chem cam

Chemistry at Cambridge Newsletter

Spring 2012

Unusual DNA and **medicinal chemistry**

Memories of Cambridge in the 1950s

Bioinorganic studies and teaching duties

A chat with the department's **deputy heads**

When Daan Frenkel became head of department in October, it was with the help of two deputy heads of department – Jane Clarke and David Wales. Sarah Houlton talks to them about their roles, and what they involve

Why does the new department structure have this 'triumvirate' headship?

David: Quite simply, because there is so much work involved – I don't know how Bill Jones could possibly have done this on his own! I've worked here for more than 20 years and I really had no idea what lay underneath the tip of the iceberg in terms of the amount of organisation and administration the department needs. The only way to do this and keep people sane is with a hierarchical structure, with layers of committees and delegated authority, which is what we now have. I think it's working quite well – we've had a reorganisation in terms of administrative staff, which has saved money while being more efficient. So Daan is the outward face of the department, I look after support and resources, and Jane is responsible for staffing issues.

It does sound like rather a large task for one person! So, Jane, what are your responsibilities?

Jane: I'm responsible for all sorts of personnel issues in the department. More than 900 people are employed within the department, including PhD students, postdocs, assistant staff, academic-related staff and academics, and my role includes overseeing all the human resources issues. This includes employment contracts, training, probationary procedures, career development, dignity at work, equality, bullying – all those sorts of issues fall under my umbrella. Any disciplinary issues that come up would also be under my remit.

I'm really well supported by support services manager Marita Walsh and welfare training and development advisor Victoria Blake, who are responsible for most of the personnel issues on a day-to-day basis, with academic secretary Howard Jones dealing with recruitment issues for the academic staff. We've also been creating career development reviews for postdocs and academics, to make sure they all get what used to be called an appraisal. We now have a system that is appropriate for scientists, trying to give postdocs and young scientists the opportunity to reflect on what they can do with their careers, focus on what they need to move on to the next step, and identify their training needs.

How well do you feel it's working?

Jane: Sometimes it feels very much like managing cats! It's very difficult, as we appoint academics because they are fantastic scientists, but very few have any training in management, leadership skills or leading groups. Some groups can expand rapidly, and for a young, enthusiastic scientist this can prove challenging. They may need help to be good at the 'people' side of the job, so we need to have proper, rigorous mentoring schemes. Every student and postdoc who comes in is assigned a mentor, but this isn't necessarily the most appropriate person to help them with everything. We are considering setting up a mentoring team, with a group of individuals who are prepared to offer different kinds of support, and people can go to different members of the team depending on what they are looking for. One might think career and work mentoring might best be done through their supervisor, who knows that area of science best, but if there are personal or personnel issues they could very well go to someone else for advice and support on how to deal with a tricky situation.

Photo: Nathan Pitt

David, what are your responsibilities?

David: I chair the support and resources, finance, and equipment and services committees within the department. Daan, Jane and I also meet together at least once a week, and consult with the senior administrators on a regular basis, too. We have delegated authority as far as possible down the committee structure, which is actually quite far! What has occupied most of my time recently is the new space guidelines. Space is one of the biggest challenges the department faces, and with the change in administrative structure there was no space management plan at all. There was no formal system for requesting space, or giving it back when it was no longer needed. We will be implementing the new space guidelines via a web-based interface, and it is being trialled on the third floor.

So how does it work?

David: It's simply a procedure that allows people to request more space if they need it after a grant has been awarded. The system is warned in advance that a grant application has been made and what extra space might be needed if successful, and it also contains a list of who is working with whom, who finishes when, and when fume cupboards return to the pool. I had to consult very widely with my experimental colleagues about all the things that, as a theoretician, I don't usually have to think about – storage, equipment and health & safety issues, for example. The quality of the space itself is very heterogeneous, and there are plenty of issues that might catch us out, but I think they have now been covered. An initial problem we faced was an absence of fundamental data – we didn't know who was occupying which desk or fume cupboard, or even office! These data should now be online with automatic updates, so when students arrive and depart the data can be fed from the administrative office into the system.

It will also help us think ahead so we can make realistic offers to new academic recruits – we can't offer them space that does not exist. We have earmarked, for example, part of the basement for the new Herchel Smith professor, and of course the new Melville professor's group will go into the Melville lab. We're also starting to fund-raise for a new building on Union Road (*for more about this, see the news story on page 5*). There are other issues that have to be taken into account – for example we can't create more fume cupboards on certain sides of the building because the plant is maxed out.

Of course we don't want anyone to be limited by space, but in order for that to happen we need to use what we've got more efficiently and flexibly, and perhaps instil a new ethos that people don't own space, but get to use what they need at the time, which needs to be reviewed periodically. If someone gives space up when their group decreases, they can expect to get it back if the group increases in size again. Of course, we can understand people being nervous about this! So we have to make sure that➢

continued on page 13

Colleague spotted

Dear *Chem@Cam*

In response to Byomkesh Biswas in the Summer 2011 issue of *Chem@Cam*, third from the left on the middle row is Peter Dawson, who both demonstrated to undergraduate classes in Lensfield Road and sang with me in the Sunday evening University services instituted by Revd Mervyn Stockwood.

He was a great talker and walker with whom Geoff Bedford and the late Brian Fraser – all chemists – and I shared an unforgettable walking holiday in Scotland in the Long Vacation of 1961.

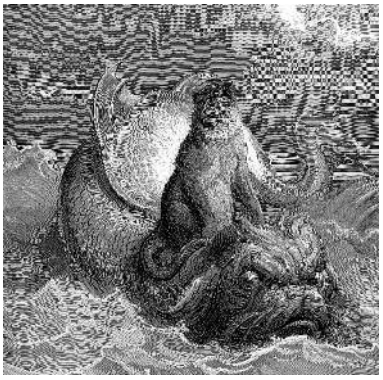
Peter hailed from the Stockton/Billingham area, but was very proud of his Scottish roots and, of course, we had to pay a visit to a ruined castle in Fife, seat of Clan Davidson and origin of his nickname, Tulloch. We sadly lost touch after going down.

Dr John P Dickinson
St John's, 1957–63
by email

What's the pic?

Dear Editor

It was interesting to note the back cover image of your *Chem@Cam* newsletter of summer 2011. I couldn't get the meaning of the image correctly. it resembles a picture of a monkey and a crocodile, I think, of a famous story book written in Sanskrit entitled Panchatantra of Vishnu Sharma of India.



I am very interested to know the source of the image, and whether it has any connection to the book.

Thanking you

Abhilash M.
by email

As with all the images on our back cover, it's a Gustave Doré engraving. This one dates from 1867, and it's a monkey and a dolphin, rather than a crocodile. It's one of Doré's illustrations of the 'Fables of Jean de la Fontaine,' published in the late 1600s. The original legend was (in translation!) 'The dolphin thought it was saving a sailor, but was dismayed to find it was carrying a chattering fool'.

A contemporary

Dear Editor

Thanks again for sending me *Chem@Cam* in e-form. I was especially interested in the article concerning Yusuf Hamied – we were exact contemporaries at Christ's, and I remember him well.

Yours sincerely

David Bronnert
by email

Any 1930s chemists?

Dear Editor

What a lovely winter solstice present it was to find my article in the Autumn 2011 *Chem@Cam*. Of course I am wondering whether anyone of my vintage still exists, and is still able to make a signal of any kind. Many thanks for brightening most pleasingly a very fortunate but unexciting exit span, and most heartfelt congratulations and thanks for what you do so elegantly for Chemists erstwhile at Cam.

