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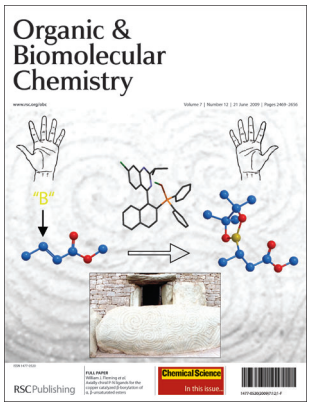

Cover

See William J. Fleming *et al.*, pp. 2520–2524.
Irish chirality old and new: the spiral background is taken from a 5000 year old Irish design found at the entrance to a Neolithic passage tomb at Newgrange, Ireland. The entrance to the tomb is shown in the inset image.

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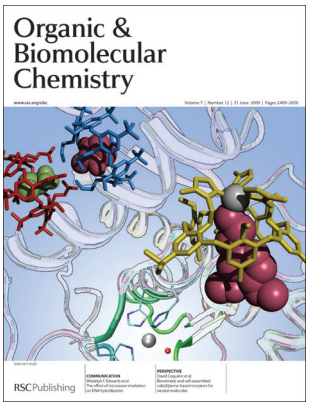

Inside cover

See David Coquière *et al.*, pp. 2485–2500.
Calix[6]arenes shaped into conic *funnels* through biomimetic coordination chemistry or self-assembly are remarkable receptors for neutral guests. Their versatility allows tuning and switching behaviours.

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Chemical Science

June 2009/Volume 6/Issue 6

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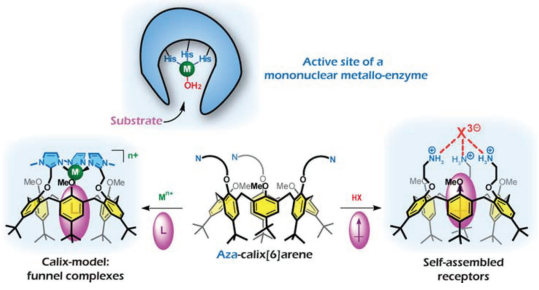
PERSPECTIVE

Calix[6]arenes shaped into conic *funnels* through biomimetic coordination chemistry or self-assembling display remarkable hosting properties for a wide variety of neutral guest molecules. The versatility of the system allows tuning and switching behaviours.



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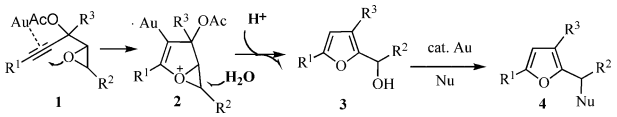

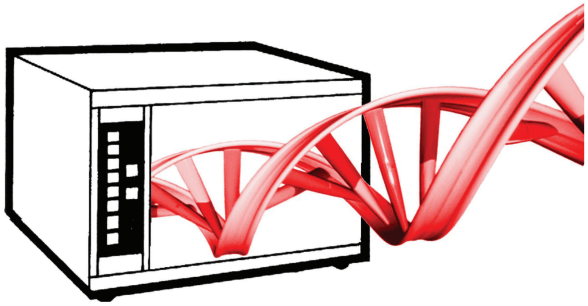

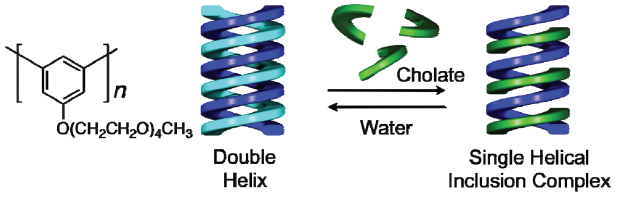

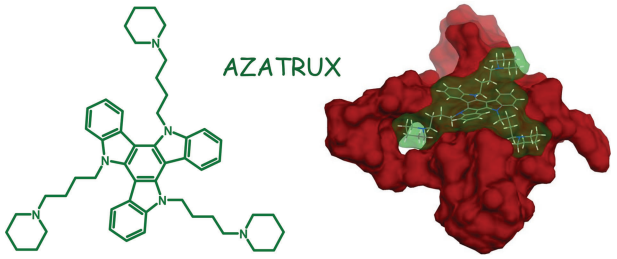

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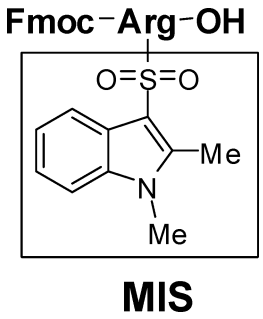

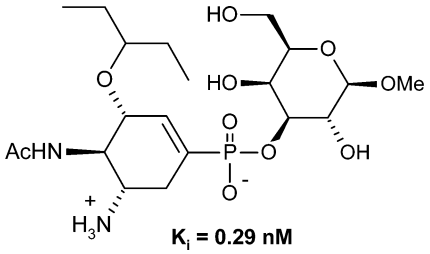

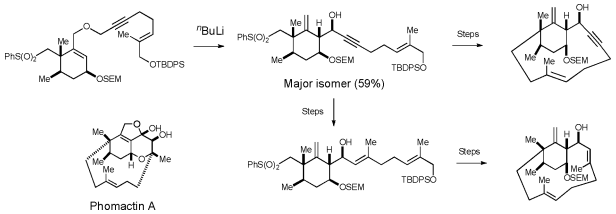

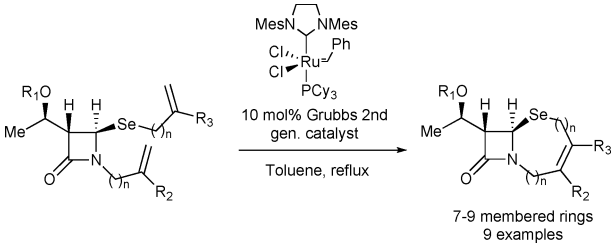

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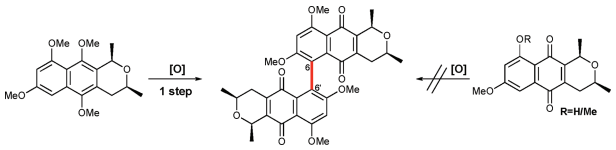

