

November 2009

Coordinator: Steph Neulinger

Roving Reporter: Gavin Perri

Editor: Peter Gill



## MONTHLY HIGHLIGHTS

### CONGRATULATIONS

*The last couple of months has seen the arrival of four babies in the RSC!*

- **Dr Morgan Watson** and his partner welcomed the arrival of their son Thomas
- **Michael and Liza Hill** welcomed the arrival of Justin Alexander Hill on Monday, 5th October, 2009 at 8.07am, weighing in at 3.505kg.
- **Dr Amy Philbrook** gave birth to a beautiful daughter, Elizabeth Leigh McLean (Ellie), on Wednesday, 14th October.
- **Jo Bayley** gave birth to a baby boy, Mekhai Dean Bayley, born on Monday, 26th October, 2009 at 10.23am weighing in at 5lb 10oz.

*Further congratulations:*

During his visit to Beijing last week **Professor John White** was elected President of AONSA (Asia - Oceania Neutron Scattering Association) until January 2012.

The ARC has announced the outcomes of applications for research support through the **2010 Round of their Discovery Program**. I am very pleased to advise that the following members of the RSC were successful:

- A/Professor Michelle Coote and Professor Peter Gill
- Dr Rian Dewhurst (QEII Fellowship)
- Professor Lew Mander (joint with JCSMR)
- Professor Denis Evans
- Professor Tony Hill
- Professor Mark Humphrey and Dr Marie Cifuentes (ARF)
- Dr Russell Barrow (joint with RSB)

**Professor David Ollis** and his colleagues at the University of Queensland have won a major grant from the NH&MRC.

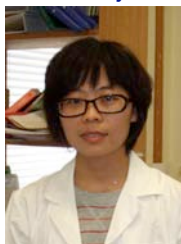
*Congratulations to the following students who have submitted their theses:*

**Mr Jim Hennessy**, Modifying Mechanisms of Enzyme Catalysis (Easton group)

**Mr Roger Coulston**, Cyclodextrin Nanomachines at Work (Easton group)

### RECENT ARRIVALS

*A sincere welcome is extended to the following people who have joined us recently:*



**Ms Shenglin Jin** has recently begun her PhD studies in the Easton group. Rm 209, ext 53733.

## STUDENT MATTERS

### Student Award for Top Supervisors

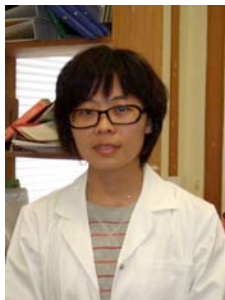
Is your Supervisor engaging? Inspiring? Motivated? A true mentor? Or just plain tops? Make sure the University knows - don't save it for the acknowledgement page of your thesis, tell them now! Nominate them for a 100% genuinely Student Award for Top Supervisors. Give them the recognition they deserve.

All you need to do is write a few words (max. 500) explaining why your supervisor deserves to be acknowledged and recognised. What do they do that makes you appreciate them so much?

The top nominees and their nominating students will be treated to a celebratory lunch, to acknowledge and congratulate them for their efforts.

Nominations are open until Friday 6th November 2009. Submit your entry online at:  
[http://www.anu.edu.au/dos/top\\_supervisor/supervisor09.htm](http://www.anu.edu.au/dos/top_supervisor/supervisor09.htm)

## Student Profile



**Name:** Shenglin Jin  
**Qualifications/Degree:** I am doing my PhD research but I have a Bachelor's degree

**Favourite TV Show:** American TV like Friends or Lost

**Favourite Movie:** Independence Day

**Favourite Music/Band:** I like all favourable music

**Sporting Code and Favourite Team/Player:** Rocket

**What is your thesis topic/field of interest?**

Investigation of molecular machines based on cyclodextrin

**If you could be a chemical element for a day which one would you choose and why?**

Palladium

(Pd), I hope I could be the palladium of the people I love

**What have you learnt about yourself during your time here?**

There are so many things to learn, I can take care of myself even without my family here

**If you could dine with any three people who would you choose (alive or dead)?**

I miss my family, so I will choose my parents

**What do you see yourself doing upon completion of the program?**

It is hard to say, I have never thought about this, maybe I would work or continue my research

**If you were stuck on a deserted island for one week what three essential items would you hope to have with you?**

Enough water, enough food, mobile phone

**What has been the most enjoyable experience during your studies at RSC?**

Working with all of Chris' group

**Favourite Saying**

Goals determine what you are going to be!