Yours most appreciatively

Peter H Plesch
by email

eChem@Cam

Chem@Cam is now being sent out by email to those who have asked for a pdf version rather than a hard copy in the mail.

If you would like to swap your paper magazine for an e-version, then please send an email with the subject line 'eChem@Cam' to jsh49@cam.ac.uk, and we'll start to send you the mag electronically from the next issue. Don't forget to tell us your postal address so we can check that the correct person is being removed from the mailing list for the paper magazine.

If you're not sure what it will look like, you can check out e-back issues on the newly redesigned department website, www.ch.cam.ac.uk

Don't worry if you still want to receive a paper copy – we'll continue to print and mail the magazine for the foreseeable future, so you won't miss out!

chem@cam
Chemistry at Cambridge Newsletter

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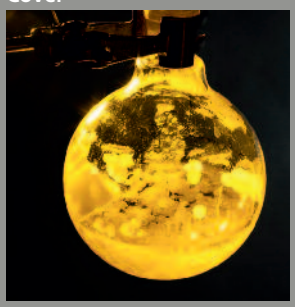

Crystals are the cover star this issue... These beauties appeared after a prolonged spell in the freezer for a sample of a 2,3-butanediacetal-protected compound made by Sean Newton, a PhD student in Steve Ley's group

Photograph: Nathan Pitt

This newsletter is published three times a year by the University of Cambridge Chemistry Department. Opinions are not necessarily those of the editor, the department, or the university.

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A visit from Singapore

Photo: Nathan Pitt

At the end of February, we hosted a delegation of eight academics from the division of chemistry and biological chemistry at Nanyang Technological University in Singapore.

Led by head of department, Prof. Soo-Ying Lee, the progtamme included an afternoon of presentations from academics from both departments, with topics covering a wide spectrum of chemistry. The visitors also toured the department, and had one-on-one meetings with various members of the academic staff.

This visit, which was Steve Ley's initiative, was designed to stimulate interactions between the two departments at a practical level. It follows on from the reciprocal visit last September by Oren Scherman, Erwin Reisner, Alessio Ciulli and Paul Barker to NTU.

As a result, there will be several new initiatives between our two departments, initially involving undergraduate research projects and moving towards joint PhD programmes. Watch this space for news about upcoming schemes.

Ruth's German prize

Ruth Lynden-Bell has been awarded the Paul Walden Award for 2011 for her work on ionic liquids by the German Research Foundation.

The winner of the award is chosen by a vote among the leaders of all 30 projects in the Foundation's ionic liquids priority programme. These projects cover the whole span of ionic liquids research, with topics covering synthetic, electrochemical, physic-chemical and theoretical aspects of the field.

As well as receiving a cash prize, Ruth will visit Germany this year for a lecture tour of the country's ionic liquid community.

The annual award was created in 2008 to honour international scientists for their research on ionic liquids. The previous winners are Hiro Ohno of the Tokyo University of Agriculture and Technology, John Wilkes of the United States Air Force Academy, and Tom Welton of Imperial College.

An uplifting experience

Visitors to the deparment will notice a slight change to the main entrance – there is now a disabled lift to give access to the building via the main reception area. It took about six weeks to install, starting during the Christmas break, and a stairlift was also put in at the other end of the building, as well as a couple of disabled toilets, one at each end of the building.

These works were all commissioned and funded by Estate Management to provide disabled access into the building. Previously, access was down the ramp and through stores, and while this technically met the legal requirements, in practice was far from ideal.

Photo: Nathan Pitt

A semantic chemical web

In January, the department hosted a three-day workshop and symposium on semantic physical science, with 25 invited visitors. Organised by Peter Murray-Rust with a lot of help from Charlotte Bolton, it is being recorded in a special issue of the *Journal of Cheminformatics*.

'We are inspired by Tim Berners-Lee's vision of the Semantic Web where humans and computer work together, and we see that already where people can ask their phones direct questions,' Peter says. 'We can do the same for chemistry – our OPSIN [Open Parser for Systematic IUPAC Nomenclature] is already better than any human at interpreting chemical names, and this can be extended to many other areas. As a start we are developing tools where chemical and maths equations can be understood and evaluated by machines.'

The event covered a lot of ground, with much that was new for many people, and many different possible ways of tackling semantics, he adds, with the immediate outcome being very good agreement on the value of semantics, what to do in the first instance, timescales and resources. Topics covered included computational chemistry, NMR and crystals, all with the aim of finding ways to make chemistry more accessible on the web.

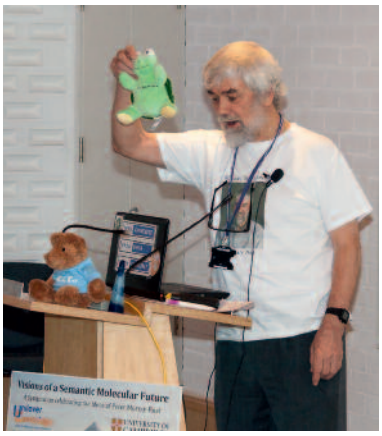


Photo: Caroline Hancox

Peter with Gulliver, the open access turtle

Photo: Nathan Pitt

Once again, the chemistry open day was a roaring success, with Peter Wothers' demonstration lecture proving as popular as ever. Look out for a full report and photos in the next issue of *Chem@Cam*!

Carol's Hopkins lecture

Photo: Caroline Hancox

A very familiar face returned to give the Alex Hopkins lecture this year – Carol Robinson. Carol, who moved back to Oxford a couple of years ago, gave a talk entitled 'Finding rhe right balance: from rare gases to rotary motors'.

The annual lecture, which relates chemistry to everyday life and contains an element of humour, is given in memory of Alex Hopkins, a much-loved teaching fellow at Churchill and Fitzwilliam, and who also played an important role in the department's inorganic teaching. The lecture is supported in his memory by Alex's father, John Hopkins.

Raising funds for Union Road

Fundraising is now under way for a new building on Union Road, between the Cambridge Crystallographic Data Centre and the Unilever building. This building would add high-quality office and laboratory space for research into the chemistry of health, such as age-related diseases. This space would ease the pressure on existing labs and offices and thus facilitate subsequent refurbishment in the rest of the Chemistry building

'The working idea is that the research in the new building will embrace all aspects of molecular medicine,' says David Wales, who chairs the department's support and resources committee. 'This is a very important area of science, and much of the department's research efforts touches on it. For example, with the tremendous importance of research into molecular approaches to age-related diseases, the new building would offer a unique opportunity for potential donors to make a real difference to society.'

Any successful department lacks space. However, our present occupancy is so close to 100% that it has an impact on our flexibility. With the addition of new, high-quality space, we would increase our capability to attract and retain the best researchers and industrial partners.

The department has already actively begun the fundraising effort, and a feasibility study is now under way. 'If a donor were to give us a cheque tomorrow, the building might be up and running in three years' time', David says. 'It will make a huge difference to the department, and our ability to address some vital problems that are facing society.'

Gareth Lloyd has been awarded the CCDC Chemical Crystallography Prize for Younger Scientists. The Herchel Smith postdoctoral fellow in Bill Jones' group has been recognised for his work on using crystallographic information to understand, control and utilise supramolecular chemistry to synthesise and design molecular materials. As well as a cash prize, he presented his research at the 2012 British Crystallographic Association's Spring meeting at the University of Warwick in April.
'The quality of the nominees for the prize was exceptionally high,' says Hazel Sparkes, chair of the BCA's Chemical Crystallography Group. 'However, the committee felt that during his career to date, Gareth has made an outstanding contribution to crystallography with some high impact publications.'

