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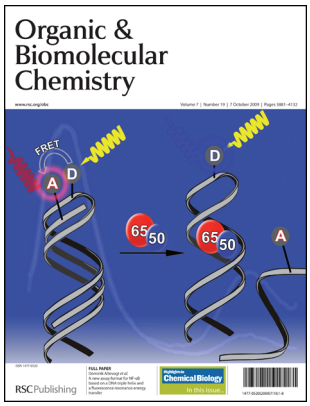

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Replacement of the third strand of a triple-helical DNA by NF-κB, p50/p65, results in a decreased FRET and represents a new assay principle for DNA-binding proteins.

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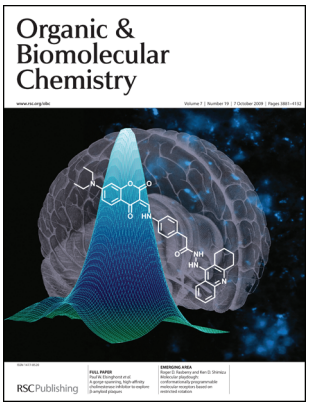

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HIGHLIGHTS IN CHEMICAL BIOLOGY

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Highlights in Chemical Biology

October 2009/Volume 4/Issue 10

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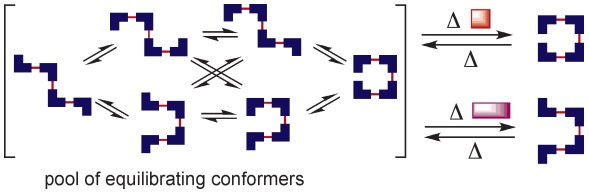
Molecular playdough: conformationally programmable molecular receptors based on restricted rotation

Roger D. Rasberry and Ken D. Shimizu*

Systems with molecular memory based on restricted rotation are reviewed with a focus on atropisomer N-arylimides.



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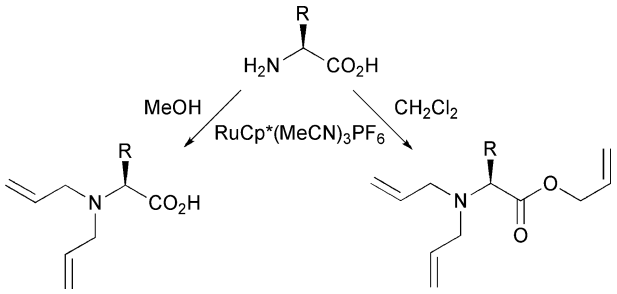

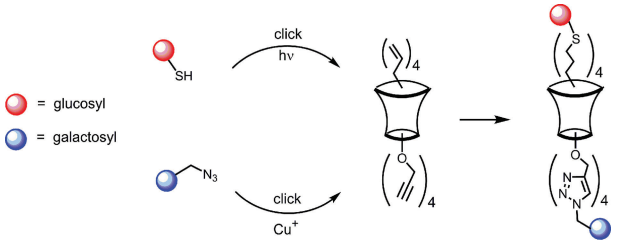

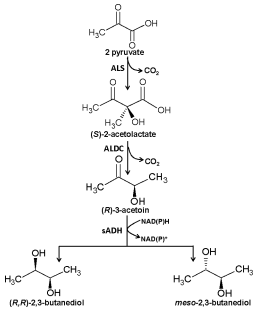

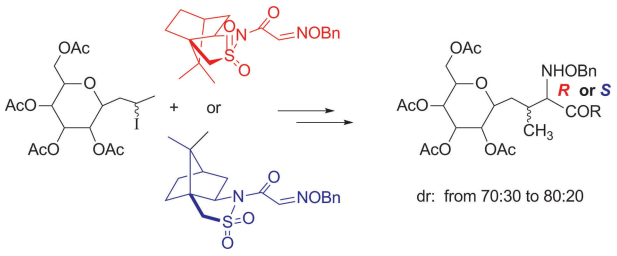

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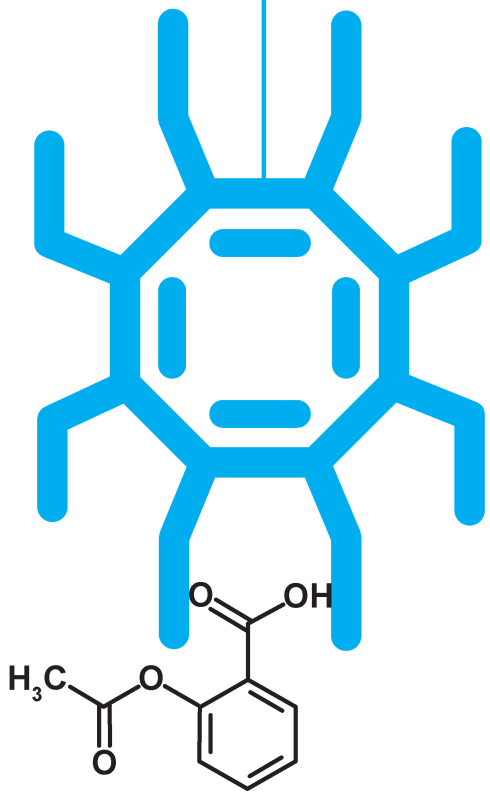

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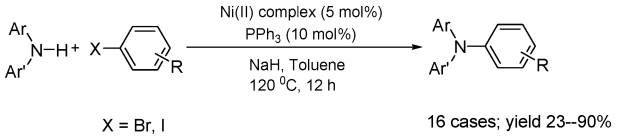