## MONDAY SEMINAR SERIES - NOVEMBER

RSC Lecture Theatre, 1pm.

2<sup>nd</sup>: Mr Masruri, Midterm Review (McLeod group)

16<sup>th</sup>: Ms Tanya Bradford, Final Seminar (Sherburn/Mander group)

23<sup>rd</sup>: Ms Laura de la Cruz, Midterm Review (Otting group)

30<sup>th</sup>: Mr Shane Wilkinson, Final Seminar (McLeod group)

## THURSDAY SEMINAR SERIES – NOVEMBER

RSC Lecture Theatre, 4pm.

4<sup>th</sup>: Professor Joel Bernstein, Ben-Gurion University, Negev, Israel, 2009 Craig Lecturer – 11am, Rm 134

12<sup>th</sup>: Dr Danielle Skropeta, University of Wollongong (McLeod group)

19<sup>th</sup>: Professor Peter Gill, RSC

## FOR YOUR INFORMATION

The next **DAG meeting** will be held at 1.30pm on the 5<sup>th</sup> of November, in the Boardroom.

The next **School Forum** will be held at 10.30am on the 6<sup>th</sup> of November in the tearoom.

Nominations are now being sought for the 2009 **Director's Prize**. The nomination form should be completed then submitted to the Director, RSC, by COB Friday, 20<sup>th</sup> November, 2009. See Martin Banwell for further details.

## RSCclassifieds

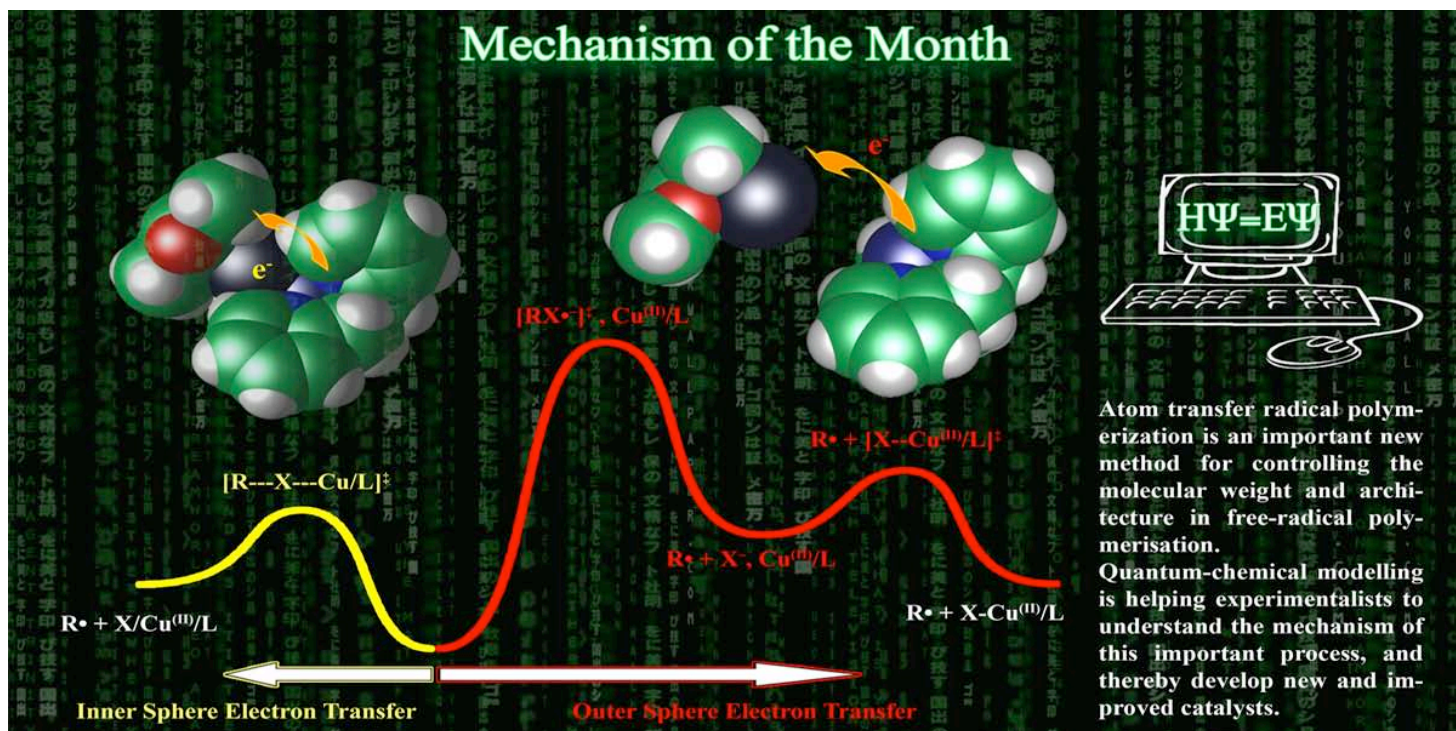
Björn Bohman ([bjorn.bohman@anu.edu.au](mailto:bjorn.bohman@anu.edu.au)), who has taken up a joint postdoctoral position in the Research School of Biology (Peakall Lab) and Research School of Chemistry (Barrow Lab) is looking for accommodation as follows:

Postdoc looking for temporary accomodation (shared or bedsitter, granny flat etc), from late November/early December until early/mid May. Even shorter period of interest. Preferably furnished and within biking distance of ANU. Max \$200 p.w.

Please contact Björn via email if you have any options or advice to offer.

## MOLECULE OF THE MONTH – NOVEMBER

### Mechanism of the Month



## 2009 NOBEL PRIZE IN CHEMISTRY – PROFESSOR TOM STEITZ

Many of you may remember the spectacular talks given by our 2008 Birch Lecturer Tom Steitz of Yale University. One of his talks was devoted to the structure of the large subunit of the bacterial ribosome. It was for this work that he was awarded, along with two others, the 2009 Nobel Prize in Chemistry. This award was not unexpected - the ribosome is an important component of the cell and its structure determination was an important milestone in structural biology.



The ribosome is a ribonuclear particle that is responsible for protein production in the cell. When centrifuged, it separates into two subunits – given the imaginative titles of the large and small subunits. These subunits can be studied separately or reconstituted to give active ribosomes. Both consist of long helical stretches of RNA and numerous proteins. It is the RNA that is responsible for catalysis. Ribosomes are extremely large. This made them easy to identify in the 1950s, but it also proved a daunting obstacle to probing their intricate workings. They were not given great prominence during the 70s and 80s when molecular biology was revolutionising the biological sciences.

However, electron microscopy was used to obtain a low-resolution ribosome structure and Peter Moore's group at Yale did manage to find the location of the proteins. This was achieved by selectively deuterating ribosomal proteins and then incorporating them into intact ribosomes so that neutron scattering could be used to find the length of the vectors between them. One of Peter's students involved in this work was Venkatraman (Venki) Ramakrishnan who was also recipient of the 2009 prize. This elegant approach to structure determination gave those involved a sense of satisfaction, but it gave little information about how the ribosome functioned. The structure of the key ingredient, the ribosomal RNA, was missing. I can remember attempts to crystallise the RNA components. These experiments required long days for purification and were followed by further painstaking hours to set up numerous crystallisation experiments. The results were generally discussed over drinks at the local neighbourhood bar. I can remember being eager to help in the discussion of experiments, but glad that I had managed to obtain crystals of a DNA polymerase – a large molecule for the time, but with the rapidly advancing technology and a lot of hard work the structure of this protein was solved in only 3 years.