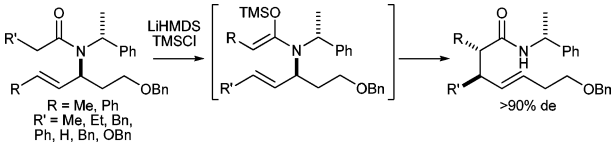

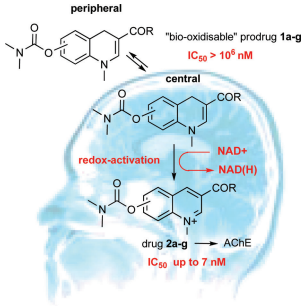

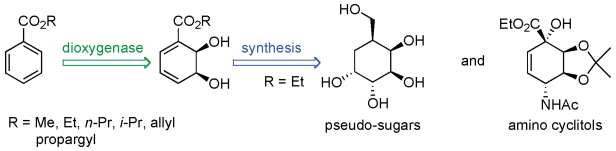

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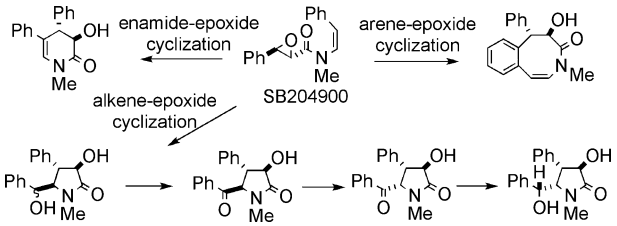

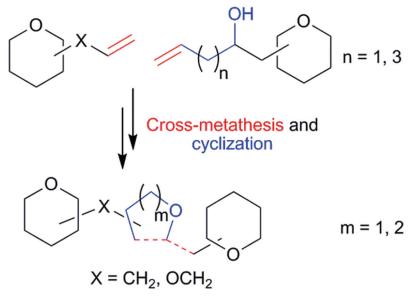

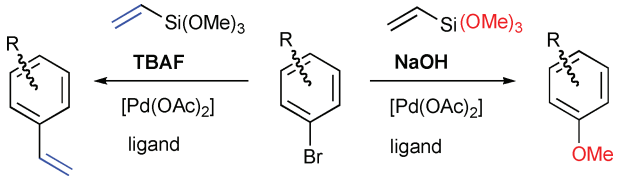

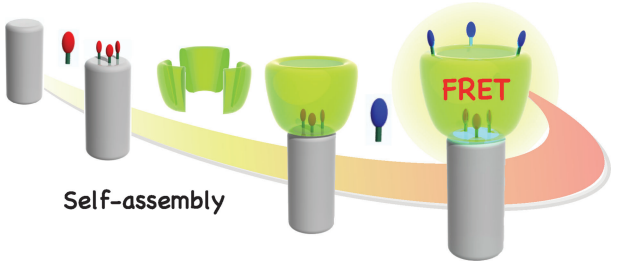

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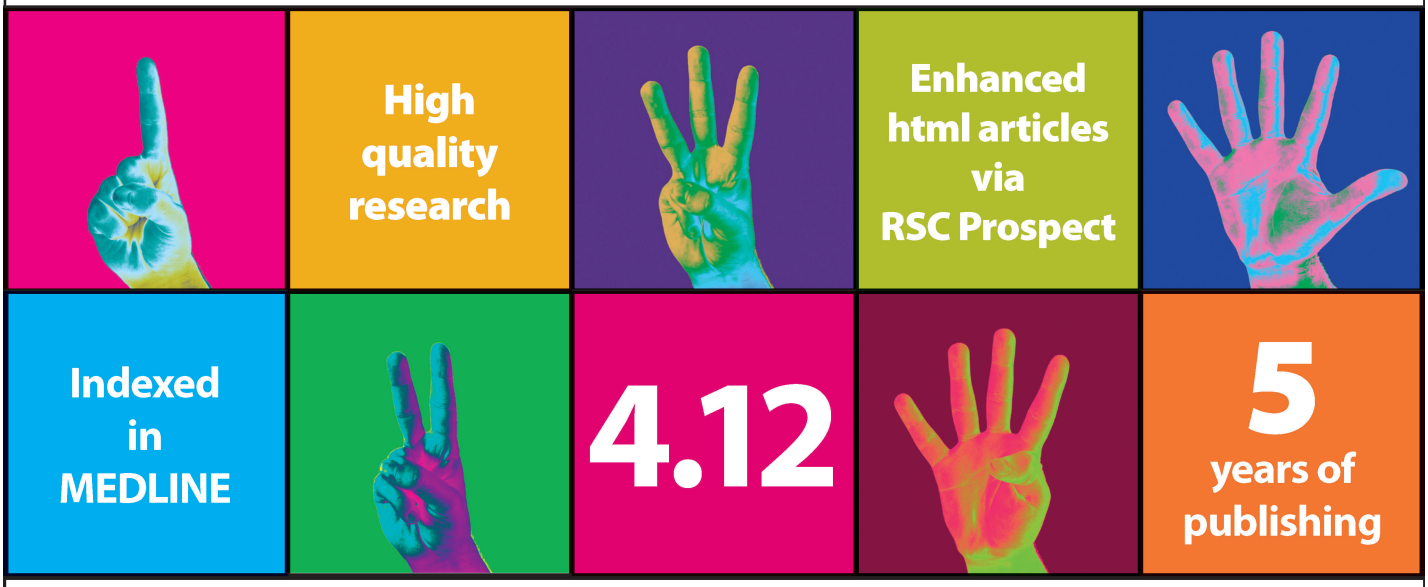

