. You need a chemical understanding of the material you are dyeing as well as the colour molecules.

Dye chemistry also underpins a lot of the work in interdisciplinary areas of biology and physics. Dye-terminator sequencing in DNA profiling and production of dye-sensitized solar cells are both extremely important applications.

If you want to be a bio-informatics specialist, energy scientist, product research chemist, food technologist or even an optometrist, all of these careers require a comprehension of dye chemistry.

Welcome
to issue 40



Happy New Year! I hope you have all enjoyed the winter break and are ready to get stuck into some serious chemistry this year. For the New Year I have decided to take a look back at some old chemistry – dyes. Dyes are typically coloured molecules that attach themselves to substrates and impart their colour. We have been using these chemicals for thousands of years to add our own personal touches to the world – from cave paints and Jackson Pollock to the fluorescent coloured clothes of nu-rave.

Expressing ourselves through colour is not the limit for dyes – their affinity for materials means that they have been used as markers for cancer and key components in sensors. With their often complex structures, dyes have even been used in exotic applications such as molecular motors and solar cells. When it comes to chemistry, dyes are definitely 'state of the art'!

Mike Bonne – Editor



Dates for your diary

ChemNet Events:

► NOW CONFIRMED

Meet the Universities 2010

Royal Horticultural Halls,
London

Saturday 3 July 2010,

Reserve the date in your diary now – it's a great opportunity to find out more about how chemistry can fit into your future!

Chemistry Facts

Not all synthetic chemicals are good for you! Artificial colourings in Smarties in the UK had to be removed due to health concerns.

Nestlé decided to replace all synthetic dyes with natural ones, but as they were unable to source a natural blue dye, the blue Smarties were removed from circulation, and white Smarties were introduced in their place.

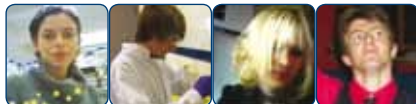
Blue Smarties were recently re-introduced in the UK in February 2008, using a natural blue dye derived from the 'cyanobacteria Spirulina'

Look out in the new year for the latest ChemNet events. Visit:

www.rsc.org/chemnet
for the full list

MyRSC

<http://my.rsc.org>



How would I describe MyRSC? Well, I suppose it is kind of like Facebook but with a more professional feel! With online social networking becoming ever larger, the RSC is looking to you guys to help bring us into the 21st century.

MyRSC provides you with the ability to post files, photos and videos, create or join a group, read or write a blog and enter into forum discussions. However, this isn't just social networking, it could really change your life – helping to inform you about the world of the chemical sciences so you can make the right decisions. If you join MyRSC you'll instantly be able to contact a wide range of people - from school and university students, right the way up to top academics and leaders in industry! Chemistry is what connects all these people.

We've made a group specifically for ChemNet where you can discuss with each other topics to do with chemistry, revision, universities, and any other topics you wish. The calendar is populated with events that may be of interest to you, including university open days.

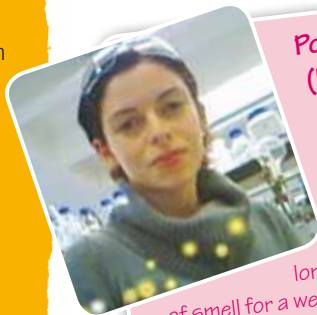


MyRSC Online Community

Furthermore, in the RSC forum you can enter into discussions with the entire chemical community and may have the chance to talk to people who are experts in their field... what better people could you ask for help with homework! We have recruited some undergraduates to write a blog describing what its like to study chemistry at university. "Confessions of an Undergrad" gives you a chance to really learn more about university life.

The most important thing about MyRSC is what you can offer it. It's a community, and it will be a great community if you are all members. So, please sign up and have a look around. Start some discussions, join some groups, read some blogs, perhaps you'd even like to write your own blog or start your own group.

Finally, remember that MyRSC is your community, so if you want to see anything there, or have any suggestions, please get in touch by emailing myrsc@rsc.org.



Polly-Anna Ashford (University of East Anglia):

As a young, naive and frankly slightly stupid first year undergraduate (not very long ago!) I once lost my sense of smell for a week after finding a beaker of colourless liquid in my fume hood and giving it a good sniff. I had assumed it was merely water, and was checking to make sure. Unfortunately, it wasn't. I had just inhaled a hefty quantity of dichloromethane. It's a common organic solvent and doesn't smell of anything much until you get really, really close. And I did. According to the safety people, who know about these things, you probably shouldn't breathe it in. Now I know why!