Lennard-Jones centre opened

The Lennard Jones Centre for Computational Materials Science was officially opened in December. It is named after Sir John Lennard-Jones, who was the first professor of theoretical chemistry in Cambridge, and also the first director of the mathematical laboratory where the basis was laid for all subsequent 'machine computing' in Cambridge. Its aim is to develop initiatives that will foster teaching and research on all aspects of computational materials science.

At the opening, held in the Unilever lecture theatre, Haroon Ahmed, former Master of Corpus Christi and emeritus professor of microelectronics in the Cavendish, gave a brief biographical sketch of Lennard-Jones, and described the early history of computing in Cambridge.

Volker Heine was also made the centre's first honorary member for his seminal contributions to the field of electronic structure calculations. He also gave an autobiographical account of the development of computational materials science at the Cavendish.

Photos: Nathan Pitt

Clockwise from left: Haroon Ahmed, head of department Daan Frenkel, and Volker Heiner

Cross-channel collaboration

Photo: Caroline Hancox

The Cambridge project team: Mark Eddleston, Bill Jones, Judit Galcera and Bhavnita Patel

A project in Bill Jones' group is part of an EU-INTERREG grant designed to strengthen collaborative activity in the 'two seas' region – involving the UK, France and Belgium.

The project, entitled 'Improving drug efficiency and availability', or IDEA, is a collaboration between his group and chemists, pharmacists and physicists in Lille, Ghent and Norwich.

The aim is to to discover new formulations of active pharmaceuticals that suffer from poor solubility in their normal solid forms.

The aim is to develop new cross-discipline strategies, ideas and technologies with the project funded to the tune of €2.6 million through to the end of 2013. It is hoped to build expertise across the three countries in areas of research that are directly applicable to small and medium-sized companies.

'An increasing number of new drug molecules are difficult to turn into effective oral dosage forms because of solubility and bioavailability issues,' Bill says. 'We have been focused on these problems in my group for some time, and this additional collaboration is proving extremely effective in catalysing new ideas for how we might go about solving these problems.'

An EPSRC fellowship for David

David Spring has been awarded an EPSRC Established Career Fellowship. This is the new top level of fellowship at EPSRC, combining the previous leadership and senior fellowship levels. It covers his salary for the next five years, along with support for his research programme, and is renewable for a further three years, giving eight years' support in total.

'Despite the negative press EPSRC is receiving in the context of funding for organic synthesis, we can certainly point to significant support by EPSRC for our organic chemistry research,' David says.

'Last year, my group was also awarded a large European Research Council grant, so with this combined support we have a strong foundation for our research going forward. It also keeps Howard Jones happy with the overheads!'

David's also been invited to give the Felix Serratosa Lecture in Barcelona next January, organised by the Catalan Society of Chemistry and the Real Sociedad Española de Química. He's in good company – previous lecturers include such luminaries as Nobel laureates Barry Sharpless, Bob Grubbs and EJ Corey.

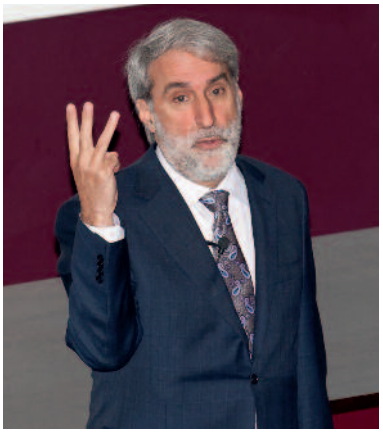


Photo: Nathan Pitt

This year's Lewis lecturer was Daniel Nocera of the Massachusetts Institute of Technology in the 'other' Cambridge. His science is focused on energy conversion in biology and chemistry, and the two lectures he gave were entitled 'Global energy challenge' and 'The artificial leaf.'

A prescient paper?

An interesting little snippet came our way from Jacek Klinowski, who tells us that apparently a paper of his was the 18th most downloaded paper from the journal *Chemical Physics Letters* in 2011. This might not sound that exciting – but in fact this paper, entitled 'A new structural model for graphite oxide', was first published in 1998 and hadn't provoked a great deal of interest in the past.

'It's an interesting story!' Jacek says. 'This perfectly decent paper was published 14 years ago, and was being cited about 10 times a year, until the Nobel Prize for physics was awarded to scientists working on graphene two years ago. It is now being cited more than 100 times a year, so it turns out to be very important. Fashion or prescience?'

Nicole's poster prize

Nicole receiving the award from Tom Caradoc-Davies of sponsors Australian Synchrotron

Nicole Lim, a PhD student in Sophie Jackson's group, won a student poster prize at the recent Lorne conference on protein structure and function.

The annual conference, held in the small seaside town of Lorne, just outside Melbourne in Australia, highlights leading-edge protein science, irrespective of its focus.

Her winning poster was entitled 'Single-molecule fluorescence studies of the folding of the knotted protein YibK', and her prize was a certificate and a cheque for $100.

Master Alan

Alan Fersht is to be the next Master of Gonville and Caius College. He will take up the position in October.

The recently retired Herchel Smith Professor of Chemistry remains extremely active in scientific research at the MRC Laboratory of Molecular Biology at Addenbrookes, with long-term funding including an MRC Programme Grant.

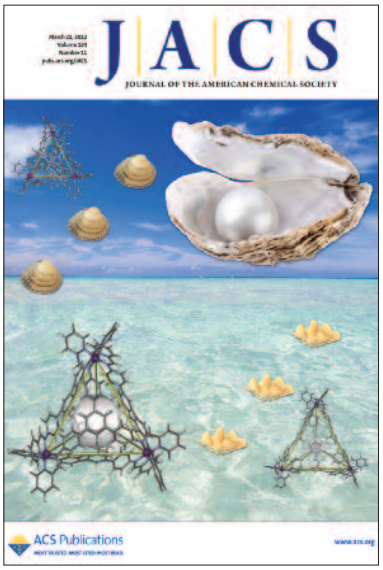
He has been on the academic staff in Cambridge since moving from Imperial College in 1988, and his links with Caius and the department go back to his student days.

A Future Fellow

Nandhini Ponnuswamy, who's a final-year PhD student in Jeremy Sanders' group, has been awarded a Faculty for the Future fellowship by the Schlumberger Foundation.

These renewable year-long fellowships are given to high-flying women from the developing world, with the aim of inspiring other female scientists to become influential role models in countries where women remain under-represented in science. Competition for them is intense.

Nandhini hails from India, and will be heading off to Harvard for a postdoc using the funding once she's finished her PhD.



A recent issue of the Journal of the American Chemical Society featured work from Jonathan Nitschke's group on the cover. The paper it illustrates describes a series of face-capped capsules with different cavity sizes. 'From a series of four different cages, only one encapsulates small organic guests successfully, as it combines sufficiently small pores with a large cavity volume,' explains PhD student Rana Bilbeisi. 'The rest of the cages are left as "spectators" as they are unable to participate in guest binding, as they are either too closed or too open.'

Is the future car electric?

Clare Grey recently took part in a Kavli Foundation online roundtable discussion on the future of electric cars, with two other experts in field. The aim was to highlight the main issues preventing the wider uptake of electric cars, and what is being done about them.

The discussion included Clare, who was awarded the Royal Society's 2011 Kavli Medal, Jeff Sakamoto from Michgan State University's department of chemical engineering and material science, and the popular science author Seth Fletcher.