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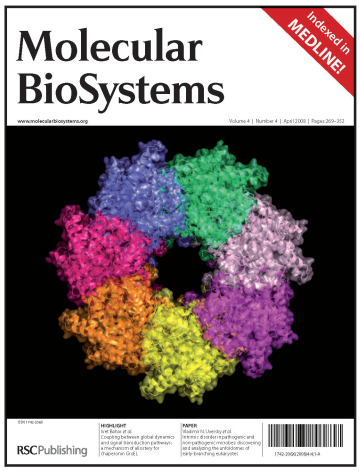

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Chemical Science

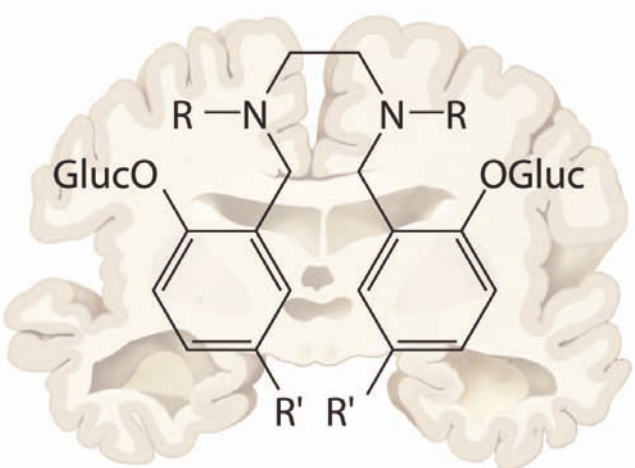
Fresh hope in battling Alzheimer's disease with three-pronged attack

Attacking Alzheimer's disease

Canadian scientists have been inspired by analytical chemistry to attack Alzheimer's disease from all sides.

Chris Orvig from the University of British Columbia, Vancouver, and colleagues made multifunctional compounds to target amyloid plaque formation, a possible cause of Alzheimer's disease. Amyloid plaques are protein clusters with metal ions that accumulate between neurons in Alzheimer's patients' brains. Orvig designed his compounds to combat the protein misfolding and metal–peptide interactions involved in amyloid plaque production as well as the oxidative stress that occurs (a condition that damages cells, caused by excess free radicals). 'We aren't 100 per cent sure about the order of things and the exact interplay,' explains Orvig. 'We thought that if we could attack them all, then who knows?'

Orvig's compounds are glycosylated tetrahydrosalens, metal-binding compounds protected by carbohydrates. The carbohydrates are there to stop the compounds binding to any metals before reaching their target, and to improve the compounds' solubility and uptake by the brain. Once absorbed by the brain (whose fuel source is sugar), the carbohydrates are removed by enzymes – this activates the compounds' metal-binding properties. Orvig tested his compounds in vitro and found that they prevent metal–peptide interactions by binding to the metals themselves as well as being potent antioxidants that could combat oxidative stress, a major feature of neurodegenerative diseases.



The metal-binding compounds would work against Alzheimer's in three ways on reaching the brain

Shuang Liu, an expert in metallopharmaceuticals from Purdue University, Indiana, US, says that he would like to see results from in vivo trials but thinks that Orvig's idea is great.

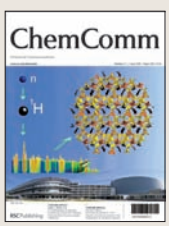
Orvig says his idea was inspired by Ashley Bush's use of Clioquinol, a metal-binding compound, to treat Alzheimer's at the Mental Health Research Institute of Victoria, Australia. 'I was stunned because Clioquinol is closely related to a gravimetric reagent (compounds that bind metals strongly to allow the metals' weight to be determined) for metals, something we used in analytical chemistry in the 1960s and early 1970s,' he says.

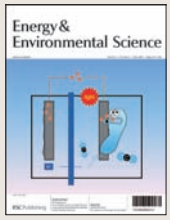
Despite a lack of progress into research on compounds related to his tetrahydrosalens, Orvig says he knows that these compounds are able to cross the blood–brain barrier. 'We're very excited about the project,' he says. 'It offers a new strategy for Alzheimer's treatment, beyond current therapies, which only offer symptomatic relief.'

Laura Howes

Reference
T Storr *et al*, *Dalton Trans.*, 2009, 3034 (DOI: 10.1039/b902545f)

In this issue





A snapshot of the latest developments from across the chemical sciences

Research highlights

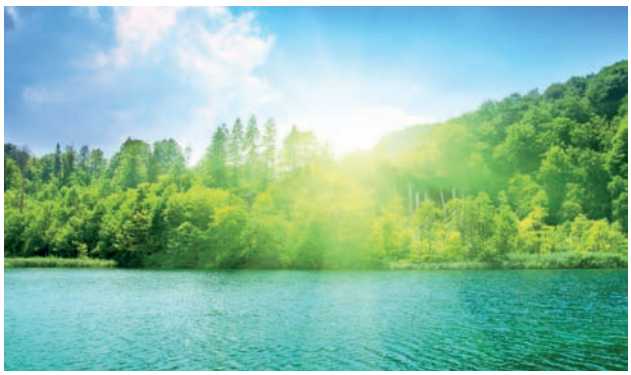
Natural light removes pharmaceutical pollutants from river water

Sunshine cleans up rivers

UK chemists have gained new insight into the fate of pharmaceuticals released into river waters. Their strategy takes into account the effect of sunlight which is not currently part of environmental risk assessment, they say.