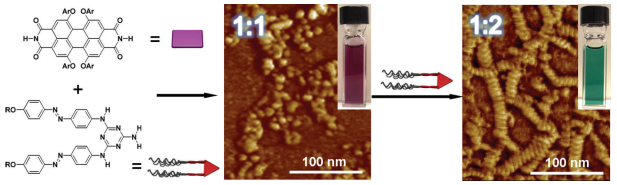

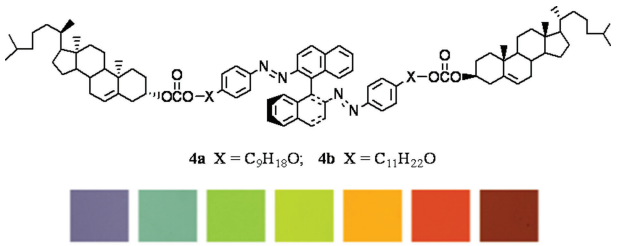

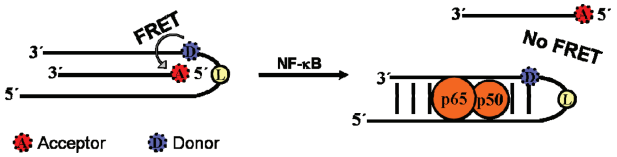

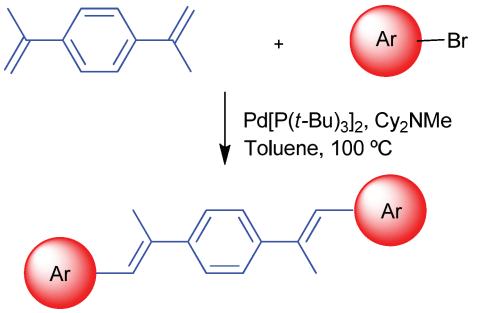

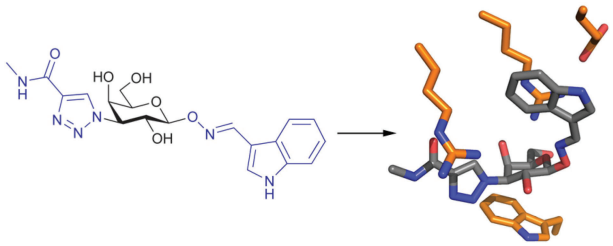

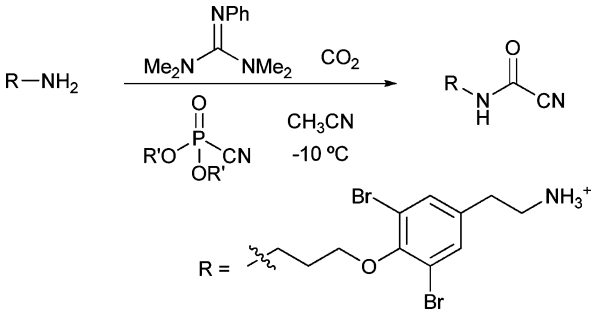

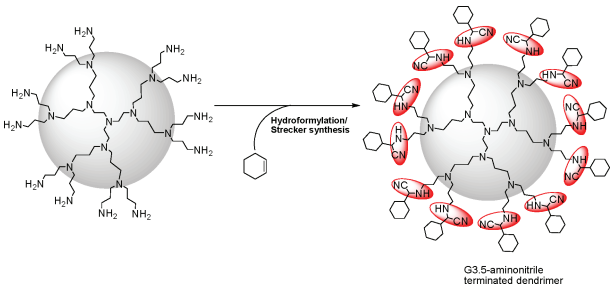

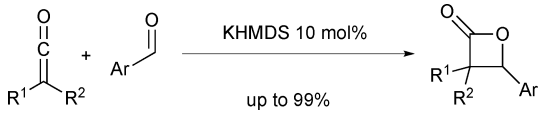

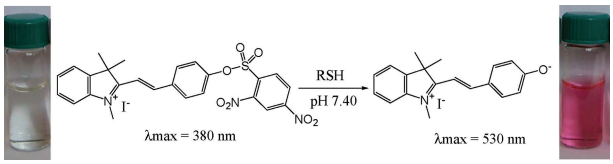

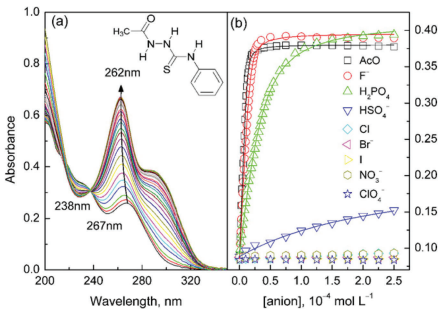

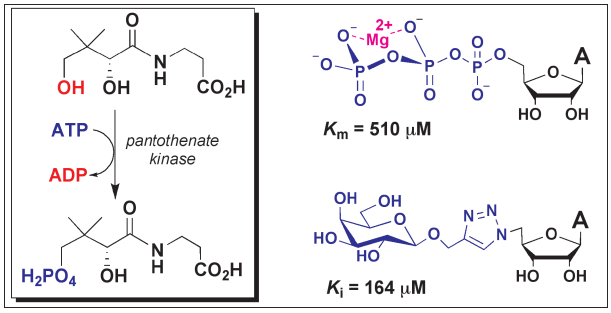

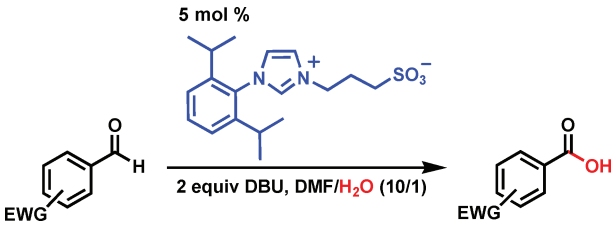

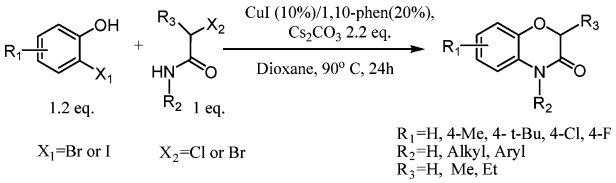

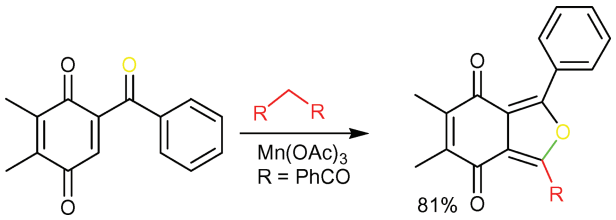

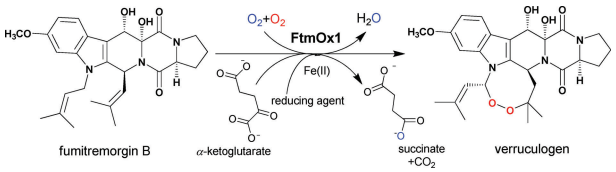

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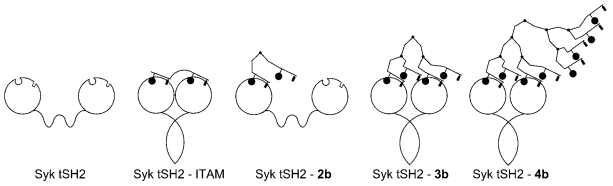

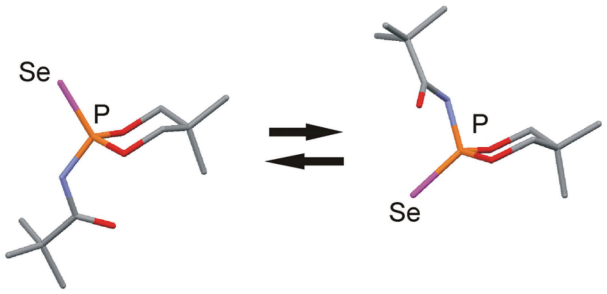

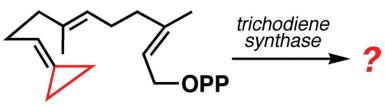

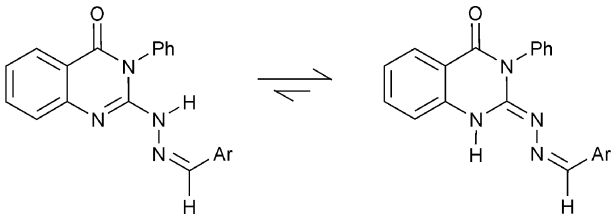

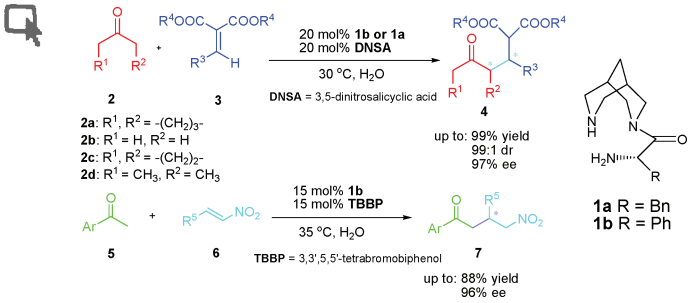

Organocatalyzed highly stereoselective Michael addition of ketones to alkylidene malonates and nitroolefins using chiral primary-secondary diamine catalysts based on bispidine