It took place shortly after the North American International Auto Show, where many of the highlights were electric cars, both production and concept. However, batteries for electric cars are still in their infancy, and if electric cars are going to gain much greater market penetration, then lighter, more powerful batteries will be essential.

Topics covered included the improvements needed in batteries, whether that's by increasing the range between plug-ins, reducing cost or making them longer-lasting, safety in the light of reports of batteries catching fire, and how new batteries are being developed. It also looked at potential new battery technologies, and what changes in the political and commercial landscapes might encourage wider uptake of electric cars.

You can read a transcript of the discussion at http://tinyurl.com/cmsktbx

Deborah wins teaching prize

Deborah Longbottom has won one of this year's Pilkington Teaching Prizes, which recognise outstanding contributions to teaching within the university.

Teaching fellow Deborah splits her time between the department and Homerton College, where she is director of studies for chemistry.

'As one of the department's team of teaching fellows, I'm delighted to have won this award,' she says. 'The awards show that the university recognises excellence in teaching every year, regardless of department, and chemistry is no exception.'

Walters-Kundert Trust joins the Guild of Benefactors

On a gloriously warm and sunny day in March the Walters-Kundert Charitable Trust was inducted into the Cambridge Guild of Benefactors in recognition of the huge contributions that the late and much missed Eric Walters had made through the Trust to the chemistry department and to Selwyn College.

Eric was the first donor to support the department's Next Generation Fellowship scheme: the unrestricted research support that he provided for Carol Robinson, Jonathan Nitschke and Oren Scherman got their Cambridge research careers off to a flying start that has paid great dividends for them and for the department. In addition, he generously supported chemistry's annual Science Festival activities.

Eric's wife Katharina, daughter Katya, and son Eric spent the morning in chemistry meeting Daan Frenkel, James Keeler, Peter Wothers, Jonathan and Oren, and then had lunch at Selwyn where Jeremy Sanders was able to thank them while wearing three hats simultaneously: as Pro-Vice-Chancellor on behalf of the University, as a chemist and as a Fellow of Selwyn.

The early evening saw an enrobed Katharina participating in a splendid medieval-type ceremony in the Senate House, receiving a scroll on behalf of the Walter-Kundert Trust from the Chancellor, Lord (David) Sainsbury of Turville. The Chancellor had himself been installed earlier the same day in the Senate House.

At the dinner in King's College afterwards, it was clear the whole family had thoroughly enjoyed and appreciated the day as a fitting tribute to Eric and his passions for chemistry and education.

Jeremy Sanders

Don't forget to let us know if you change your address – or if you want to receive eChem@Cam instead of paper copies!

Exploring unusual DNA

Photo: Caroline Hancox

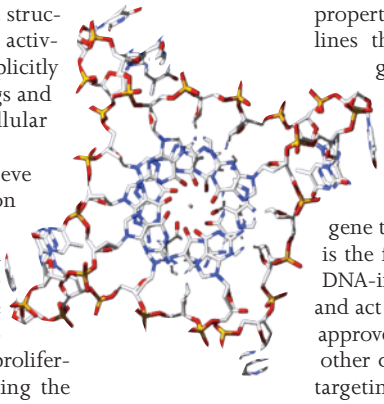
New links with the medical school have given a real boost to Shankar Balasubramanian's research into some of the unusual structures that can form in DNA

Since he was appointed as Herchel Smith Professor of medicinal chemistry, a joint appointment with the medical school, Shankar Balasubramanian has found it has had a real impact on his science. Now, not only does he have a lab here in chemistry, filled mainly with organic chemists plus a couple who specialise more in physical chemistry and biophysics, but he is now a senior group leader at the Cancer Research UK Cambridge Research Institute over at Addenbrookes. This centre is about five years old, and Shankar has a small lab there with six biologists.

'It's still one group, but people are free to visit the "other" lab, whether to carry out experiments, or simply to chat,' he says. 'It's allowing us to tackle problems in a way we couldn't before. We have several really valuable collaborative relationships with other groups, and we're now able to meet them more than half way as we can do a lot of the more sophisticated biological experiments ourselves. We now have expertise within the group in synthetic chemistry, biophysics, biology, informatics and computational biology.'

For more than a decade now, Shankar has been interested in the four-stranded DNA structures called G-quadruplexes. 'There has been a lot of excitement and optimism in the field recently,' he says. 'However, there are two central questions that no-one has really been able to answer. First, how do you show that these structures exist in cellular genomic DNA? And then, there are many papers in the literature about small molecules that target these structures, and some have biological activity. But ascribing that activity explicitly to interactions between the drugs and these structures within cellular genomic DNA is very difficult.'

A collaboration with Steve Jackson's group at the Gurdon Institute here at the university, and driven by postdoc Raphaël Rodriguez, has recently produced fascinating results. Some time ago, Raphaël found a molecule he'd designed had an antiproliferative effect in cancer cells, stalling the cell cycle, and effects typical of DNA damage were evident in the cells. 'Along with Steve, who is an expert in this area, we took markers for DNA damage, and applied the Solexa sequencing technology we invented together with Dave Klenerman some years ago,' he says.



The structure of a G-quadruplex

'You can take cellular genomic DNA, chemically cross-link all the associated proteins to the DNA, and then isolate the DNA from the cells and fragment it. If you have antibodies to a specific marker, you can enrich those fragments of DNA that are associated with it. And then you can sequence them in a massively parallel fashion, and identify where all of these markers bind in the genome.'

Using a DNA damage marker, they were able to show where in the cellular genomic DNA this drug molecule was causing functional damage. 'Raphaël mapped out all the sites in the genome where damage was occurring, and it turned out they were all in regions of the DNA sequence that we had predicted would fold into G-quadruplex structures,' he says. 'This was a very important observation as it is really the first example showing a quadruplex-targeted ligand is acting at sites where you would expect these structures to form.'

They then looked more closely at the genes in these regions, and there were only about 50 or so hotspots, many of which were known cancer-causing genes. It turned out that the drug downregulated the activity of many of these genes, and one gene, called Src, really stood out. This is a well-known oncogene – the first to be discovered – and it is also an important driver of many cancers, notably a number of aggressive metastatic cancers.

'The hotspot is right in the middle of this gene, and the drug downregulates it so much it almost silences it,' he says. 'Cellular assays were then run to measure the metastatic migration properties of cancer cells, and it turned out this molecule could inhibit the metastatic properties of some breast cancer cell lines that were being driven by this gene. This was important because this whole approach of using chemistry on the genome led us to strengthen the G-quadruplex hypothesis, and identify an unexpected but important gene target. As far as we are aware, this is the first example of mapping where DNA-interactive drugs actually bind and act on cellular genomic DNA. Many approved cancer drugs – and some for other diseases such as malaria – act by targeting DNA, but we don't really understand where. I think these approaches will be quite powerful in characterising DNA-targeting drugs in a way they have not been before.'

Another current project is looking at unusual structures that form in DNA, which is usually made up of four bases

– cytosine, guanine, adenine and thymine. However, these bases can undergo chemical modification, and the best known is the methylation of cytosine. '5-Methyl cytosine is an epigenetic mark – meaning it's a change in the DNA that does not alter the sequence, but it does alter the properties and function of the DNA and gene expression,' Shankar explains. 'It is also hereditable as it can be carried forward from one generation to another. But there are a lot of other chemical modifications to DNA bases that have been found in other organisms.'