Qin-Tao Liu at AstraZeneca in Devon and colleagues have found that β-blockers, drugs used for treating heart conditions, degrade in sunlight through a process called phototransformation. These drugs are not removed from water by standard sewage treatment due to properties, such as water solubility, that allow them to interact with the human body, explains Liu. This has led to concerns about how long they persist in the environment.

By comparing kinetic measurements of river water samples under simulated environmental conditions in the light and the dark, Liu found that β-blockers were quickly removed from surface water by phototransformation in light conditions. This is in contrast to dark conditions like those of sewage treatment plants where the main routes for pollutant removal are biodegradation and sedimentation.



Cleaner water can be provided by sunlight

The current EU environmental risk assessment regulations do not include phototransformation, explains Liu, which means the risk of some pharmaceutical drugs may be hugely overestimated. 'Our strategy addresses the need for a holistic way to understand the fate and behaviour of pharmaceuticals in surface waters,' she says.

Linda Lawton, an expert in water quality monitoring at Robert Gordon University, Aberdeen, UK, highlights the importance of studies such as this looking at the many factors affecting compound degradation. 'It will be challenging to ultimately define the combination of factors that should be explored when determining the persistence of these trace contaminants, but the work goes a long way in addressing some of the key factors,' she says.

Liu explains their approach could be developed in several ways in the future. This will include testing for different pharmaceuticals, understanding how different water parameters such as salinity and microbial populations affect degradation, and also investigating how the phototransformation products impact on the environment. 'This will help develop a framework for integrated fate testing of chemicals in the environment,' she says. *Katherine Davies*

Reference
Q-T Liu, R I Cumming and A D Sharpe, *Photochem. Photobiol. Sci.*, 2009, DOI: 10.1039/b817890a

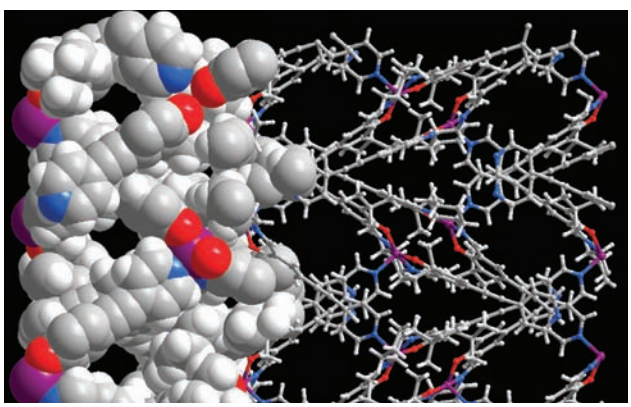
A bendy, twistable polymer could improve oil refining

Stretch, bend and twist

A bendy polymer that can recognise and separate aromatic hydrocarbons from aliphatic mixtures has been developed by Chinese scientists.

Yong Cui and colleagues from Shanghai Jiao Tong University built the porous 3D polymer using a flexible 1D polymer made from metal units bound to salen ligands (chelates, or claw-like compounds, made from salicylic aldehyde and ethylenediamine). The resulting structure bends and twists when its polymer chains stretch, triggered by guest molecules – the aromatic compounds – entering or leaving the structure. The structure's flexibility and the host–guest interactions within its hydrophobic channel allow it to bind to and separate these compounds from aliphatic mixtures.

'In the refinery process, separating aromatic hydrocarbons from aliphatic hydrocarbon mixtures is challenging,' explains Cui. This is because the hydrocarbons have similar boiling points or form azeotropes (mixtures of two or more chemicals that can't be separated by simple distillation). 'Although azeotropic and extractive distillation can be used for this separation, both processes suffer from high operational costs,' says Cui.



The polymer can recognise and separate aromatic compounds from aliphatic mixtures

Cui adds that his polymers are readily tunable, so polymers with different functional surfaces in the channel – hydrophobic, hydrophilic or amphiphilic – could be developed. Darren Bradshaw, an expert in metal–organic frameworks at the University of Liverpool, UK, says that Cui's polymer framework 'could be an effective design strategy for future applications. What is also interesting is that many transition metal salen complexes are catalytic, so Cui's material and its derivatives may also be useful selective heterogeneous catalysts.'

Cui says that in the future, he hopes to balance his polymer's flexibility and stability to generate a semi-flexible porous framework that can be recycled without adsorption and selectivity losses. *Emma Shiells*

Reference
G Li *et al*, *Chem. Commun.*, 2009, 2118 (DOI: 10.1039/b901574d)

Chemists have made and characterised a compound containing 136 metal atoms

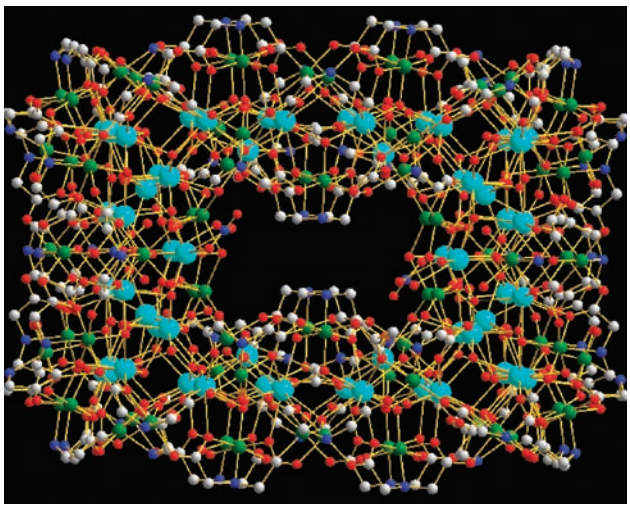
A simple route to a complex cluster

Chinese scientists have synthesised a giant cluster containing 60 lanthanum and 76 nickel atoms, the largest of its type.

The four-layer cluster contains both first- and third-row transition metals, making it a member of the so-called 3d-4f family. A variety of these complexes have been made, some with over 100 metal atoms, but this one, which has a maximum dimension of 31 Ångstroms, is the largest so far, says Zhiping Zheng from Xiamen University and colleagues.