Jie Liu, Zhigang Yang, Xiaohua Liu, Zhen Wang, Yanling Liu, Sha Bai, Lili Lin and Xiaoming Feng*

Organocatalysts containing primary-secondary diamines based on bispidine have been further developed to catalyze the asymmetric Michael addition of ketones to alkylidene malonates and nitroalkenes. High yields and high stereoselectivities were obtained under mild conditions.

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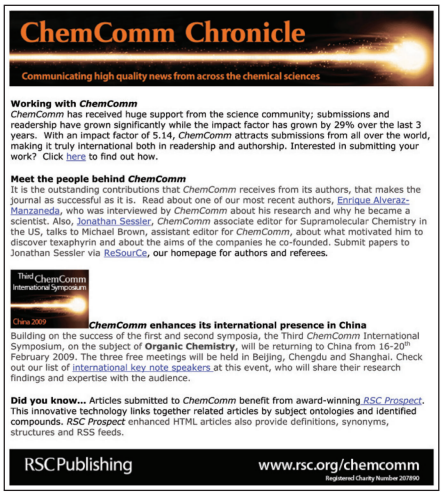

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Highlights in
Chemical Biology

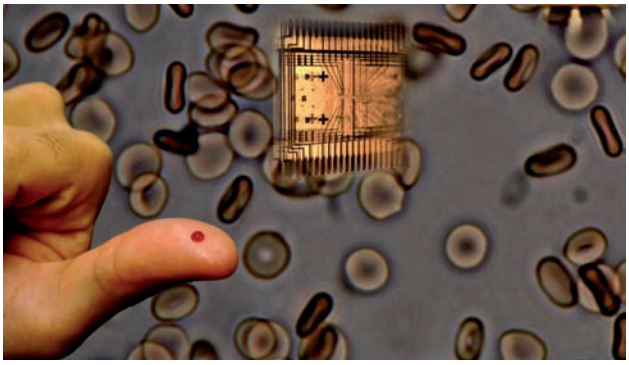
Numerous applications offered by time- and money-saving gadget

Potential for bedside medical diagnostics

A handheld device which could offer point-of-care blood cell analysis is being developed by scientists in the UK. Team members David Holmes and Hywel Morgan, from the University of Southampton, suggest their system could find a range of applications in diagnostics.