The attitude of crystallographers to the ribosome changed in the early 80s. Ada Yonath, the third recipient of the 2009 award managed to crystallise intact ribosomes and ribosome subunits. The crystals were at first a curiosity, but after many years they were improved to the point where they were a viable crystallographic problem. These crystals attracted the attention of numerous structural biologists including Tom and Venki. Tom's efforts started in 1995. He was lucky in some respects since 3<sup>rd</sup> generation synchrotrons were coming online and they resulted in much improved data. However, the standard approaches to the phase problem proved ineffective - Tom's group now made an important contribution. They used large metal clusters to prepare heavy atom derivatives that gave good quality electron density maps. They obtained an atomic resolution structure of the large subunit that could be combined with a similar resolution structure of the small subunit to give a very detailed picture of the intact ribosome. The co-recipients of the prize obtained these latter structures.

New structures often have an aesthetic appeal that tends to hide their real worth. Cynics have been known to remark: "a very nice structure, but it does not really tell us anything new / useful". It was clear to anyone attending Tom's Birch lecture that this was not true of the ribosome. For example, the ribosome is the target for numerous antibiotics. We can now see how they bind to the ribosome and we can see how their components can be linked together to produce new more potent drugs.

So how does one train to win a Nobel Prize? Tom's university education started at a liberal arts college in the Midwest. He managed to gain entry into the Harvard university graduate program – where he was fascinated by a talk given by Max Perutz who had just received the Nobel Prize for using X-ray crystallography to determine the first protein structure. As a result he completed a PhD in Bill Lipscomb's (Nobel Prize 1976) laboratory that involved crystallographic studies of carboxypeptidase. This was followed by a post-doctoral period in Cambridge working with David Blow, one of the prominent crystallographers of the time. Tom obtained a faculty position with Yale University in 1970 and was promoted to Professor a few years later. It was at this point that he started working on the structures of proteins that were connected with the central dogma of molecular biology as outlined by Jim Watson – DNA polymerases, RNA polymerases and these led finally to the ribosome.



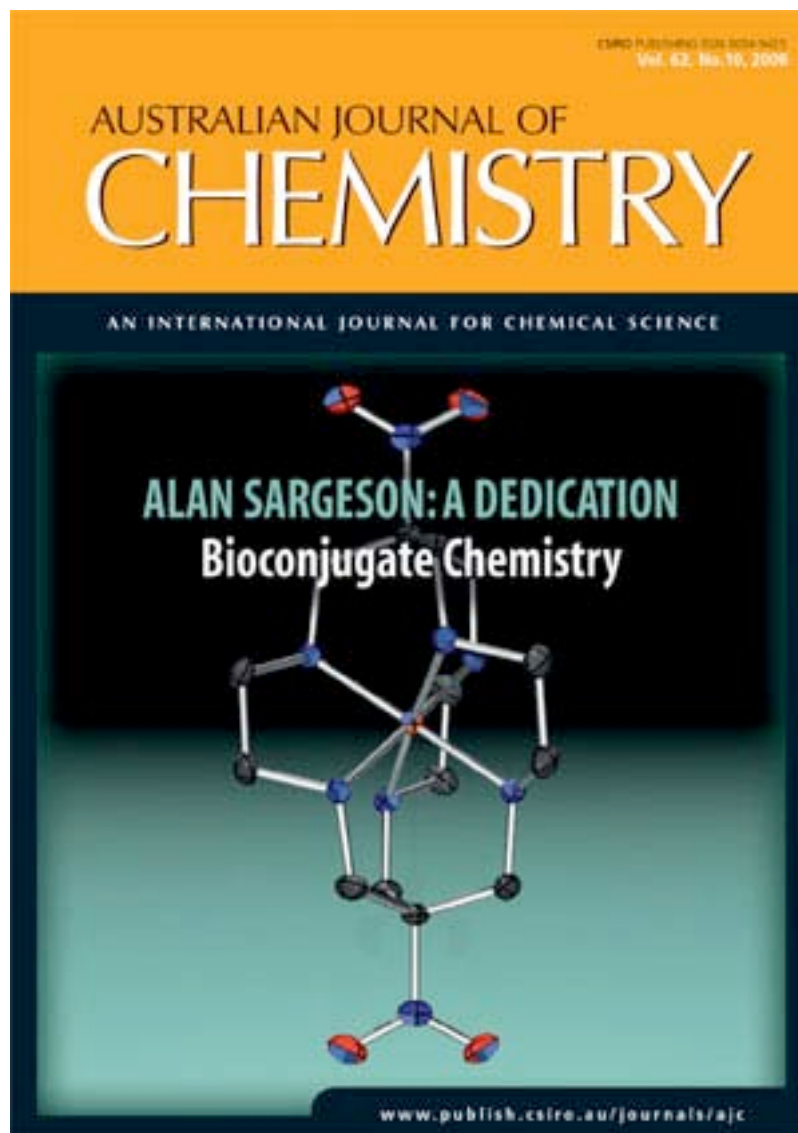
One could argue that Tom was trained and inspired by some pretty exceptional characters – but it would be unfair to attribute all his success to his background. There are numerous people with finer pedigrees and larger laboratories than Tom who have achieved relatively little. Part of the reason for his success is the desire to work on important problems and the determination to solve them. The argument he frequently presented to incoming students and postdoctoral workers ran along the lines: "you know, sometimes it is easier to solve important and interesting problems than it is to complete what appears to be a routine project". Most of the incoming people were very excited with the prospect of working on a really interesting project and failed to see the minor flaw in Tom's logic. Not everyone who entered Tom's lab managed to leave after completing one of Tom's more difficult projects. Some of the more challenging projects required input from a number of people. However, there were successes. In fact, there were many successes and Tom is known throughout the world for the quality of his science.