Zheng's team made the compound by mixing lanthanum nitrate, nickel nitrate and iminodiacetic acid (a ligand for the reaction) with sodium hydroxide at 80°C. They filtered the resulting suspension and evaporated the filtrate to give the cluster as blue block-shaped crystals.

Zheng says that determining the compound's structure by single-crystal x-ray diffraction is challenging because of disorder within the crystals. Nevertheless, they were able to deduce the exact arrangement of atoms, and found that the cluster consisted of four distinct shells. In addition, interactions between the metal atoms gives the cluster magnetic properties, something that will be the subject of further work, says Zheng.



The giant cluster may have an application in molecule-based magnets

Reference
X-J Kong *et al*, *Chem. Commun.*, 2009, DOI: 10.1039/b822609a

The conditions used to make the cluster are better controlled than in syntheses of similar compounds because they avoid the use of high pressure, says Zheng, who adds that 'other closely related clusters may be readily accessible simply by using different transition and lanthanide metal salts.' This, he says, will help to establish the structure–property relationships of these materials, which may have applications as molecule-based magnets.

Lawrence Dahl, an expert in cluster chemistry at the University of Wisconsin Madison, US, is impressed by the work. 'The formation under carefully controlled reaction conditions of this highly organised four-shell architecture is indeed amazing.' He looks forward to further results in the field, saying that Zheng and coworkers have 'opened the door to an exciting new diversity of nanosized transition-metal materials.'

David Barden

Birds' beautiful colours may not be due to pigments

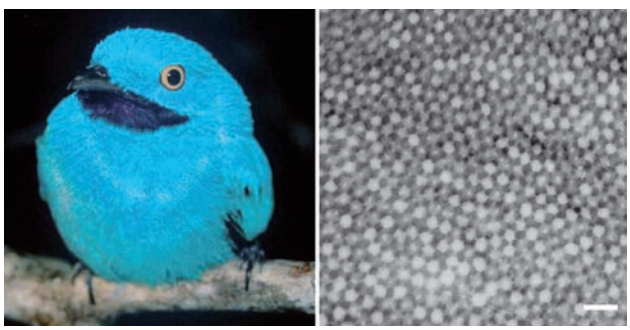
Attracting a mate, nano-style

Some of the most vivid colours in the animal kingdom are produced by nanostructures scattering light, rather than pigments, say US researchers.

Eric Dufresne and Richard Prum from Yale University and colleagues looked at how bird feather barbs, the structures that branch from the main feather shaft, give birds their colours. They found that the barbs contain nanostructures that scatter different light wavelengths, producing the colours.

The nanostructures, which consist of a protein called β-keratin and air, are made when the protein in the feathers' cells starts to polymerise. The polymer separates from a part of the cell called the cytoplasm. This is phase separation (unmixing), which stops when the protein's fibres become entangled.

Many bird species may have evolved to control these processes, suggest Dufresne and Prum. The colours depend on the way the nanostructures are arranged. For example, in the Eastern Bluebird (*Sialia sialis*), which has a blue-black plumage, the nanostructures are made up of β-keratin bars and air channels in twisted forms. The turquoise plumage of the Plum-throated Cotinga (*Cotinga maynana*) could be caused by its spherical nanostructures.



The Plum-throated Cotinga's turquoise colour could occur because of nanostructures in its feathers

Reference
E R Dufresne *et al*, *Soft Matter*, 2009, **5**, 1792 (DOI: 10.1039/b902775k)

Colour plays an important role in social and sexual communication in the animal kingdom. Any variation in nanostructure dimension could result in ineffective social or sexual communication signals.

As well as helping us to understand the mechanisms underlying the evolution of beauty in nature, Dufresne adds that his research has the 'potential for finding a new class of photonic (light-emitting) materials, based on disordered, instead of periodic structures.'

Dufresne and Prum say they hope to explore the phase separation of feather protein in vitro and conduct analyses of other coloured biomaterials. This future work would indicate whether similar self-assembly mechanisms are widespread, they say. *Michael Brown*

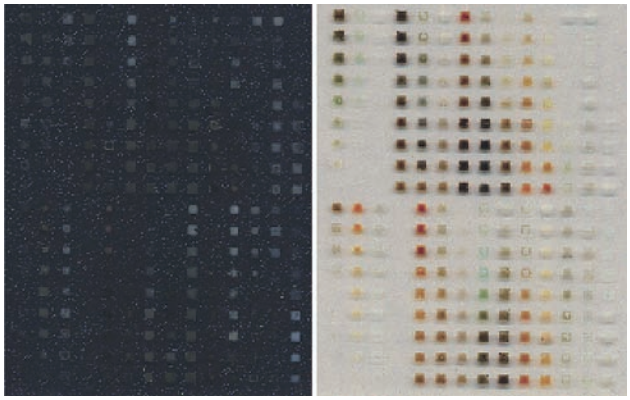
An inkjet printer could be the answer to getting our energy from water

Printing solution to hydrogen production

US scientists have used an inkjet printer to produce large numbers of photoelectrodes in search of the ideal material to split water molecules and release hydrogen.

Hydrogen is in demand as an alternative energy source and a cheap and efficient method of producing it is a desirable goal. Splitting water molecules using sunlight's energy fits the bill but there is a need for effective photoelectrodes to do this. Some photoelectrodes, such as metal oxide semiconductors, have long-term stability in sunlight but are inefficient at energy conversion; others exhibit high energy conversion efficiencies but are unstable in sunlight. There is a need for materials with both properties and a fast method to find them.