He's interested in understanding the chemistry of DNA base modification in a systematic way. It's an emerging science – a further cytosine modification, 5-hydroxymethyl cytosine, was discovered in human DNA 2009, and last year two more were found – 5-formyl cytosine and 5-carboxy cytosine. 'In just a few years we've gone from four canonical bases and one dynamic modification to four canonical bases and four dynamic modifications in human DNA,' he says. 'This has happened because analytical approaches have become more sensitive and precise, and we can now see things that previously weren't visible.'

But what do these modified cytosine bases do? They are prevalent in stem cells and certain cancers, for example. And what other modifications might be present in human DNA that haven't been discovered yet? 'About 20 DNA bases have been discovered in nature, and more than 100 chemical modifications of bases have been identified in RNA,' Shankar says.

Identifying them has been a real problem, but work in his group by PhD student Michael Booth might just change that. He set out to discover new chemistry that would allow 5-hydroxymethyl cytosine and 5-methyl cytosine to be sequenced – while their existence was known, there was no way of accurately sequencing 5-hydroxymethylcytosine in DNA.

'There's an old chemical reaction using bisulfite that converts cytosine to uracil, and when it is sequenced it reads as thymidine,' he says. 'But it does not convert methyl cytosine. This allows you to difference-map the DNA and find the methyl cytosine. Mike has invented a chemistry that turn hydroxymethyl cytosine into another base, while leaving methyl cytosine alone.'

And it works. They've collaborated with Wolf Reik's group at the Babraham Institute to sequence strands of DNA using the new method and been able to identify – at a single base resolution – what proportion of the cytosine is in its normal, unmodified form, and how much in the methylated and hydroxymethylated states.

'It's a real breakthrough – and will work on any sequencing platform,' Shankar says. 'Our next goal is to map 5-hydroxymethyl cytosine at single base resolution for the whole three billion bases of the mammalian genome. It's all been made possible by a chemical reaction! Many colleagues working on stem cells and cancer are really interested working with us to use this new method in a clinical context, and find out whether there is any clinical relevance to patterns of these modified bases.'

Although it's evident that these modifications are present in human DNA and they are dynamic, their function remains unclear. They are present in brain cells, most of which do not divide, so Shankar believes it has nothing to do with replication. 'It appears that methyl groups are hopping on and off dynamically, and there's some evidence to suggest it is in response to a stimulus, so it is functional,' he says.

One idea for how the methyl is removed from cytosine in nature is by oxidation – first to hydroxymethyl, then formyl, then carboxy, which then drops off. 'There must be a reason why nature has evolved the sophisticated machinery to do this!' he says. 'We know that the methylated state of genes affects their activity, and it appears to be key for many cancers, and also, possibly, for normal biological function. It's early days, but we believe it is important. Now we can pinpoint where these modifications are, we hope it will help work out exactly what it is the modifications do.'

Shankar Balasubramanian

CV

Born: Madras (now called Chennai), India. He moved to the UK as a baby, and grew up near Runcorn

Status: Married to Veena, who's a GP. They have two children – son Sachin, who's 9, and eight-year-old daughter Sashi.

Education: A Cambridge degree in Natural Sciences was followed by a PhD with Chris Abell, and a postdoc with Stephen Benkovic at Penn State University.

Career: He returned to Cambridge in 1994 as a Royal Society research fellow, and was made a lecturer in 1998. He's now Herchel Smith professor of medicinal chemistry, a joint appointment with the medical school.

Interests: Spending time with his family, and running (to keep up with his wife and children!). He is also learning to play the piano.

Did you know? Shankar used to DJ in nightclubs in Cambridge and London, and along with two friends in the late 1980s set up Hitman Promotions, which promoted R'n'B and hip hop bands. 'This was the start of my entrepreneurial career!' he says.

Back row: Pierre Murat, Mehran Nikan, Ramon Kranaster, Chris Lowe, Neil Bell, Keith McLuckie, Anthony Bugaut; middle row: Helen Lightfoot, Keren Abecassis, Xavier Dorland, Shankar, Sina Berndl, Michael Booth, Liang Wu, Hamid Nasiri, Enid Lam, Debbie Sanders, Raphaël Rodriguez; front row: David Tannahill, Beth Thomas, Andrew Lewis, Amy Zhang, Nagaratna Hegde, Marco Di Antonio, Giulia Biffi, Eun-Ang Raiber, Kate Nix

Photo: Nathan Pitt & Caroline Hancox

A question of metal binding

When she's not teaching, Sally Boss is studying the coordination bonds ruthenium forms in biological systems, and how these might alter drug activity

Sally Boss combines her role as a teaching fellow with research in bioinorganic chemistry. Although her teaching duties keep her very busy, she still finds time to co-supervise two PhD students with Paul Barker, and a couple of Part III project students looking at how metals interact with biological systems.

'We're working with simple ruthenium organometallic complexes, trying to exploit the fact that metals form strong coordination bonds to Lewis bases in biological environments,' she says. 'We're trying to direct where these bonds form. The idea is to use organic molecules with clearly defined biological targets to try and direct where the metal will bind.

'We're working with a couple of different organic directing molecules,' she says. 'We are trying to tether our ruthenium organometallic complexes to these directing molecules. This might then direct the ruthenium into a specific target site where it will, hopefully, form a coordination bond with Lewis basic residues that are nearby.'

It is important to synthesise compounds with linkers that conjugate the organometallic part to the organic part at varying distances, so there is a freedom for the metal to find its optimum site without disrupting the binding of the organic part, she says. 'We are exploiting the fact that the chemistry of metal complexes is completely distinct from that of simple organic molecules. Can we exploit the fact that metals form strong coordination bonds to bind to and inhibit proteins?'

In the longer term, the work might have pharmaceutical applications. 'There has been a fair amount in the literature concerning the antitumour properties of ruthenium compounds, but a detailed understanding of exactly how these compounds exert their cytotoxic effect remains unclear' Sally says. 'It's not like the platinum-containing drug cisplatin, where there is a much clearer idea of the mode of action. But if we can control the system, then we may be able to find out more about how these ruthenium complexes exert their therapeutic effects.'

The questions she hopes to be able to answer are very simple, she says; for example, the oxidation state of the ruthenium might make it more or less therapeutically active. 'Of course, if you put a simple organometallic complex into a biological environment, it is likely that it will exchange some or even all of its ligands. The complex that is administered is rarely the one that exerts a toxic or therapeutic effect so it is a complicated problem to address.'

TEACHING DUTIES

During term-time, Sally's teaching duties mean there is little time to concentrate on research. Her contract is half-time in the department and the other half at Churchill college, where she is an undergraduate tutor and has pastoral responsibility for about 50 students. She's also an admissions tutor for natural sciences, medicine and veterinary medicine. 'It's fascinating to see the workings of the admissions process – just how much time and effort is put into selecting candidates,' she says.

It was a natural progression for her – she'd done a lot of supervising and demonstrating throughout her PhD here in the department, and really enjoyed it.

'This job came available at just the right time, and it was perfect for me,' she says. 'As an inorganic teaching fellow, I can continue teaching while starting to carve out my own research area.'

Within the department, her teaching includes lecturing the Part 1B coordination chemistry course, and supervising all of the inorganic chemistry courses for several different colleges. 'I really enjoy the supervision side of it, having the opportunity to talk in such depth with students who are really engaged with the subject, and ask you challenging questions every week,' she says. 'It's partly giving them the confidence to have a go at finding an answer without worrying about getting things wrong to start with – simply having a go is half the battle with inorganic chemistry!'

Sally in the lab (above) and teaching a group of sixth-formers on an outreach day (below left)

Photos: Nathan Pitt

CV Sally Boss

Born: Swindon, and moved to the Peak District when she was 2, going to school in Ripley

Status: Engaged to Sam Grace, a former Royal Marine and now a PE teacher. They will marry this summer.