Holmes explains that the microfluidic set-up uses electrodes to measure each blood cell's electrical properties as it flows through the device's channels. From these measurements it is possible to distinguish and count the different types of cell, providing information used in the diagnosis and treatment monitoring of numerous diseases.

To verify their results the researchers mounted their device on a fluorescence microscope. This allowed them to observe the cells optically and confirm that the electrical data correlated with the correct identification of each cell. The system can identify three types of white blood cells: T lymphocytes, monocytes and neutrophils.



Blood cells are identified as they flow through a microfluidic device

Currently routine blood analysis uses flow cytometry which requires expensive reagents and fluorescent antibodies as well as bulky and fragile equipment. It is also time consuming. In comparison, Holmes and Morgan's method requires only that the red blood cells are removed from the sample, which takes just 8 seconds. This step has the added benefit of enhancing the discrimination between the white cells.

Yuri Feldman, head of the Dielectric Spectroscopy Laboratory at the Hebrew University of Jerusalem, Israel, points out that the group's combination of microfluidics, optics and impedance spectroscopy implemented on the single cell level is unique. 'It opens new avenues for effective use in modern medical diagnostics,' he says.

The next step for the team is to integrate the red blood cell removal step into the device. Further down the line they plan to develop power-free microfluidics, using capillary forces to pull the blood, or other samples, through the system. 'There is a lot of opportunity for developing the system further,' says Holmes.

The team's eventual aim is to produce a handheld device which would be available for around £1000 which would use disposable chips costing a few pence each. They say that uses for the device would not be restricted to blood cell analysis but could range from cancer and HIV monitoring to the examination of drinking water.

Jennifer Newton

Reference
D Holmes *et al*, *Lab Chip*, 2009, DOI: 10.1039/b910053a

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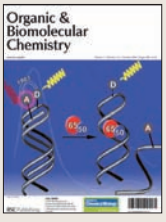


Research highlights

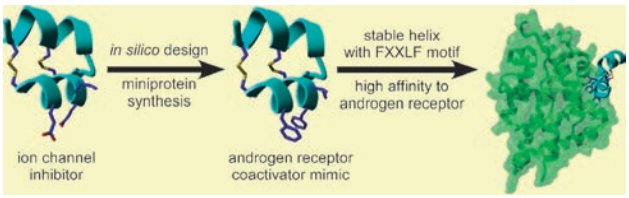
Computer-aided design yields miniproteins that bind prostate cancer linked receptor

Targeting the androgen receptor

European researchers have used computers to find proteins that bind a receptor linked to prostate cancer.

Luc Brunsveld, of the Eindhoven University of Technology, and colleagues from the Netherlands and Germany have used computational methods to probe the protein–protein interactions involved in androgen receptor activation. The receptor controls many of the processes that are associated with male sexual characteristics and is a potential target for prostate cancer treatment.

Whilst the androgen receptor is activated by hormones, its behaviour is modulated by proteins called coactivators. Brunsveld's team has studied how these coactivators bind to the receptor, with the eventual aim of finding new inhibitors. Knowing that a helical peptide sequence with an FXXLF motif (F = phenylalanine, L = leucine, X = unspecified) is key to receptor binding, the team looked at how variations in these peptides' structures affect their binding.



Computer modelling of mutant miniproteins aids inhibitor discovery

Reference
B Vaz *et al*, *Chem. Commun.*, 2009, 5377 (DOI: 10.1039/b910677d)

The researchers selected miniproteins with helices of differing lengths from the Protein Data Bank repository and modelled them computationally. They then substituted amino acids in each protein to introduce the FXXLF motif and simulated the binding of these mutants to the androgen receptor. In this way the team could identify candidate proteins, which they then synthesised and evaluated in experimental binding studies with the real receptor.

The binding studies identified several miniproteins with micromolar binding affinities, making them comparable with one of the best peptide binders currently known for the androgen receptor.

Brunsveld says that by performing point mutations on their unoptimised protein sequences he hopes to obtain miniproteins with even stronger binding affinities. He stresses that while the miniproteins are unlikely to be suitable for use as therapeutics, 'what we try to learn with these miniproteins is the minimum motif that we need for binding to these receptors, so we can design small molecules based on these motifs.'

Kip Guy of St Jude Children's Research Hospital, Memphis, US, an expert in the fields of protein interactions and transcriptional activation complexes agrees. 'This work will have important implications for building better assays for detecting small molecule inhibitors,' he says. 'It could shed light on the specific details of the adaptation of [the ligand binding] site on the androgen receptor during binding that would allow much better design of inhibitors.' *David Sharpe*

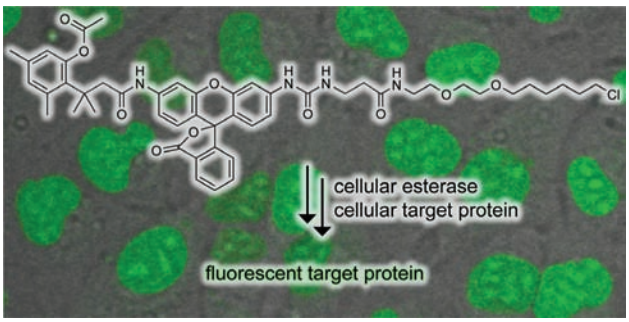
Enzymes activate fluorescent tag for in-cell protein labelling

Harnessing enzymes for protein tagging

Protein-probing molecules that work only inside cells have been developed by US scientists. Ron Raines, from the University of Wisconsin–Madison, and colleagues designed a small molecule containing a fluorophore and used it to label and image a target protein in cells. The team's approach relies on enzymes to activate the fluorophore and fuse it to the protein.