Now, Nathan Lewis and co-workers at the California Institute of Technology, Pasadena, think that they may have found the solution. Lewis used combinatorial chemistry, which allows large numbers of compounds to be produced at once, to make approximately 200 potential photoelectrodes at a time. They mixed metal ion solutions and printed them into 200 wells on glass coated with tin oxide using an inkjet printer. They then heated the solutions on the glass to form mixed metal oxides. The team tested the oxides for their ability to absorb sunlight and convert it into energy in a high-throughput fashion.



200 new compounds at a time could be printed out and screened for water-splitting activity

This allows a large database of compounds and their properties to be built up quickly and, as Lewis explains, the data could be used to 'guide exploration of additional sets of materials for desirable activity in photoelectrochemical solar-based water splitting.'

P Davide Cozzoli, an expert in nanocrystalline semiconductors from the University of Salento, Lecce, Italy, believes this method will ultimately lead to 'new photocatalytically active semiconductors for cost-effective production of alternative eco-friendly fuel molecules, thus overcoming the inherent limitations of materials available in nature.'

Elizabeth Davies

Reference
J E Katz *et al*, *Energy Environ. Sci.*, 2009, **2**, 103 (DOI: 10.1039/b812177j)

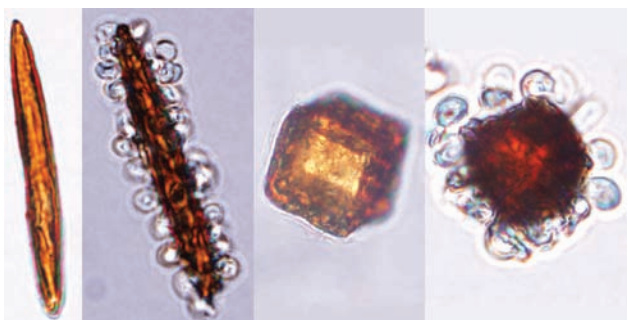
Scientists have made living cell clusters that could explain evolution

Introducing cellosomes

Chemists have produced living multicellular structures that could show how organisms evolved in nature and be used in tissue engineering.

The structures, termed cellosomes, were made by Vesselin Paunov from the University of Hull, UK, and Rawil Fakhrullin from Kazan State University, Tatarstan, Russia. The pair built up the structures by layering yeast cells on to aragonite (rod-shaped) and calcium carbonate (rhombohedral) templates. They coated the yeast cells with a negatively charged polyelectrolyte layer and the templates with a positively charged polyelectrolyte to encourage attraction between them. They then dissolved the templates with ethylenediamine tetraacetic acid to give rod- and rhombohedral-shaped, hollow 3D cellosomes.

Paunov and Fakhrullin coated the templates with magnetic nanoparticles so they could manipulate them with an external magnetic field. KiBum Lee, an expert in nanotechnology and cell biology from Rutgers, The State University of New Jersey, US, says that 'the magnetic property will be very useful for selective sorting and separation of cells.'



The rod- and rhombohedral-shaped cellosomes are made by layering yeast cells onto templates

The team analysed the clusters with fluorescence microscopy and found that the yeast cells were still active in the cellosomes, which remained viable for at least two weeks if stored at 4°C. The cellosomes resemble primitive multicellular organisms to a certain degree, so we could speculate that nature has used a similar assembly mechanism in evolution, comments Paunov.

The technique, Paunov says, 'works not only with yeast cells but also with virtually all kinds of cells. Just imagine the possibilities of combining our technique with stem cells. There are tremendous opportunities for novel ways of engineering tissues – their shape can be directed by the shape of the template.'

'We are currently working on a simpler technique to produce living cellosomes of various shapes and from different types of cells,' concludes Paunov. 'We are combining several types of bacterial cells to produce symbiotic colonies, which is the next step in the design of an "artificial" living multicellular organism.' *Alexandra Haywood*

Reference
R F Fakhrullin and V N Paunov, *Chem. Commun.*, 2009, 2511 (DOI: 10.1039/b902260k)

Instant insight

Agents of destruction

Ivan Parkin and Michael Wilson from University College London, UK, look at how to make hospital-acquired infections a thing of the past

MRSA (methicillin-resistant *Staphylococcus aureus*), *Clostridium difficile*, *Acinetobacter* and *Enterococcus* species – these microorganisms are now virtually household names, and with good reason. The organisms are responsible for hospital-acquired infections that lead to over 5000 deaths in the UK alone each year. They are an enormous burden on the healthcare system – around 10 per cent of admitted hospital patients in the UK develop an infection.

A pressing issue is that the bacteria are developing a resistance to antibiotics, and some strains don't respond to therapy at all. In a race to develop new classes of antibiotics before the bacteria develop resistance, it is clear that the bacteria are winning. An alternative and certainly more desirable way to reduce infections is to prevent them starting in the first place. This can be helped enormously by strict hygiene control; however, bacteria are quite evasive in avoiding complete destruction.

Hospital surfaces, for example door handles, ward fabrics and plastics, can act as reservoirs for the microorganisms and so are implicated in many infections. To tackle these problems, scientists are looking for ways to make the surfaces permanently antimicrobial. The strategy involves either making surfaces that are very difficult for microbes to attach to, or to make surfaces that kill microbes on contact.