Education: A chemistry degree at Bristol with a year spent in Heidelberg led on to a PhD here in Cambridge with Andy Wheatley

Career: In 2007, after a brief spell as a postdoc in Brian Johnson's group, she was appointed a teaching fellow in the department and at Churchill College, a joint position she still holds today

Interests: She's been riding horses since her schooldays, and owns one very well-behaved horse and half of a much more mischievous one – she claims ownership of the back rather than the front since the front half is somewhat more dangerous! She also spends a lot of time running, cycling and swimming with Sam

Did you know? Never mind a paper round, when she was a teenager she did a milk round before school. 'It was from 4.30am to 8am, which was good for the pocket money but it did mean that by lunchtime I was asleep so it was less good for my schoolwork!'

Norrish, Emeléus, Todd and a bit of a deluge

Howard Clark writes to us from his home in Canada, with some memories of his time in Cambridge Chemistry in the 1950s

Chem@Cam always makes interesting reading and I am delighted to receive it. The summer 2011 issue contained news from John Ogilvie, whom I remember from about 1958–59 as an undergraduate who attended lectures I gave in inorganic chemistry at the University of British Columbia.

I have been intending to write to you for some considerable time. This issue brought back memories of both Cambridge and UBC, and I can no longer refrain from writing.

John's mention of Charles McDowell, head of the UBC chemistry department, reminds me of the Norrish visit to UBC at about that time. Following Norrish's first weekend in Vancouver, I recall Charles recounting to a group of faculty members, gathered one Monday morning casually over coffee, that he had taken Norrish on the previous Sunday for a trip by car up the recently opened road along Howe Sound to Squamish, and beyond to the then undeveloped and largely unpopulated area where Whistler now stands.

Charles recounted that immediately on entering the car, Norrish had extracted from some pocket a bottle or flask from which he steadily sipped, more interested in its contents than in the spectacular mountain scenery all about him. On the return trip, Norrish, not surprisingly, just went to sleep!

My own Cambridge experience occurred in 1955–57 with those years spent in the Emeléus group. On my arrival from New Zealand, I found that an Australian, Tom O'Donnell, had started some work on molybdenum hexafluoride, and Emeléus suggested that I might be interested in exploring the chemistry of vanadium pentafluoride about which little was known. My first year was spent at Pembroke Street, much of it in a very small room that had obviously originally been the demonstrator's office off the large undergraduate lab which most of the Emeléus group then temporarily occupied.

Photos: Antony Barrington Brown

From the left, with varying degrees of fierceness: Norrish, Emeléus and Todd

My room contained, in its fume hood adjacent to the single door entry to the room, the fluorine generator. This monster, on loan from ICI, contained the molten electrolyte of approximate composition KF.2HF, and it was temperamental. Unpredictably, it would occasionally spurt out on to the floor, gobs of the electrolyte, as a result of which all glassware in the room, including bottles on the shelves, were etched. The windows overlooking Pembroke Street were completely opaque from the etching!

THE MOVE TO LENSFIELD ROAD

The Emeléus group was the very first to move to Lensfield Road in 1956, followed then by the organic people. The very first person to move into the new building was Bill Brett, an Australian, who was asked by Emeléus to move one of the last remaining soda glass vacuum systems (used in Emeléus' silane work and perhaps inherited from Viktor Gutmann), with Fred Munn's help, to Lensfield Road.

The working of soda glass required prolonged and careful annealing with the torch, a task which Bill and Fred found quite impossible since the unfinished building was still a construction site and there were frequent and unpredictable shut-downs in the gas supply. Every piece of glass-blowing shattered and two more frustrated people would have been hard to find!

In the next few weeks, they were followed by the rest of the inorganic chemists on to the new fourth floor, and three of us were assigned the first large room along the corridor overlooking the Leys school yard. One of us, another 'colonial' just arrived in Cambridge, set up as his first piece of experimental work. This was a reflux apparatus for solvent purification and drying, to be left refluxing overnight.

Unfortunately, he did not wire the rubber water leads onto the condenser, and during the night one slipped off, causing a considerable flood. By some mysterious route, some of the water descended into Lord Todd's office, two floors down on the corner of the building, and landed on his new, unused magnificent teak desk.

The three of us were cleaning up in the lab the next morning when we had a visit from Harry Emeléus. He had been told of the flood and came to warn us that we could expect a visit from Lord Todd. Todd was naturally a big tall imposing figure, but the angry, red-faced Lord Todd who arrived in our room not long after was truly an awesome sight!

He proceeded to tell us, without any questioning and in somewhat choice language, that all of us were incompetent idiots who should never have been let loose in a chemistry laboratory, and we should consider ourselves severely reprimanded.

At the time, I felt a bit indignant that all three of us were blamed equally when it was obvious who the real culprit was. In retrospect, I am sure that Emeléus had already told Todd that the person responsible had only just arrived in Cambridge, and that Todd deliberately cast the blame on all of us equally rather than descend too vigorously on one poor individual just commencing his research career.

In a day or so, Fred Munn told us that the new desk had to be sent out for refinishing before poor Lord Todd could ever start using it in the office for which he had waited so long.

Calling the class of 1972!

Chem@Cam was minding her own business in the Lensfield Road 'Emeritarium' (© Alan Battersby) one lunchtime in March when the phone rang. At the other end was Doug Yarrow – who was rather fortunate to find anyone at the C@C desk – wondering if we could help track down some of his ex-labmates from the Lewis/Johnson lab from 1972.

He's already managed to get hold of six of his contemporaries, and plans are afoot for a 40-year lab reunion – but he's rather hoping to find the rest of his colleagues from those days. Contact has been made with Messrs Evans, Howell, McCardle, Domingos and Ashley Smith, but what of the rest? Are they reading this issue of *Chem@Cam* – or do you know where they are?

The missing people are John Segal, Colin Eadie, Reg Matthews, Reg Davies, John Wellsman and Robert Edwards. 'Any help you could give in tracking them down would be most welcome!' Doug says.

'Also, we don't want to exclude anyone, and if there was anyone else in the lab who's not on this list whom our deficient memories have failed to recall, then please get in touch too!'

Chem@Cam is, of course, delighted to be of service, and please get in touch via news@ch.cam.ac.uk if you can help Doug out in his quest. If he succeeds, we look forward to the photos!

A plea for more information

Tis the season for requests, clearly… Matthew Fletcher, who studied Natural Sciences at Cambridge in the late 80s and early 90s, with a Part II in Chemistry, is now a chemistry teacher. He writes:

Dear Editor
It may be that my enquiry is best answered by an appeal to the magazine's readership, but perhaps you are able to assist. I have recently discovered that T. M. Lowry (of acid theory fame) was a pupil at Kingswood School, where I teach. My pupils and I were very excited by this discovery!

I've been searching for further information about him and found his obituary in *J. Chem. Soc.* 1937 p. 701 (and others, elsewhere), and a few other references to him on various websites. From these, I learnt that he was the first Professor of Physical Chemistry at Cambridge (1920-1936), so I wonder if there is any information about him in the department's archive. I believe the department awards an annual Lowry Prize for postgraduate student presentations (is that correct?).

I'd be particularly interested in any photographs of him at Cambridge and information about his involvement with the local Methodist Church (Kingswood is a Methodist Church School). Also, I have not yet discovered to which college he was affiliated.

Thanks for any help you may be able to give me.