Raines's label doesn't fluoresce until it is activated by an esterase which is found only inside cells. This means the system has minimal background fluorescence even when high concentrations of label are used, removing the need to wash the cells before monitoring their fluorescence. Wash steps used to rinse away excess fluorescent label are 'time consuming and tedious,' comments Raines.

Along with the esterase-cleavable fragment, the new fluorescent label also contains a haloalkane functional group. This allows the



Two enzyme-catalysed steps are needed before the latent fluorophore labels its target protein

Reference
R W Watkins *et al*, *Org. Biomol. Chem.*, 2009, DOI: 10.1039/b907664f

researchers to tag the fluorophore to the protein target using a system called HaloTag. This system uses a variant of a haloalkane dehalogenase – an enzyme that usually catalyses haloalkane hydrolysis. But the variant dehalogenase cannot complete the hydrolysis and halts once the fluorophore is covalently attached to the enzyme, therefore labelling the system. The team says that by using recombinant DNA technology to attach the haloalkane dehalogenase to other cell proteins it will be possible to study a range of proteins inside live cells.

Raines's system has several advantages as the fluorophore activation and covalent labelling steps are both catalysed by enzymes – meaning they are highly selective and efficient. Also, the fluorescent label is based on a modular system which allows you to change the fluorophore. Spencer Williams, an expert in chemical biology at the University of Melbourne, Australia, explains that 'the benefit of chemical dyes over fluorescent proteins is the relative ease with which the colour may be tuned.' By tagging a protein with different coloured fluorophores at different times the researchers suggest they could conduct time-dependent studies, which isn't possible using fluorescent proteins. *Russell Johnson*

Microfluidic device mimics the conditions kidney cells experience in the body

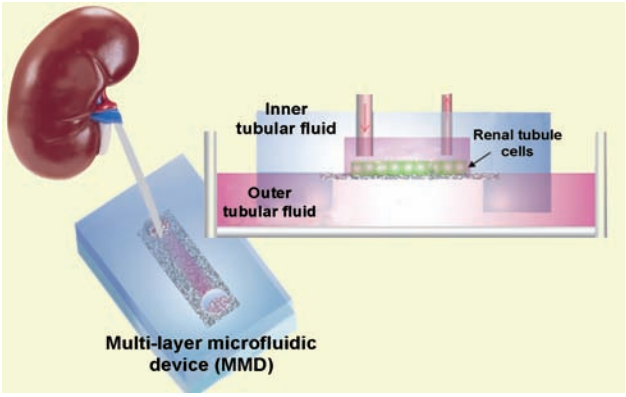
Kidney on a chip

Scientists in Korea are mimicking the conditions kidney cells experience in the body to grow the cells in a microfluidic device.

Cell culture using microfluidics is an expanding research area, as scientists work to create models that are physiologically relevant. Such cell cultures can lead to new insights into cell and organ function and be used for drug screening. Now, Kyung-Jin Jang and Kahp-Yang Suh from Seoul National University have used the method to grow renal tubular cells.

Renal tubules are structures in the kidney that are involved in filtering the blood and producing urine. Renal tubular cells are important to study as many drugs are secreted into the kidneys via these cells. The cells also play pivotal roles in many kidney diseases, which are often due to the tubules being damaged or reacting to various molecules.

However, the flow of blood and urine means that renal tubular cells are exposed to shear stresses and the effect of this flow on the cells is not yet understood. It also brings challenges to making physiologically relevant models using the cells. To counter this Jang and Suh developed a multilayer microfluidic device and optimised the growth conditions for the renal tubular cells. The cells are grown on a permeable support that is placed over a well containing fluid playing the role of blood whilst a continuous stream of a precursor urine mimic is passed over the cells. This leads to the cells growing and functioning as they would in the body.



Renal tubular cells grow on a support between fluids resembling blood (outer fluid) and precursor urine (inner)

Reference
K-J Jang and K-Y Suh, *Lab Chip*, 2009, DOI: 10.1039/b907515a

Jang and Suh were able to use their device to show that hormone stimulation causes protein movement within the cells. 'This suggests that our device can be used as a simple drug screening tool,' Suh explains.

Shuichi Takayama of the University of Michigan, Ann Arbor, US, who also uses microfluidics towards understanding cell function, agrees that the device could potentially lead to better tests for drugs. He adds that because this model more accurately mimics how the cells respond in vivo, the approach 'can lead to a more relevant understanding of cellular mechanisms of disease.' *Laura Howes*

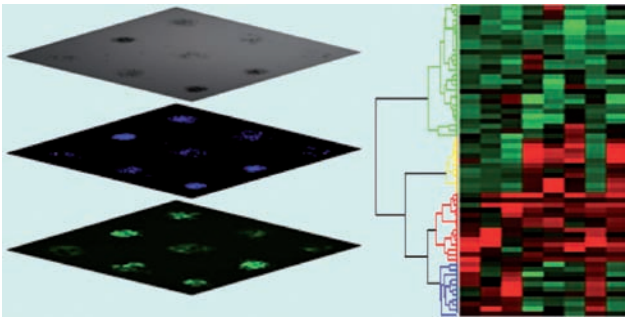
Array system tests hundreds of conditions to find which lead to liver damage

Revealing the factors behind liver disease

More effective treatments for liver disease may be a step closer, thanks to an array to test the conditions that lead to liver damage.