While he was in Australia Tom managed to meet a number of old friends – here in Canberra and others in Melbourne. He enjoyed the company of friends at the many dinners organised in his honour, as well as the occasional glass of red wine. However, the highlight of his journey to the great south-land was a trek into the wilderness with the intrepid Denis Evans – he spoke of it often.

- Submitted by Professor David Ollis

## CHEMISTRY REPORT

The latest issue of *The Australian Journal of Chemistry* is (partly) dedicated to **Alan Sargeson** - hence the 4 papers in the publications list with his name on them. The issue contents can be found at: <http://www.publish.csiro.au/nid/52/issue/4907.htm> A picture of the cover, downloaded from the *Aust. J. Chem.* website is below:



## FUNNIES

Dear Tech Support,

Last year I upgraded from Boyfriend 5.0 to Husband 1.0 and I noticed a distinct slowdown in the overall system performance, particularly in the flower and jewellery applications, which operated flawlessly under Boyfriend 5.0.

In addition, Husband 1.0 uninstalled many other valuable programs, such as Romance 9.5 and Personal Attention 6.5, and then installed undesirable programs such as NEWS 5.0, MONEY 3.0 and CRICKET 4.1.

Conversation 8.0 no longer runs, and House cleaning 2.6 simply crashes the system.

Please note that I have tried running Nagging 5.3 to fix these problems, but to no avail.

What can I do?

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Reply

Dear Madam,

First, keep in mind, Boyfriend 5.0 is an Entertainment Package, while Husband 1.0 is an operating system.

Please enter command: `ithoughtyoulovedme.html` and try to download Tears 6.2 and do not forget to install the Guilt 3.0 update.

If that application works as designed, Husband1.0 should then automatically run the applications Jewellery 2.0 and Flowers 3.5.

However, remember, overuse of the above application can cause Husband 1.0 to default to Silence 2.5 or Beer 6.1. Please note that Beer 6.1 is a very bad program that will download the Snoring Loudly Beta.

Whatever you do, DO NOT under any circumstances install Mother-In-Law 1.0 (it runs a virus in the background that will eventually seize control of all your system resources.)

In addition, please do not attempt to reinstall the Boyfriend 5.0 program. These are unsupported applications and will crash Husband 1.0.