Matthew Fletcher

Chem@Cam's first port of call was Brian Crysell, who always seems to know everything about old members of the department (even those who predated him by some years, like Lowry!). He was able to track down this photo, and also an obituary from Nature which identified his college as Trinity Hall, and the fact that his father was a Methodist chaplain.

There were some other fascinating nuggets in this obituary, such as his involvement in the Trench Warfare and Chemical Warfare committees, and during World War I he devoted himself to problems connected with high explosives, and acted as director of shell-filling from 1917–19.

But after that, the trail went cold. Do any of our older readers remember Lowry? Or can anyone enlighten us further about his history or chemistry? Let us know!

The only portrait of Lowry we can find... can anyone tell us more?

➢ continued from page 2

people know they are entitled to ask when they need more space, but if it's not needed any more, please give it to someone who needs it now.

Overall, how do you feel it's going?

Jane: Sometimes I feel like the department's mother! Some weeks I have people through my door every day with issues and problems. But if I can help make the department more supportive of people, and a kinder, gentler place to work, then I would be happy.

Like so many workplaces, it can sometimes feel a little like a bear-pit – everyone is so keen to get their research done, and they may not realise that while they might feel personnel matters are getting in the way of research, we all actually have legal responsibilities as employers and managers. And, of course, happy students and postdocs are much more productive!

I find it interesting that more issues are coming through my door now than were last year. I think that's because people, particularly assistant staff, now feel more directly involved in the department. I'm proud to have been involved in setting up the assistant staff committee, which helps them find out directly what's happening in the department, and it's been really successful. I think maybe people now have the confidence that if there's a problem, action will definitely be taken. So although more issues are coming to me, I think it probably means we're making progress as they feel the system is more open. But it does take up a great deal of my time, and I'm only going to do this for one more year.

Did you have any idea how busy the role would make you when you agreed to take it on?

David: Well, I didn't think it would be quite as much work as it is! But a lot of this has been the start-up and putting processes in place that will be more efficient in the future.

At the start, we had still to recruit some of the people needed to support the new structure, particularly Daphne Kaufhold, who is the head of department's executive assistant, and is handling issues ranging from email enquiries being filtered and sent to the appropriate person, to identifying those things that had fallen through the cracks previously. So it should work better in the future, and we hope will take up less of everyone's time.

If everything works properly, it should take the lower level issues away from the senior members of the department, who shouldn't have to get together quite so often to discuss things that ought to be sorted out at the research interest group level. I haven't measured the amount of time it takes up – I just do what needs to be done. It's coincided with by far the most productive time ever for my research in terms of grants and group size, and my role has changed somewhat, away from hands-on programming towards more fundamental direction of new theories and applications. This is working well, thanks to the fact that I have a wonderful group.

Are you finding it satisfying?

Jane: It depends on the day! Some weeks I feel that all I've done is listen to people's stressful stories, but for the most part, yes, it's very satisfying. You have to pay back – the department's been good to me and I really appreciate the opportunity to work in one of the best chemistry departments in the world.

I'm also really committed to encouraging more women to stay in science. All the evidence is that if the working conditions are good that would encourage more young women to think science is a career they would like to have. You don't have to be aggressive to be a great scientist – it should be possible to thrive if you are a gentle, collaborative and supportive sort of person.

David: Yes – I really enjoy both discovering new things and helping people, either directly through collaborative research, or indirectly, by facilitating research. You can get a lot of personal satisfaction from resolving problems.

I'm trying to fulfil my responsibilities without being overstretched, and remain available to my group whenever they need me. My door's always open if I'm not in a meeting, and research is still my number one priority, but helping this wonderful department to run and reinforce its position as, arguably, the best chemistry department in the world is a very worthwhile objective.

Messing about on the river

Photo: David Ponting

Krit in bumping action, fourth from the back

While this year's boat race provided the most drama anyone can remember (and a Cambridge win, to boot), this issue *Chem@Cam* reports on a much more arcane version of the sport – bumps.

Pretty much peculiar to Oxbridge, it's rowing as a contact sport, and *Chem@Cam* got chatting to Krit Sitathani, who's doing a PhD in the surface science group under Steve Jenkins, and just happens to row in Downing's second boat. He only took up rowing after coming to Cambridge from Liverpool a couple of years ago – there, he took part in various different martial arts. So switching to combat rowing seems somehow appropriate.

There are two bumps races a year, the Lent bumps and the May bumps (which, being Cambridge, of course, are held in June). It's a four-day event, with each boat taking part in one race a day. There are usually multiple divisions (races) per day, and during each division 17 boats line up about 1.5 boat lengths apart. When the cannon is fired to start the race, they all set off and try to hit the boat in front of them. If they succeed, that's the end of their race for the day, and also for the boat that's been hit.

The boats then swap places in the starting lineup for the next race. 'This means you can normally only go up four places in a set of races, although there are also occasionally "overbumps", where you hit the a boat 3 places ahead if the boat in front of you have 'bumped' out,' Krit says.

Krit's boat did pretty well in the Lent bumps this year – they managed to bump the boat in front each day, earning 'blades'. 'Only a small number of crews out of the 112 crews this year earned blades – which is much better than being hit every day and being awarded "spoons"!' he says.

'The thing about earning blades is that it not only requires being a decent crew, but also a good amount of luck. You might be faster than the boat in front, but it's not guaranteed that you will hit them - or they might hit the crew in front of them first, leaving you an awful lot of ground to catch up to get an overbump.'

Clear as mud!

A baby boy…

This issue's dose of bonny baby loveliness comes in the form of Thomas Jack Atkins, son of Catherine Atkins, who's Chris Abell's secretary, and her hubby Steve, who's a senior software tester at a data mining company. He made his appearance on Easter Monday last year, almost 13 days late, weighing in at an impressive 8lb 12oz and, his mum says, with the loudest cry known to man!

Catherine's now back from maternity leave and sent us over this rather lovely photo of a smiling Thomas to celebrate. 'He's now a reformed character, very happy and smiley,' she says. 'He loves birds and is constantly pointing them out in the garden, doing baby signing for bird and saying "ba". He loves cows as well, and can say "moo".' She adds that he can eat for England – and is rather keen on rough play with his three-year-old sister Lucy.

…and baby birds

Photo: Caroline Hancox

Pigeons were proving to be something of a menace to those who work underneath the area around the entrance to stores – they roosted on the windowsills, and the resulting, ahem, deposits they made were making it rather unpleasant to work beneath.

One pigeon had made a nest there, which was cleared away before she could lay any eggs, but she sneaked back, made another, and laid eggs straightaway. This time, the nest was allowed to remain, and as soon as her hatchlings made their first flight, the ledge was cleared and spikes erected to prevent a repeat performance.

But that wasn't the end of the story for intrepid Mrs Pigeon – she built another nest, this time on the metal trough that collects rainwater outside the link corridor between the main building and the Unilever. While this provided a spike-free environment, it wasn't exactly very bright, as Rebecca Myers, whose office is right next to it, reports. 'When I finished for Easter it was raining, and she was busy shoring her nest up with the help of other family members to keep her eggs out of the rising water,' she says. 'Their attempts were in vain and her nest flooded, and her attempts to build another nest further up the trough outside the library office window were thwarted.'

As *Chem@Cam* went to press just after Easter, Rebecca reported that for the previous couple of days the family had been huddled up nearby. 'It was either in grief, or plotting their next move,' she says. If they have any sense, she'll find another, safer nesting spot!