Shu Chien and colleagues at the University of California, San Diego, US, have demonstrated a system that can identify the biological components that lead to or alleviate liver disease. The array works by controlling the range of environments surrounding an array of star-shaped liver cells – hepatic stellate cells or HSCs. HSCs make up five to ten per cent of the liver and are normally in a resting state but when the liver is diseased, they begin to proliferate. This can lead to a build-up of connective tissue, which can impair liver function.

Current approaches to identify the factors affecting HSC biology typically focus on each factor individually, ignoring the complex cross-talk between the many components acting on the cells. 'How these factors interact with each other to affect HSC activation remains unclear,' Chien explains. 'To overcome the shortcomings of traditional assays, we developed a system for the simultaneous screening of hundreds of physiochemical parameters on HSC behaviour.' By exposing cell arrays to different protein mixtures the system allows the researchers to rapidly identify the conditions that either promote HSC activation or maintain the resting state. 'We could systematically assess the complex relationships between the cells and their microenvironment,' says Chien.



The array system determines which combinations of factors promote cell activation, and which do not

Reference
D A Brafman *et al*, *Integr. Biol.*, 2009, **1**, 513 (DOI: 10.1039/b912926j)

The US team found that certain proteins are critical in regulating HSC activation and that the proteins influence one another's action on the cells. 'In the future, such approaches will yield insight into the role of microenvironment components in vivo,' says Chien, 'and will lay the foundation for identifying more efficient antifibrotic therapies.'

Bill Murphy, of the University of Wisconsin–Madison, US, studies how environment affects stem cell behaviour. He says that Chien's work is 'an elegant example of the potential of array-based strategies in biology and medicine. Emerging approaches like this may ultimately lead to a more advanced understanding of natural microenvironments,' adds Murphy, 'as well as identification of new microenvironments that elicit specific cell behaviors, such as tissue regeneration.'

Michael Spencelayh

Immunological detector finds toxins in food in contamination scenario

Anti-terror antibodies

European scientists have developed a method to detect potential biological warfare agents in food.

A possible scenario for a bioterrorism attack could involve food contamination with protein toxins, such as ricin and botulinum neurotoxins, says Brigitte Dorner, researcher into microbial toxins, of the Robert Koch Institute in Berlin. However, until now detecting toxins in such complex samples has been difficult. Dorner and colleagues in Germany and Switzerland have devised a highly sensitive system that can detect trace amounts of the toxins in foods such as milk, baby food and yoghurt.

Protein toxins are detected most effectively using immunological techniques, since antibodies bind to their targets with very high affinity. However, current methods for raising antibodies against toxins without causing animal poisoning are time consuming and labour intensive. Dorner and coworkers have used an alternative technique, immobilising the toxins on microbeads to reduce their toxicity, allowing the team to generate antibodies quickly in vivo.

The researchers then modified a commercially available system to analyse complex food samples using the antibodies. In Luminex xMAP technology, antibodies are covalently coupled to beads embedded with dyes that generate signals in response to different targets – in this case the toxins. Dorner explains: 'We further developed the Luminex xMAP technology to incorporate magnetic beads to allow us to analyse complex matrices.' The magnetic property means that the beads can be easily removed from food samples and can undergo automated washings. This makes toxin detection in foods possible where many other technologies have failed due to interference of sample components with binding agents or technical equipment.

USDA-ARS

Castor bean protein ricin inhibits protein synthesis in the body

Using the bead array, the researchers simultaneously detected trace amounts of five toxins, including ricin and botulinum neurotoxins, in food at lower concentrations than commercially available systems. Dorner says the technique has very good sensitivity. 'We are able to detect toxins down to a level of picograms per millilitre which, as far as I know, is superior to any limit published for other multiplex detection systems,' she says.

Phillipe Thullier from the Research Centre for Armed Forces' Health in La Tronche, France, is an expert in the field of immunological techniques for toxin detection and neutralisation. He comments: 'The sensitivities are quite unique and to a large extent are made possible by the beads. In the future,' he adds, 'we could see more of these nano objects in biology, used for several purposes.'

Dorner anticipates a possible commercial application for the technique. 'A further step would be introduction of a mobile device using the bead array,' she says, 'and a very nice use of the technique would be large scale screening of the food supply chain.' *Victoria Steven*

Reference
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In the current issue of Research Articles...

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Graham S Baldwin, *Metallomics*, 2009, **1**, 370 (DOI: 10.1039/b909112m)

Proteome research in food science
Monika Pischetsrieder and Rainer Baeuerlein, *Chem. Soc. Rev.*, 2009, **38**, 2600 (DOI: 10.1039/b817898b)

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Electrophoretic separation of DNA in gels and nanostructures
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Read more at www.rsc.org/highlightschembiol

Interview

Making soft matter

Martien Cohen Stuart talks to Alexandra Haywood about soft matter, music and fruit trees

Martien Cohen Stuart

Martien Cohen Stuart is professor and chair of physical chemistry and colloid science at Wageningen University in the Netherlands and is the new chair of the *Soft Matter* editorial board. He has received numerous awards, including the Akzo Nobel Science Award in 2008. Martien has a broad range of research interests in the field of soft condensed matter, including surfactants, emulsions, self-assembly, interfaces, wetting and the physics of macromolecules in living cells.