Gareth Langley (Oxford University):

So, term has started and for a fresher, the whole swing of university life is starting to feel almost normal; well, as normal as it can be when you have to battle through swarms and swarms of tourists as you head to and from the science department. I'm at Oxford and if I'm honest, I can't quite believe it. If you had told me 2 years ago that I would be sat, in Oxford, worrying about quantum mechanics and thermodynamics; I would have told you that you were insane!

I think that we'll look at how on earth I got here another time, since the first few weeks are reasonably hectic; having information hurled at you from all directions and not taking it all in. Then, lectures and after that comes the first day in labs as an undergraduate; which is an alien environment for nearly everyone (luckily, I had some work experience in a research lab so it wasn't that bad - complete with the mandatory tedium of COSHH assessments!)

We have lots of reading to do for tutorials and the 8 week term is fast-paced and intense. Although lectures started with "this is an atom..."; you soon find yourself worrying about quantum mechanics and making jokes about Schrödinger's cat on MyRSC...

Careers: Heartfelt Chemistry

After working in New Zealand, medicinal chemistry tempted **Ashley Jarvis** back to the UK. He now works in his dream field, as Yfke Hager discovers



Curriculum vitae

Age 33

Work experience

2004-present

Senior medicinal chemist,
NCE Discovery, Cambridge

2003-2004

Senior research fellow
(medicinal chemistry),
Wolfson Institute for Biomedical
Research, London

2000-2003

Research chemist,
Industrial Research, Lower Hutt,
New Zealand

1998-2000

Senior scientist,
Evotec OAI, Abingdon

Education

1994 BSc chemistry,
University of Bristol

1998 PhD,
University of Reading

Hobbies

Golf, badminton,
mountain-biking, guitar

'I felt in my heart that I wanted to get back into medicinal chemistry,' he says. 'My mother had recently recovered from bowel cancer and, while I wouldn't say that was a turning point, it played a role.'

Ashley Jarvis never suspected that meeting a New Zealand chemist at a UK conference would one day turn out to be his ticket abroad. After a career detour that took him halfway around the globe, Jarvis has now come full circle.

His passion for medicinal chemistry was kindled at the University of Bristol where he studied chemistry with biochemistry and maths. At the end of his degree, most of his friends found jobs outside of chemistry. *'I was one of the few who stayed on for a PhD,'* Jarvis says. He joined Joe Sweeney's lab, where he worked at the interface of chemistry and biology. When Sweeney took up a senior position at the University of Reading, UK, Jarvis moved with him.

Determined to find a position in synthetic organic chemistry after completing his PhD, Jarvis co-wrote a grant to work with a carbohydrate chemistry group in New Zealand. One of the group's chemists interviewed Jarvis but it didn't work out. Undaunted, Jarvis began applying for jobs with a focus on synthetic and medicinal chemistry. *'I was keen to make compounds with a use in therapy or a biological application,'* Jarvis explains. In his first job at Oxford Asymmetry International (now Evotec OAI), he was pleased to work on the production of a focused compound library to identify potential anti-HIV drugs. *'For a medicinal chemist, it's something of a holy grail to work on something that eventually gets into the clinic,'* Jarvis says.

Accidental traveller

An accident then steered his career in another direction. *'I seriously damaged my knee, which temporarily affected my work, and I considered other options,'* Jarvis says. *'A colleague must have sensed that I had itchy feet, because he sent me an advert for a job in New Zealand.'* Incredibly, it was the same carbohydrate chemistry group that Jarvis had already been in touch with. *'They remembered me and were keen to have me,'* he says. *'I saw it as a chance to travel and gain new chemistry experience. It was one of the best things I ever did.'*

In New Zealand, Jarvis found himself working on large-scale chemistry. *'Before, I was interested in the products, but now I was concerned with the processes, and making compounds on a larger scale.'* It was also his first proper exposure to project management. While he enjoyed his two-year sojourn in New Zealand, and was certainly tempted to stay, eventually due to personal circumstances he left and spent two years in London.

In 2004, Jarvis took up a full-time position at the spin-out company, now based in Cambridge, UK. Arriving at NCE Discovery, a provider of medicinal chemistry services, Jarvis faced his largest project to date. *'I had to help assemble a team of chemists, set up processes and procedures and make sure everything was running smoothly - all the things you take for granted in a big company, I was suddenly responsible for,'* he says. Over time, he started spending less time in the lab and more time managing his team.

His current job suits Jarvis down to the ground. *'Being exposed to science on a daily basis is a big bonus and something I would miss if I ever changed job,'* he says. Regarding the future of his niche market, Jarvis is concerned about the amount of outsourcing to Asia. But, he says, *'UK-based service providers that specialise in medicinal chemistry are still ahead of the game compared with the Asian market.'* Jarvis seems well equipped to face the challenges of a career in medicinal chemistry. *'I feel that I'm in the right job at the right time, and that's very satisfying.'*

Chemistry on the web

► Bang! And your homework is fun...