Comings & goings

Retired
Phil Gallego

New staff
Tom Sweet
Simon Chapman
Adriana Costa

After many years working for the university, the past 10 of them in chemistry, glass blower and former *Chem@Cam* cover star Phil Gallego retired back in December. He's pictured with his wife Yvonne and Bill Jones at his leaving do

Christmas charity

In the run-up to Christmas every year, we hand the car park over at weekends to the South Cambridge Rotary Club, who then charge Christmas shoppers to park there.

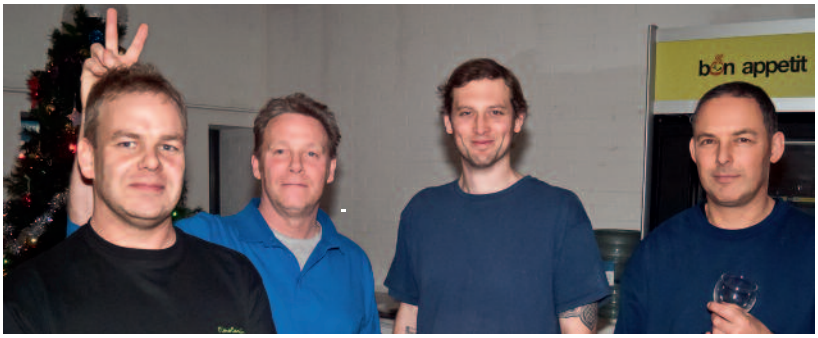
This year, the chemistry car park raised an impressive £2665, with the money going to Standing Start, Jimmy's Night Shelter, Wintercomfort and Hearing Dogs for the Deaf.

Photo: Nathan Pitt

Cheers at Christmas!

Another Christmas, another chance to get together with assistant staff old and new over a drink. Nathan Pitt took the photos

Clockwise from left: Pat Chapman, Katherine Abell and Phil Gallego; Marita Walsh, Anne Railton and Bill Jones; Victoria Blake, Sue Cowan and Liz Alan; Andy Milner, Russell Oates, Matt Bushen and Richard Preston



Clockwise from left: Emma Graham and Caroline Hancox; Tiger Coxall and Roger Ward; Jane Snaith and David Plumb, Erwin Reisner, Julie Lee and Chris Wilson; Bill Jones and Sue Johnson

Last issue's solutions

Literary chemistry

David Wilson's chemistry-to-arts puzzle drew many compliments from readers. The answers were Brideshead Revisited, Frankenstein, Ivanhoe, Northanger Abbey, Kidnapped, Prometheus Unbound, Great Expectations, Agnes Grey, Villette and Silas Marner.

One or two readers gave the answer to the PB Shelley The Cenci or The Cloud, which are technically correct so we've allowed them, even though they're not what David said.

Correct answers came from Robert Mather, Martin Robiette (who claims to have been upbraided by his old mate Tom Banfield for not sending in answers in the past), Karl Railton-Woodcock, Alison Griffin, Morgan Morgan, Martin Firth (who confesses he graduated in 1981 and thus had to look up some of the elements – and, worse, Villette – but he still looks forward to receiving Chem@Cam, and is continually surprised by how much of the chemistry he can still understand!), John Nixon, Paul Stickland, John Carpenter, Richard Moss, Anthony Jenkins, Richard Brown, Derry Jones, John Collier (who says he took a break from his A-level marking – Cambridge board, of course – to do the puzzles), Godfrey Chinchen, Tim O'Donoghue, Kimberley Whittaker, Rob Broughton, Jim Dunn, John Turnbull, Helen Stokes, Audrey Herbert and A.J. Wilkinson.

As it's currently a lovely sunny day, *Chem@Cam* is working in her alternative home office, in full sight of a bird feeder. So avian chance was allowed to pick the winners – how many birds it took before a non-sparrow appeared on it. The 14th bird after we started counting sparrows (there are rather a lot of sparrows in these parts) was a spectacular northern cardinal, so the £20 prize goes to Derry Jones.

ChemDoku

Our ever-popular Chemdoku puzzle produced its usual clutch of correct answers, and the sneakily-absent element was rhenium.

Correct solutions from: A.J. Wilkinson, Robin Foster, Audrey Herbert, Helen Stokes, John Turnbull, Jim Dunn, E Davies, Tim O'Donoghue, Godfrey Chinchen, John Collier (who says his periodic table coffee mug proved invaluable in identifying rhenium), Richard Brown, John Carpenter, Tom Banfield, Chris Hubbard, Alex Mckeeman, Robert Blyth, Morgan Morgan, Alison Griffin, Karl Railton-Woodcock and Martin Robiette.

This time the sparrows got out of the way rather sharpish, and we only had to wait four birds for a house finch to show up. So the prize is on its way to Helen Stokes. Congratulations!

This issue's puzzles

Spot the missing element

A short-but-sweet puzzle reaches us from Karl-Railton Woodcock in Australia. He says… What do the following chemical elements have in common, why are they listed in this not-quite-alphabetical order, and which missing element would complete the group?

Al, Ar, Ca, Co, Ga, In, La, Mn, Mo, Mt, Ne, Nd, Pa and Sc.

PVC labelling

As that one was so short we have room for a bonus puzzle from regular contributor Graham Quartly. He says…Professor Haddock was so pleased with his discovery of words on elemental cubes – the puzzle in last summer's issue – that he investigated placing letters on different polyhedra, and was enthralled to find the 12 letters C, D, E, H, I, L, N, O, P, R, V and Y could be placed on a dodecahedron such that a path between adjacent faces could be traced out, spelling polyvinyl chloride. The challenge is to find another combination of letters that will allow another recognised chemical to be traced out. The 12 faces must all have a different letter, and the path be between neighbouring faces, thus ruling out any double letters, such as in 'ferric chloride'. The longest valid chemical name wins.

ChemDoku

Au					Na	Ag		
	Sn	Sb			Fe			
			Pb	Sn				Hg
	Ag				Pb	Sb		Sn
Fe		Sn	Ag				Hg	
Hg				Fe	Ag			
			Na			W	Pb	
		Ag	Sn					Na

£20 prizes are on offer for each puzzle. Send entries by email to jsh49@cam.ac.uk or by snail mail to Chem@Cam, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW

Usual rules, usual prize... but what do these elements have in common?!

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Thanks to the generosity of the department's Corporate Associates, we have been able to benefit the education and environment for students and staff. For example, the Associates make significant contributions to the library for journal subscriptions. Moreover, they provide exam prizes, faculty teaching awards and summer studentships, and have recently funded the refurbishment of a state-of-the-art meeting room with teleconferencing and display facilities.

Corporate Associate membership not only provides essential support for the department, but also provides numerous benefits to help members work with us and achieve their business objectives. Members enjoy many benefits through their enhanced partnership with the department, such as:

- Visibility within the department;
- A dedicated meeting room and office for members to use while visiting the department;
- Invitations to recognition days and networking events at the department;
- Access to emerging Cambridge research via conferences, special briefings and various publications;
- Access to the department library and photocopying/printing facilities;
- Regular communications about upcoming events and colloquia;
- Subscriptions to department publications, including *Chem@Cam*;
- Priority notification of and free access to departmental research lectures;
- Ability to hold 'Welcome Stalls' in the department entrance hall;
- Preferential conference rates;
- Free access to the teaching lectures held within the department;
- The full services of the Corporate Relations team to facilitate interaction with students, staff, and other parts of the University of Cambridge to help achieve your corporate objectives.

If your organisation would be interested in joining the Corporate Associates Scheme, then please email Sian Bunnage at cas-admin@ch.cam.ac.uk, or call 01223 336339.

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When you said there was a new disabled lift, I didn't think that was quite what you meant...

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