Who or what inspired you to become a scientist?
I think it happened relatively late in my life. I was a curious person with an interest in biology as a school kid but there was not a clear sign I would become a scientist. Then I studied chemistry as a student. When I graduated the economic situation was rather bad and it was not easy to get a normal job so I decided then to go for a PhD. I joined the university, where I am now, to do a PhD just to see what it was like. It happened to be a very good place which was really inspiring – I had very interesting and very clever fellow PhD students who I learnt a lot from. The staff in the lab were excellent and so I got a taste for it and that's where it really started.

How would you define soft matter and what motivated you to work in this field?
What I see as soft matter is the collective behaviour of molecules and particles. So not just one single particle but the way that they interact together, the structures they form and the way they organise. The role of the forces and energies controlling such systems that bring out the structure and the function is also part of this field. It is also very important to understand why these structures form. So those two aspects I think are key to soft matter, not just to know how, but to know why. That's where the science is.

What projects are you working on at the moment?
I've got a big group with a broad spectrum of activities but the important theme is self assembly driven by electrostatic attraction - how charge particles come together to form objects. Another theme is self assembling gels, some of them based on synthetic polymers but also some of them based on biosynthetic polymers. For example, proteins that are not natural but are designed, coded in DNA and then produced by cells. I think that's a very fascinating area.

What's going to be next big thing in your field?
That's hard to say. I think from the view point of the needs for society, soft matter has got a lot to offer in the area of energy harvesting, photovoltaics and perhaps in understanding the mechanisms of photosynthesis in plants and biomimetic approaches to the same things. So I think and hope that soft matter is going to be important in the future.

Collaborations form a large part of modern scientific research. Which scientist, past or present, would you really like to work with?
Well the one person that I very much admire and I would like to work with is the late Pierre Gilles de Gennes, a physicist from France. I happened to spend a year in his lab as a postdoc and that was an absolutely fascinating time. Of course I can't work any more with him, nobody can, but I think that his legacy is carried forth by a couple of people.

Other people that I would like to work with for a while are Mike Cates and Wilson Poon in Edinburgh. It's a very interesting place where I could learn a lot and join in with their modelling and experimental work.

Welcome to the *Soft Matter* editorial board. What excites you most about your new role?
Two things, one is that I get a look behind the scenes at what's going on in publishing and what's going on in soft matter which I find interesting. The other thing is that I get to meet many people in the area that play a role in this field of science.

What do you enjoy doing when you're not working?
I have a great hobby which is music. I play the bassoon myself and with a small ensemble and if I have time that's what I like to do. I also like outdoor life and hobby farming. I have a place in Normandy, France where I go to grow my fruit trees.

And finally, if you weren't a scientist, what would you do?
I think I could have been a professional musician. There was a deciding moment in my life when I had taken the entrance exam to a music conservatoire and had been offered a place to do a PhD. In the end I decided I'd prefer to be a happy amateur rather than a frustrated professional in music and I went for science.

Instant insight

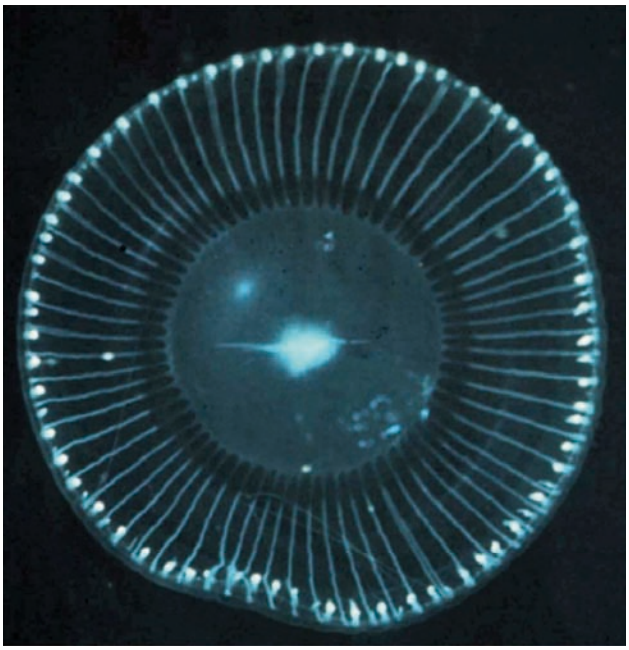
Lighting up biology

Jellyfish have changed science. Marc Zimmer of Connecticut College, New London, US, explains

Over a period of thirty years Osamu Shimomura caught at least 800 000 jellyfish. Although this feat did not get him into the *Guinness World Records*, his jellyfish research did earn him a third of 2008's Nobel Prize in Chemistry. The prize was well deserved, for the product of the research has been cited in more than 20 000 publications. Shimomura found that in the jellyfish, *Aequorea victoria*, a protein called aequorin produces blue light. However, instead of emitting blue light the light is absorbed by green fluorescent protein (GFP) and emitted as green light.

GFP belongs to a unique class of proteins. Once expressed it folds into a soda-can shape and attacks itself to form the chromophore that is responsible for its green fluorescence. It is this self-propagating characteristic that makes GFP and GFP-like proteins so very useful. No matter which organism or cell type it is expressed in, GFP can form its fluorescent chromophore.

Applying Shimomura's findings, Martin Chalfie was the first to make use of known promoters – DNA regions that assist gene expression – to express GFP in *Escherichia coli* and in neurons of *Caenorhabditis elegans*. That work led to Chalfie being awarded his share of the Nobel Prize. Soon after it was shown that fusion proteins could be created between GFP and proteins whose genes were known, thereby allowing researchers to monitor a fusion protein's production and movement in a living cell. Surprisingly, the proteins still function despite being attached to the 238 amino acid long GFP.