Chemistry in Your Cupboard shows the chemistry behind familiar household products ranging from pharmaceuticals (Nurofen, Gaviscon) to cleaning materials (Cillit Bang, Finish).

<http://chemistryinyourcupboard.rsc.org>

► Chain Reaction

The Synthesis Explorer helps students plan and understand synthetic organic chemistry routes. Examine real-life physical, structural and spectral data for each individual compound. The spectral data is especially useful when illustrating reaction schemes that involve changes in functional groups.

<http://synthesiexplorer.rsc.org>

► So you think you're lucky?

Why not chance your arm at *The Quantum Casino* and learn more about thermodynamics!

Try these at:

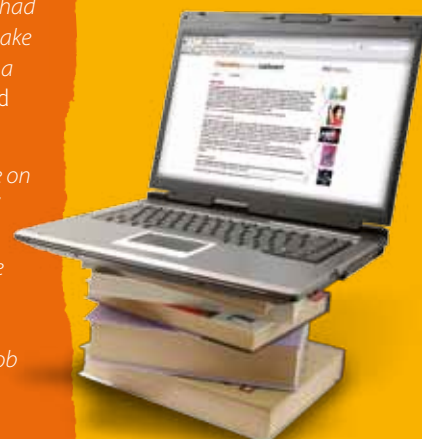
<http://thequantumcasino.rsc.org>

► Quick, pass me the antidote!

Ever wondered how chemists designed and made all the medicines we now can't live without? Try *The Design Studio* and learn about common diseases and the concepts of shape, enzyme inhibition, potency and drug-like properties that are needed to discover effective medicines.

Design your medicine at <http://thedesigstudio.rsc.org>

<http://thedesigstudio.rsc.org>



Win stuff

Dyes are extremely useful chemicals that have been used for thousands of years, but what was the name (and colour for a bonus point!) of the first dye made by a chemist? **Hint:** The chemist's name was William Perkin!

Send your answer by email to: chemnet@rsc.org with your name and ChemNet membership number.

Closing date 15th January. Two winning entries will each receive a copy of *Elegant Solutions*, showcasing 10 of the best chemical experiments of all time.

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

Cool Chemistry

In America, a recent trend has seen people take personal portraits to a new level – by making pictures out of peoples DNA profiles! The coloured images are produced by using molecular biology techniques to extract, amplify and take a digital image of the DNA. What do you think of this? Would you like to have your own made?

For more stories like this featuring the latest research from RSC journals, visit Chemical Technology on the web: www.rsc.org/highlightschemtechnol

Cutting-edge Chemistry

Smart windows convert light to energy

Increasing energy demands and concerns about global warming mean that the sun is an important inexhaustible and clean energy source. Dye sensitised solar cells (DSSCs) have proved to be a highly efficient and low-cost option for conversion of sunlight to energy.

Ruthenium dye photosensitisers have given the highest power conversion efficiency in the past but they are not very environmentally friendly and supply is limited, explains Eric Diau at the National Chiao Tung University, Hsinchu, Taiwan. Diau and his team took inspiration from nature by developing a dye based on porphyrin – a component of chlorophyll, which gives plants their green colour and allows them to convert sunlight into energy. They also replaced ruthenium with zinc, which is more abundant and costs less.

'a step further on the long-standing research into bio-inspired artificial leaves for photovoltaic applications'

Emilio Palomares, Institute of Chemical Research of Catalonia, Tarragona, Spain

A light scattering layer is often added to a DSSC to improve the efficiency of the device. But Diau's group found that their porphyrin dye performed better than a ruthenium dye in devices without adding a scattering layer. This also made the device see-through meaning it could be integrated into windows in the buildings of the future, explains Diau.

Emilio Palomares from the Institute of Chemical Research of Catalonia, Tarragona, Spain, says this represents *'a step further on the long-standing research into bio-inspired artificial leaves for photovoltaic applications'*. He adds that *'the high efficiency achieved using fully transparent devices makes the dye suitable for applications in smart windows which people can see through, while the window acts as an active light-to-energy conversion system.'*

Diau says that this type of light-weight, see-through and colourful DSSC could be very useful in the building industry. However, he sees some challenges ahead before it is commercialised: solar power conversion efficiency and the stability of the devices need to be improved, he says.

Article by: Fay Nolan-Neylan



An efficient artificial porphyrin dye is used to harvest solar energy in an organic photovoltaic device