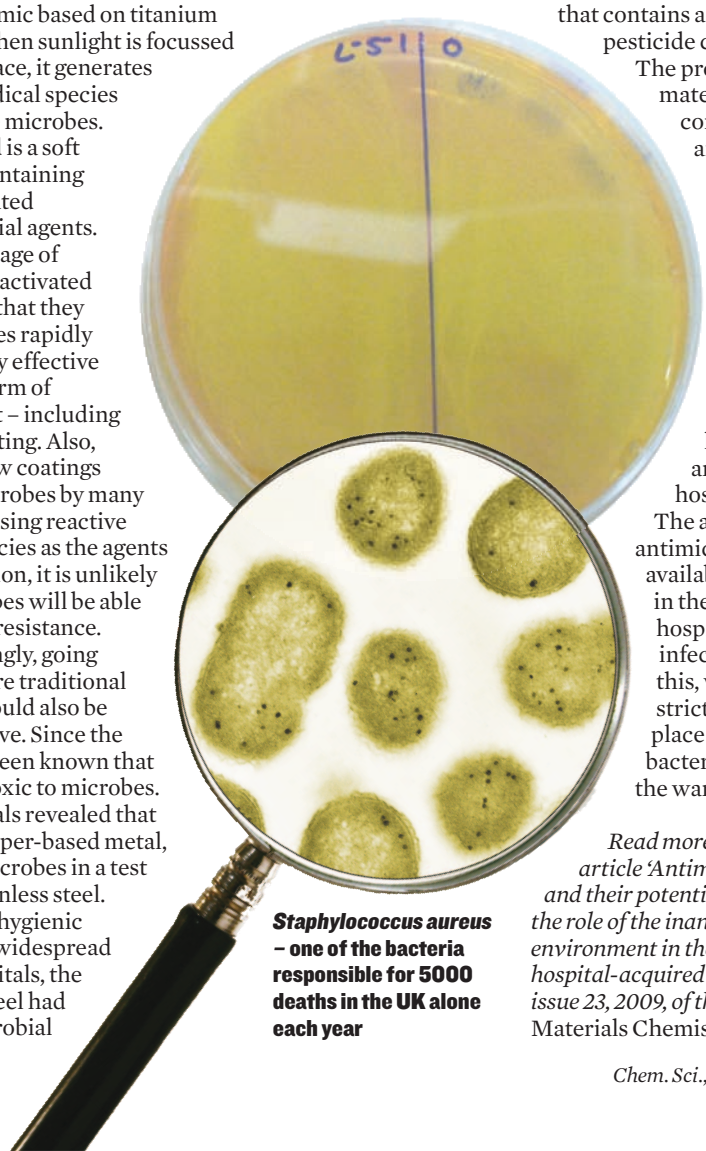
One type of surface that prevents microbes from sticking to it is called the easy-clean surface. This works by stealing a trick from nature – called the 'Lotus effect' – where plants have developed water-repellent surfaces to keep themselves free of microbes and parasites. The surfaces cause water to form spheres that spin and roll across them, picking up microbes as they go. An alternative approach is to have a hard diamond-like carbon surface that microbes find very difficult to adhere to.

To kill microbes on contact, scientists have developed two new coatings. Both use light to activate materials within them. The first is a hard ceramic based on titanium dioxide. When sunlight is focussed on the surface, it generates reactive radical species that kill the microbes. The second is a soft polymer containing light-activated antimicrobial agents. The advantage of these light-activated coatings is that they kill microbes rapidly and are very effective with any form of visible light – including indoor lighting. Also, as these new coatings can kill microbes by many pathways using reactive oxygen species as the agents of destruction, it is unlikely that microbes will be able to develop resistance.

Surprisingly, going back to more traditional methods could also be very effective. Since the 1980s, it's been known that copper is toxic to microbes. Clinical trials revealed that brass, a copper-based metal, reduced microbes in a test against stainless steel. Despite its hygienic image and widespread use in hospitals, the stainless steel had no antimicrobial activity. So an act as simple as replacing stainless steel fixtures and fittings in hospitals, such as push plates on doors, with brass ones could have an effect. Many antimicrobial coatings are already in use but have yet to be adopted within the healthcare environment. These include AgION, a coating that releases antimicrobial silver ions, and Microban, which is a polymer that contains a registered pesticide called triclosan.

The problem with these materials is that they continually release antimicrobials into the environment, making it easier for microbes to build up a resistance to them.

The ideal surfaces, then, should be permanent, hard-wearing and work under hospital conditions. The armoury of antimicrobial coatings available offers hope in the fight against hospital-acquired infections, yet despite this, we still need a strict hygiene regime in place too, or we give the bacteria a chance to win the war.



***Staphylococcus aureus* – one of the bacteria responsible for 5000 deaths in the UK alone each year**

Reference
K Page, M Wilson and I P Parkin, *J. Mater. Chem.*, 2009, DOI: 10.1039/b818698g

Read more in the feature article 'Antimicrobial surfaces and their potential in reducing the role of the inanimate environment in the incidence of hospital-acquired infections' in issue 23, 2009, of the Journal of Materials Chemistry.

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Interview

Solutions and cocktails

Mimi Hii talks to Christina Hodkinson about making a difference in medical diagnostics and how to ace your PhD viva

Mimi Hii

Mimi Hii is a senior lecturer in inorganic chemistry at Imperial College, London, UK. Her key research interest lies in the development of catalytic processes for organic synthesis. As a member of the Applied Catalysis Group committee within the RSC's Industry & Technology Forum, she is actively involved in the promotion of catalytic science to academia and industry sections within the UK. She is a member of the scientific committee that is organising a session entitled 'Catalysis for a Sustainable Future' at the forthcoming IUPAC meeting in Glasgow (August 2009).

What is your earliest recollection of science?
As a little girl, I was always fascinated by how things work – often taking things apart, like my piano and my granddad's radio, to have a closer look!

What's the trickiest problem you've had to overcome in your research and how did you solve it?
In terms of science, the nature of my research area throws up all sorts of technical and practical problems on a daily basis, and there is never one solution that cures all. I am an optimist in this regard – every problem is 'tricky' until it is solved, whereupon it becomes patently obvious and we say 'How did we miss that?'

Working out how to establish and sustain an active research programme in today's funding climate is a very tricky non-scientific problem.

You've worked in Leeds, Oxford and now London – how would you say the chemical research community differs in these cities?
Each academic institution has its own unique history, character and culture. However, good science can flourish in any environment, provided there is enough support, a shared passion and a common goal. I am proud to have worked in departments that have produced some of the world's greatest scientists. To think that they used to roam the same corridors as I do is a very inspiring thought!