Fluorescent protein aequorin produces blue light in jellyfish *Aequorea victoria*

References

1 M Zimmer, *Chem. Soc. Rev.*, 2009, DOI: 10.1039/b904023d

2 http://gfp.conncoll.edu

The Nobel triumvirate was completed by Roger Tsien. He was the first to create a wavelength mutant of GFP (a blue fluorescent protein); the first to use fluorescence energy transfer (FRET) measurements between fluorescent proteins; and the first to find an enhanced mutant of GFP (EGFP) and to crystallise it. In 2004 Tsien also produced the mFruits, a palette of new fluorescent proteins, and created a series of genetically encoded FRET sensors to detect calcium, protease, phosphorylation and cAMP (cyclic adenosine monophosphate – a signalling molecule used in many biological processes).

GFP has developed into a tremendously useful molecule with applications in many areas of science and medicine. It is a molecular microscope that allows scientists to follow in vivo processes that were hidden before the advent of GFP-based techniques. These methods include the cell cycle indicator FUCCI (fluorescent, ubiquitination-based cell cycle indicator); Brainbow, which allows researchers to follow individual neurons in the neuronal spaghetti that is the brain; and the optical highlighters that have resulted in super resolution microscopy techniques. Fluorescent proteins have become routine in many laboratories, and like optical microscopes and spectroscopic methods, descriptions of their use are now relegated to the experimental section of publications.

Yet in some cases fluorescent proteins can propel scientific publications into the public arena. It is not surprising that news of Ruppy, the ruby fluorescent cloned beagles, circulated the globe earlier this year. So too did reports of the marmoset monkeys that pass GFP expressing ability onto their offspring. These futurist applications and the beautiful images that fluorescent proteins can trigger create an excellent opportunity for scientists to inform the public about new advances in cloning, stem cell technology and creating genetically modified organisms, and to initiate a debate about the responsible use of these techniques.

Read more in a *themed issue on the topic of green fluorescent protein (GFP) in issue 10, 2009 of* Chemical Society Reviews.

Essential elements

New journal *Chemical Science*

The recent ACS Fall 2009 National Meeting in Washington was the occasion for the release of some exciting news for researchers from across the chemical sciences: invitations were distributed, an audience gathered, a few words were spoken and then the ribbon was cut, revealing the news that in 2010 a new journal – *Chemical Science* – would join the RSC portfolio.

Editorial director, James Milne, describes this new venture as a milestone in the development of the RSC publishing portfolio. 'During recent years, RSC journals have attracted significant growth in submissions, while impact factors have increased to lead the field. The launch of *Chemical Science* will truly complement RSC Publishing's world renowned communications and review flagship titles.'

David MacMillan cuts the ribbon to reveal RSC's new journal, *Chemical Science*

At the forefront of the most exciting developments, and helping to define the important areas by publishing the most significant cutting-edge research, *Chemical Science* will be a dedicated home for findings of exceptional significance from across ALL the chemical sciences.

Editor-in-chief David MacMillan of Princeton, US, will lead a dynamic international team of associate editors who will drive the scientific development and make decisions on the content. 'I am extremely honoured and excited to be working with the RSC on the launch and development of *Chemical Science*,' he says. 'This is an opportunity to bring forward a very new type of journal and a new way of disseminating edge publications from the world of chemistry. I look forward to being part of this new approach to publishing the world's most pioneering studies in the chemical sciences.'

Free access to Chemical Science will be available – find out more at www.rsc.org/chemicalscience

MedChemComm coming soon

MedChemComm, a new, peer-reviewed journal from RSC Publishing was announced recently at the 3rd International Symposium on Advances in Synthetic and Medicinal Chemistry in Kiev, Ukraine, and the ACS Fall 2009 National Meeting and Exposition in Washington DC, US. Launching in mid 2010, the journal will focus on medicinal chemistry research, including new studies related to biologically-active chemical or biochemical entities that can act as pharmacological agents with therapeutic potential or relevance.

The new journal will be owned by RSC Publishing and will be the official journal of the European Federation for Medicinal Chemistry (EFMC). It will complement the existing RSC Publishing portfolio of bioscience journals, providing authors in the field with a dedicated subject-specific publication. Monthly issues will contain a mix of vibrant and concise research and review articles.

The co-editors-in-chief will be Gregory Verdine, Harvard University, US, and Anthony Wood, Pfizer, UK. Wood comments: '*MedChemComm* is very important, especially when one considers the mission of the journal is to emphasise the role of chemistry as a powerful vehicle to conceptualise new understanding of biological systems and processes. It is a means to design new tools to modulate these selectively by exploring multiple modalities of intervention.'

Free access to MedChemComm will be available for 2010 and 2011. Find out more at www.rsc.org/medchemcomm

Further news...

October sees the publication of the 100th issue of the *Journal of Environmental Monitoring* (*JEM*). Editor Harp Minhas, announced it a milestone event, as the journal undergoes a significant change in its subject approach. Minhas explains: 'The impact of environmental research is of special concern to our readers. From now on all submitted articles will provide a statement explaining how the research impacts the environment directly and how the work provides insight into environmental processes.' www.rsc.org/jem

In a separate journal development, new titles *Nanoscale* and *Analytical Methods* have published their first articles online, just months after the initial launch announcement in March.

Nanoscale, a collaborative venture with the National Center for Nanoscience and Technology, Beijing, China, publishes experimental and theoretical work across the breadth of nanoscience and nanotechnology, while *Analytical Methods* will appeal to scientists with an interest in the latest research methods demonstrating the link between fundamental and applied analytical science.

Read the articles for free at www.rsc.org/methods and www.rsc.org/nanoscale. Register for free online access to all Nanoscale and Analytical Methods content throughout 2009 and 2010 at www.rsc.org/free_access_registration

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