In summary, Husband 1.0 is a great program, but it does have limited memory and cannot learn new applications quickly. You might consider buying additional software to improve memory and performance. We recommend: Cooking 3.0 and Hot Looks 7.7.

Good Luck Madam!

## Staff Publications as at 28 October 2009:

For a full list of RSC publications from 2002, see <http://rsc.anu.edu.au/research/Publications/index.php>

- Addicoat MA, Collins MA **Accurate treatment of nonbonded interactions within systematic molecular fragmentation.** *J. Chem. Phys.* (2009), 131(10), 104103/1–9. <http://dx.doi.org/10.1063/1.3222639>
- Bodenreider C, Beer D, Keller TH, Sonntag S, Wen D, Yap L, Yau YH, Shochat SG, Huang D, Zhou T, Caflisch A, Su X-C, Ozawa K, Otting G, Vasudevan SG, Lescar J, Lim SP **A fluorescence quenching assay to discriminate between specific and nonspecific inhibitors of dengue virus protease.** *Anal. Biochem.* (2009), 395(2), 195–204. <http://dx.doi.org/10.1016/j.ab.2009.08.013>
- Brookes NJ, Ariafard A, Stranger R, Yates BF **Reactivity of CO<sub>2</sub> towards Mo[N(R)Ph]<sub>3</sub>.** *Dalton Trans.* (2009), (42), 9266–9272. <http://dx.doi.org/10.1039/b909982d>
- Clark IJ, Crispini A, Donnelly PS, Engelhardt LM, Harrowfield JM, Jeong S-H, Kim Y, Koutsantonis GA, Lee YH, Lengkeek NA, Mocerino M, Nealon GL, Ogden MI, Park YC; Pettinari C, Polanzan L, Rukmini E, Sargeson AM, Skelton BW, Sobolev AN, Thuéry P, White AH **Variations on a cage theme: some complexes of bicyclic polyamines as supramolecular synthons.** *Aust. J. Chem.* (2009), 62(10), 1246–1260. <http://dx.doi.org/10.1071/CH09356>
- Clarkson AJ, Blackman AG, Clark CR, Sargeson AM **Reactions of Co(III)-coordinated ornithine: towards inhibitors of the polyamine biosynthetic pathway.** *Aust. J. Chem.* (2009), 62(10), 1221–1225. <http://dx.doi.org/10.1071/CH09315>
- Cox N, Jin L, Jaszewski A, Smith PJ, Krausz E, Rutherford AW, Pace R **The semiquinone-iron complex of Photosystem II: structural insights from ESR and theoretical simulation; evidence that the native ligand to the non-heme iron is carbonate.** *Biophys. J.* (2009), 97(7), 2024–2033. <http://dx.doi.org/10.1016/j.bpj.2009.06.033>
- Di Bartolo N, Smith SV, Hetherington E, Sargeson A **An investigation into the potential of SarAr for use in <sup>64</sup>Cu radioimmunotherapy.** *Aust. J. Chem.* (2009), 62(10), 1261–1270. <http://dx.doi.org/10.1071/CH09369>
- Elkins A, Barrow R, Rochfort S **Carp chemical sensing and the potential of natural environmental attractants for control of carp: a review.** *Environ. Chem.* (2009), 6(5), 357–368. <http://dx.doi.org/10.1071/EN09032>
- Green KA, Cifuentes MP, Corkery TC, Samoc M, Humphrey MG **Switching the cubic nonlinear optical properties of an electro-, halo-, and photochromic ruthenium alkynyl complex across six states.** *Angew. Chem. Int. Ed.* (2009), 48(42), 7867–7870. <http://dx.doi.org/10.1002/anie.200903027>
- Jørgensen PM, Clayden SR, Hanel C, Elix JA ***Erioderma mollissimum* (Pannariaceae) found with certainty in Newfoundland, Canada.** *The Bryologist* (2009), 112 (3), 572–575. <http://dx.doi.org/10.1639/0007-2745-112.3.572>
- Limpanuparb T, Gill PMW **Resolutions of the Coulomb operator. Part III. Reduced-rank Schrödinger equations.** *Phys. Chem. Chem. Phys.* (2009), 11(40), 9176–9181. <http://dx.doi.org/10.1039/b910613h>
- Lin J-M, Lin T-L, Jeng U-S, Huang Z-H, Huang Y-S **Aggregation structure of Alzheimer amyloid- $\beta$  (1–40) peptide with sodium dodecyl sulfate as revealed by small-angle X-ray and neutron scattering.** *Soft Matter* (2009), 5(20), 3913–3919. <http://dx.doi.org/10.1039/b908203d>
- Lin J-M, White JW **Denaturation resistance of  $\beta$ -lactoglobulin in monomolecular films at the air-water interface.** *J. Phys. Chem. B* (2009), 113(43), 14513–14520. <http://dx.doi.org/10.1021/jp906831q>
- Liu Y, Withers RL, Nguyen HB, Elliott K, Ren Q, Chen Z **Displacive disorder and dielectric relaxation in the stoichiometric bismuth-containing pyrochlores, Bi<sub>2</sub>M<sup>III</sup>NbO<sub>7</sub> (M = In and Sc).** *J. Solid State Chem.* (2009), 182(10), 2748–2755. <http://dx.doi.org/10.1016/j.jssc.2009.07.007>
- Loos P-F, Gill PMW **Two electrons on a hypersphere: a quasireactly solvable model.** *Phys. Rev. Lett.* (2009), 103(12), 123008/1–4. <http://dx.doi.org/10.1103/PhysRevLett.103.123008>
- Malins A, Williams SR, Eggers J, Tanaka H, Royall CP **Geometric frustration in small colloidal clusters.** *J. Phys.: Condens. Matter* (2009), 21(42), 425103/1–11. <http://dx.doi.org/10.1088/0953-8984/21/42/425103>
- Nebhani L, Sinnwell S, Lin CY, Coote ML, Stenzel MH, Barner-Kowollik C **Strongly electron deficient**