What projects are you working on at the moment?
We are developing new catalytic methodologies for atom-economical reactions, for example, OH and NH additions to C=C bonds, and their application to the synthesis of complex organic molecules. The synthesis of optically active materials (asymmetric catalysis) is particularly challenging.

Recently, I have also started collaborative projects with colleagues in chemical engineering, tackling redox reactions that are particularly problematic in synthetic chemistry.

What motivated you to specialise in the development of selective catalysts for C–C and C–X coupling?
As an undergraduate, I was fascinated by the ability of metals to alter the reactivity of organic molecules. On the other hand, I am also amazed by the complexity of organic molecules that have unique biological activities associated with one particular optical form. Doing what I do, I get to work with the best of both worlds – exploring the unique reactivity afforded by organometallic chemistry and constructing complicated organic molecules selectively.

What are your ultimate goals in research?
I'm working towards the day that all reactions will be performed efficiently, starting from the most accessible materials, with no extraneous steps and no waste.

You're interested in cross-disciplinary work, including chemical engineering and medical diagnostics. What draws you to these areas in particular?
Interdisciplinary work gives me a glimpse into problems in other disciplines, and it is incredibly satisfying to know that I am able to offer a solution using my chemical knowledge. In turn, it also introduces new techniques and concepts that complement my own research projects. Personally, I also enjoy having intelligent conversations with brilliant scientists.

My work with life scientists, on the synthesis of molecular entities that can be used to diagnose and/or cure diseases, was very satisfying in an 'I have made a difference' sort of way. On the other hand, my recent collaboration with chemical engineers taught me that not everything can happen in round-bottom flasks! By reaction design, we can overcome thermodynamic and kinetic issues that traditionally plague reactions that are conducted in batch mode, thus delivering far more efficient, and hopefully selective, reactions.

You have been an external examiner for a number of PhD students – what would be your top tips for someone defending their thesis?
- Make sure you know the key concepts and techniques, inside and out.
- Take time to think before you answer the question – avoid saying the first things that come into your head, as they are often wrong.
- You've worked really hard for the results – don't let the examiners think that you know nothing.

If you weren't a scientist, what would you be?
When I was little, I wanted to be an interpreter working for the UN. Nowadays, I often say that if I ever quit my present job, I will sell up, move to somewhere sunny and exotic, and serve cocktails all day. If, and when, that happens, I know that many of my current colleagues will be fighting their way to my bar!

Essential elements

Celebrating bioscience

Experimental Biology 2009, New Orleans, US, 18–22 April, saw the perfect opportunity for RSC Publishing to display its impressive bioscience journals portfolio. Visitors to the RSC picked up free copies of recently launched journals *Integrative Biology* and *Metallomics*, as well as the established *Molecular BioSystems*, *Organic & Biomolecular Chemistry*, *Photochemical & Photobiological Sciences* and *Natural Product Reports*. RSC staff were also available to provide online demonstrations of enhanced HTML articles via *RSC Prospect*. Many visitors also entered the competition to win an iPod Touch, and the lucky winner, drawn at random from the entries, is Abu-Bakr Al-Mehdi, University of South Alabama, Mobile, US.

Also at this event, *Integrative Biology* celebrated its 2009 launch in style on 19 April with an evening reception. Guests were welcomed with refreshments and the editor, Harp Minhas, was on hand to provide details and answer questions regarding this exciting new journal. *Integrative Biology* focuses on quantitative multi-scale biology using enabling technologies and tools to exploit the convergence of biology with physics, chemistry, engineering, imaging and informatics.

'Integrative Biology is looking great – just hits the mark and all the articles are innovative, highly of interest and thought provoking.' Philip Day, University of Manchester, UK

Visit our booth at the 34th FEBS conference in Prague, the Czech Republic, this July. We will be holding another reception, this time to celebrate *Molecular BioSystems*' 5th year of publication.

Alternatively, visit the website – *www.rsc.org/publishing*

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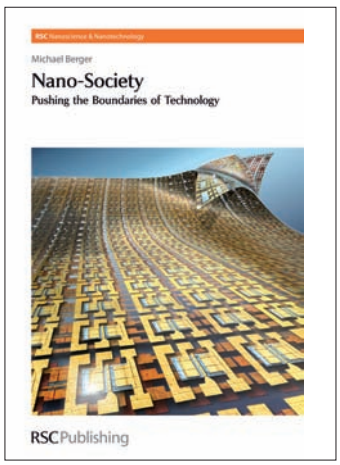
You can find out more online at www.rsc.org/ej_alert

RSC Publishing book series 2009

RSC Publishing's definitive book series provide valuable insights into critical research, appealing to a broad cross-section of scientists in multiple disciplines. The series bring together coverage from new and emerging areas of scientific interest, such as green chemistry, energy and environment and nanoscience and nanotechnology.

In response to green chemistry's wider recognition as being one of the most important and rapidly growing concepts in modern chemistry, RSC Publishing launched the Green Chemistry series during 2008. The series has grown in popularity and this year we see four new titles published, including *Sustainable Solutions for Modern Economies* and *Eco-Friendly Synthesis of Fine Chemicals*.



Energy and environmental sciences remain high on the scientific agenda and, for the first time, environmental forensics is addressed as a volume in the ever popular Issues in Environmental Science and Technology series.

The RSC Nanoscience and Nanotechnology book series grows from strength to strength, with no less than eight titles scheduled for publication during 2009. This innovative series continues to reflect the diverse areas in which nanotechnology is being deployed, such as food science, information technology and molecular biology. Look out for the groundbreaking title *Nano-Society: Pushing the Boundaries of Technology* written by the acknowledged authority in the community, Michael Berger.

For more information on our prestigious, international best selling series lists please visit www.rsc.org/books

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