**sulfonyldithioformate based RAFT agents for hetero Diels–Alder conjugation: computational design and experimental evaluation.** *J. Polym. Sci., Part A: Polym. Chem.* (2009), 47(22), 6053–6071. <http://dx.doi.org/10.1002/pola.23647>

Poldy J, Peakall R, Barrow RA **Synthesis of chiloglottones – semiochemicals from sexually deceptive orchids and their pollinators.** *Org. Biomol. Chem.* (2009), 7(20), 4296–4300. <http://dx.doi.org/10.1039/b912233h>

Sargeson AM, Lay PA **Dependence of the properties of cobalt(III) cage complex as a function of the derivatization of amine substituents.** *Aust. J. Chem.* (2009), 62(10), 1280–1290. <http://dx.doi.org/10.1071/CH09368>

Smith SJ, Riley MJ, Noble CJ, Hanson GR, Stranger R, Jayaratne V, Cavigliasso G, Schenk G, Gahan LR **Structural and catalytic characterization of a heterovalent Mn(II)Mn(III) complex that mimics purple acid phosphatases.** *Inorg. Chem.* (2009), 48(21), 10036–10048. <http://dx.doi.org/10.1021/ic9005086>

Stocker-Wörgötter E, Hager A, Elix JA **Intraspecific chemical variation within the crustose lichen genus *Haematomma*: anthraquinone production in selected cultured mycobionts as a response to stress and nutrient supply.** *Phytochem. Rev.* (2009), 8(3), 561–569. <http://dx.doi.org/10.1007/s11101-009-9149-1>

Taylor MS, Ivanic SA, Wood GPF, Easton CJ, Bacskey GB, Radom L **Hydrogen abstraction by chlorine atom from small organic molecules containing amino acid functionalities: an assessment of theoretical procedures.** *J. Phys. Chem. A* (2009), 113(43), 11817–11832. <http://dx.doi.org/10.1021/jp9029437>

Williams JF **Pentose phosphate pathway.** In *Wiley Encyclopedia of Chemical Biology, Volume 3*, Begley TP, ed. Wiley-Blackwell: Hoboken, NJ (2009), pp. 564–575.